

Do Community Perceptions of Forest Management and Conservation Vary Across Wealth Groups? The Case of the Kilosa REDD + Initiative in Tanzania

Amani J. Uisso ^{1,2,*}, Paxie W. Chirwa ^{2,3}, Pierre A. Ackerman ², Siima S. Bakengesa ¹

¹ Tanzania Forestry Research Institute, P.O. Box 1854, Morogoro, Tanzania

² Department of Forest and Wood Science, Faculty of AgriSciences, Stellenbosch University, P/Bag X1, Matieland 7602, South Africa

³ Postgraduate Forest Programme, Department of Plant and Soil Sciences, University of Pretoria, 5-15 Plant Sciences Complex, Corner of Lynwood Rd & Roper St, Hatfield 0028, South Africa

*Correspondence to Amani J. Uisso. Email: uissoaj@yahoo.com; amani.uisso2@tafori.or.tz

Abstract

Various community groups tend to interact with their environments differently. Understanding how forest dwelling communities interact with their environment provides important insights for promoting sustainable forest governance. We studied the perceptions of four communities across wealth groups (poor, medium, better-off) on forest management and conservation under the Reducing Emissions from Deforestation and forest Degradation plus (REDD +) initiative in Tanzania. Results showed that whereas general community awareness of forest management and conservation across wealth groups varied significantly, their perceptions on the extent of occurrences of several aspects/attributes of forest management and conservation were relatively symmetrical across all wealth groups. Community willingness to participate in forest management and conservation was also not significantly different across all wealth groups, apart from participation in trainings/workshops. Overall, community perceptions showed mixed results. The observed similarities and variations across wealth groups within the community are crucial to informing future REDD + actions. Thus, policies, plans and strategies related to REDD + should consider these dynamics.

Keywords: Community; Conservation; Forest; Management; Poverty; Tanzania; Wealth groups

Introduction

Reducing Emissions from Deforestation and forest Degradation, conservation, sustainable management of forests and the enhancement of carbon stocks (REDD +) initiative is placed at the forefront of the global efforts to mitigate climate change in the forest sector (Bhullar,

2013; Boer, 2019; Isyaku, 2021). The REDD + initiative rewards or compensates communities for sustainably managing and conserving their forests and providing environmental services, including carbon sequestration and storage (Dyngeland et al., 2014; Robinson et al., 2013).

Worldwide, and in tropical countries in particular, Land Use Plans (LUPs) have been integrated into REDD + implementation to support effective management and conservation of forests (Blomley et al., 2017; Bourgoin, 2012; Sundström, & Mustalahti, 2010). The REDD + initiative is an on-going activity continuing to develop in many places globally (Sheikh et al., 2021), and caution is needed in the discussion of its effectiveness. Likewise, in the context of Tanzania, to enable the communities to manage and conserve their forest sustainably, LUPs in the form of Village Participatory Land Use Plans (VPLUPs) were an essential part integrated into the REDD + initiative during the implementation of the pilot projects (Robinson et al., 2013; URT, 2013a) and the recent initiatives of Yaeda – Eyasi Landscape in Northern Tanzania by Carbon Tanzania (Nelson et al., 2018; Carbon Tanzania, 2022). LUP is defined as the process of allocating and relocating land to its most optimal use for the social-economic, cultural and ecological conditions and formulation of legal and administrative instruments that support the plan (Chigbu et al., 2017; Rubakula et al., 2019; Rudel & Meyfroidt, 2014). The VPLUP tool is proposed to give villagers the right to plan on how best they can use their land sustainably for present and future generations by considering the needs of the community (GIZ, 2011; Metternicht, 2018). Globally, in various conservation initiatives, it is widely recognised that proper implementation of VPLUP is sought to limit the key drivers of deforestation and forest degradation, such as population growth associated with poverty, insecure land tenure systems and weak enforcement of forest regulations (Bourgoin et al., 2013; Sundström, & Mustalahti, 2010).

Whereas previous forest management and conservation efforts/initiatives/studies in Tanzania and elsewhere have mostly been analysed at the village or community level (Raphael, & Swai, 2009; Phiri et al., 2012; Tesfaye et al., 2012; Turyahabwe et al., 2013; Treue et al., 2014; Siraj et al., 2016; Uisso et al., 2019), the analyses encompassing wealth groups/strata are limited. Previous studies in the area (Uisso et al., 2018, 2019) focused on the role of Village Land Forest Reserves (VLFRs) in implementing land use plans, forest management and conservation before and after the implementation of land use plan. The question remains of how the community perceives forest management and conservation across wealth groups under the intervention of VPLUPs in the REDD + initiative. This study focused on the perceptions of the community on forest management and conservation across wealth groups. Generally, many rural development projects especially community-based forest management projects (including REDD + projects) make assumptions that the community operates as a unit with common interests and that everyone stands to benefit equally. However, this has been criticised and is often unpractical (Agrawal & Gibson, 1999). Thus, it is necessary to study economic stratification within the community. In the context of this study, “community” is defined as a collection of individuals or group(s) of people who reside in a given geographical area and have multiple interests and perceptions (Beyerl et al., 2016). The concept of perceptions refers to the process by which individuals or group of people analyse and interpret or understand conditions associated with a certain phenomenon or environment (*ibid*). The core intuition of perception is that it helps to describe and understand the dynamics of perceptions within the community. Lund et al. (2010), noted that perception-based methods could elicit people’s assessment of a forest conservation initiative. However, perceptions could be influenced by people’s abilities that includes intentional, intellectual or physical modalities. These are considered to affect people’s decision-making about what they

perceive (Loomis & Philbeck, 2008). Moreover, the process of perception is subjective in the sense that different individuals or groups of people may perceive the same phenomenon or environment differently based on how they experience, believe and understand that particular scenario/situation and associated processes (Onko et al., 2018).

In this study, the analysis of wealth groups as a class division within the community is motivated by the fact that REDD + is affected by variations within-population differences between income groups (Dyngeland et al., 2014). Also, there are often significant differences in how poor, medium, and better-off households interact with their environment. For example, it has been established that poor people rely more on a forest than better-off people (Blomley & Iddi, 2009; Dokken & Angelsen, 2015; Lund & Treue, 2008). Similarly, Wunder (2001) and Wunder et al. (2014) noted that forests are often essential “safety nets” for the rural poor to shocks and resources for seasonal gap-filling. The forests can be vital safety nets, helping rural poor people to alleviate poverty. Thus, it is hypothesised that wealth groups might have divergent perceptions regarding forest management and conservation. As the REDD + initiatives are being implemented around the world (Arts & Ingram, 2019) and are likely to be an on-going activity and continue to develop in many places globally (Nelson et al., 2018), knowing community perceptions on forest management and conservation across wealth groups is an essential prerequisite for better planning and effective management and conservation of forests. In addition, it is important for decision-making processes that focus on the wealth heterogeneity nature of the community interests and expectations. In Tanzania, Carbon Tanzania (a Non- Governmental Organisation) which is a social enterprise addressing deforestation and forest degradation have successfully launched REDD + projects and has begun to trade REDD + credits in the Voluntary Carbon Market. This organization and the Tanzania Community Forest Conservation Network (MJUMITA) are the only REDD + Verified Emissions Reduction (VER) through a voluntary market in the country. The Carbon Tanzania has been involved in VER through the voluntary market since 2013 and the Asilia Africa is one organization that has purchased local carbon credits in the country (The Nature Conservancy and Dalberg Advisors, 2021; Carbon Tanzania, 2022). Despite being one of the pioneer countries in the piloting of REDD + projects, the pilot projects have not entered into transacting VER, the reason being that the lessons learnt from these pilots have yet to influence public policy, institutional infrastructure and financial decision-making mechanism to support the same (The Nature Conservancy and Dalberg Advisors, 2021).

We assess community perceptions across wealth groups (poor, medium, better-off) of forest management and conservation under VPLUPs in four villages, namely Kisongwe, Dodoma Isanga, Chabima, and Mfuluni in the Kilosa REDD + initiative in Tanzania. Specifically, our study aimed to: i) examine the community’s perceptions of forest management and conservation attributes (indicators/variables) across wealth groups; ii) determine the perceptions of the community on forest management and conservation activities across wealth groups; iii) ascertain the community’s willingness to participate in forest management and conservation across wealth groups; and iv) assess the community’s perceived uses of forest across wealth groups (Table 1). According to Brockington and Noe (2021) material asset holding is associated with well-being.

Table 1. Villagers' criteria for the grouping of wealth categories

Wealth category	Main criteria/locally defined characteristics
Better-off	Own brick-wall house with cement floor and iron sheet roof, business, farmland greater than 10 acres (4 ha), keeping more than 10 livestock, own motorbike, can afford to pay for all school expenses (e.g. uniform, text books, pens, transport etc.) for their children from primary to secondary level and some to technical school, use solar power, food secure for the whole year, own mobile phone and afford to pay for all health care services.
Medium	Own brick-wall house with mud floor and grass or iron roof, farmland between 3 acres (1.2 ha) and 10 acres (4 ha), own less than 10 livestock, own bicycle, can afford to pay for school expenses for primary school only, food secure for more than eight months in a year, own mobile phone and afford to pay for health care for simple illness.
Poor	Own mud-wall house roofed with grass, own farmland less than 3 acres (1.2 ha), own only few chickens, food insecure more than five months in a year and cannot afford to pay for school expenses and health care at all.

Source: Uisso (2018)

The Context of the Kilosa District REDD + Pilot Project

Kilosa District REDD + initiative is one of the REDD + pilot intervention sites in Tanzania. It was implemented between 2009 and 2014 by two non-governmental organizations, the Tanzania Forest Conservation Group (TFCG) and Tanzania Community Forest Conservation Network (MJUMITA), in collaboration with the Kilosa District Council (TFCG, 2012; Vatn et al., 2013; Blomley et al., 2017). The pilot area covered about 83,441.89 ha of forests under the Village Land Forest Reserves (VLFRs) in 12 villages, namely; Chabima, Dodoma Isanga, Ibingu, Idete, Ilonga, Kisanga, Kisongwe, Lunenzi, Malolo "A", Mfuruni, Msimba and Nyali (Uisso, 2018; Uisso et al., 2021). The pilot sought to demonstrate the feasibility of REDD + in Community Based Forest Management (CBFM) by involving local communities. The aim was to integrate community and forest management and conservation by rewarding the community for effectively managing and conserving their forests to provide environmental services, including carbon sequestration and storage, as well as community's goods and services (TFCG, 2012; Vatn et al., 2013; Kajembe et al., 2015). The project activities were carefully designed to develop human resources, establish conservation tools, and develop alternative livelihood support at the community level necessary for the conservation and management of forest resources. Thus, the portfolio of the project includes capacity building for the villagers, implementation of VPLUP, allocation of VLFRs, the establishment of alternative livelihood activities, estimating carbon stocks, and payment of trial carbon funds.

A participatory approach underpinned by the principles of 'Free Prior and Informed Consent' (FPIC) was employed in the implementation process of REDD + in the area. According to Costanza (2015), FPIC is an important tool/approach to any initiative that may affect the local community on their property rights over land, natural resources, and territory. It is embedded in international human rights law aiming at achieving more effective bottom-up participation by establishing an obligation to consult and obtain the consent of local communities before projects/programmes and legal reforms that would affect them can proceed (Costanza, 2015; Fontana & Grugel, 2016). The FPIC approach is entrenched in three major pillars namely: i) informing the community about the positive and negative effects of the initiative (communal orientation); ii) allowing the community to vote on whether to implement the initiative (communal consent); and iii) involving the community in every step of the implementation of the initiative (communal participation) (Forrester-Kibuga, 2011; Costanza, 2015; Boer, 2019). Dyngeland et al., 2014 and Vatn et al., (2013)

noted that this approach in implementing the Kilosa REDD + pilot was non-discriminatory and informed and involved most community members in the process.

Vatn et al. (2013) noted that the approach was more successful in attracting community members than the previous initiatives led by the public authority in the area. However, there is no guarantee that the initiative being participatory, all people participated fully in the process (Magessa et al., 2020). At the end of the project in 2014 when the REDD + initiative was handed over to the Kilosa District Council to oversee further implementation and MJUMITA to provide advocacy and look for the carbon market, several activities were already in place (Uisso et al., 2019). These included VPLUPs, VLFRs, and associated by-laws and were already approved at the district level. Only Dodoma Isanga village had acquired village land certificate, and no VLFRs had been gazetted yet, but they had agreed to start enforcing the VPLUPs and associated by-laws. In addition, trial payments for carbon were already made to the participating villages (E.g., in the study villages: Chabima = 14 510.48 USD, Dodoma-Isanga = 8 307.45 USD, Kisongwe = 10 493 USD and Mfuruni = 4 010 USD) (Dyngeland & Waized, 2013; Kajembe et al., 2015).

Although the study didn't find how much individuals were each paid and directed to projects, the funds obtained from trial payment were distributed to individuals (direct payment) and/or allocated to community development projects. Villagers made these arrangements, giving them a sense of ownership and trust in project proponents (DELOITTE, 2012). Although, as noted earlier that MJUMITA is looking for a possibility of future carbon funding after the pilot projects, this has not yet materialised. Others established income-generating activities such as beekeeping, conservation agriculture, village community banks (VICOBA), sustainable charcoal, and chicken rearing. This was enabled through capacity building and creating groups in each activity. Uisso et al. (2019) noted that in the REDD + villages, there had been community readiness and willingness to participate in forest management and conservation activities. More regulated access to the forest resulted in reduced grazing, agriculture, logging, and limited extraction of wood fuel, especially for charcoal production. However, this has implications for the poor group who rely more on forest resources for their livelihoods to meet basic needs. The medium and better-off groups generally benefit more, especially timber and charcoal enterprises.

Materials and Methods

Description of the Kilosa District

The study was conducted in the REDD + initiative in the Kilosa District of Tanzania. The District is in the Morogoro region, approximately 300 km from Dar es salaam city between 6°00' and 8°00' S latitude and 36°30' and 38°00' E longitude at an altitude ranging from 550 m to 2 200 m above sea level (a.s.l.) (KDC, 2012; Kajembe et al., 2015). The district land area covers approximately 1 424 500 ha, equivalent to 20% of the total (7 062 400 ha) land area of the Morogoro region (URT, 2013b). The rainfall pattern is bimodal, with long rains from February to May and short rains from October to December. On average, it receives between 500 mm and 1 600 mm of rainfall annually. The annual average temperature ranges between 25 °C and 30 °C (URT, 2013a). The forests in the district are classified as Miombo woodland (Mtimbanjayo & Sangeda, 2018; Shishira et al., 1997) and cover about 40% of the total land area in the district (Benjaminsen et al., 2009; URT, 2013b). The soils in the highlands areas are generally moderately fertile and well-drained, comprising sandy (clay) loam soil, while the soils in the lowlands area are poorly drained black clay and

loamy (KDC, 2012). The district is inhabited by 1 438 175 people (URT, 2013a), and their major livelihood activity is agriculture, practised by 80% of the people. Agriculture practice is dominated by illegally shifting cultivation, clearing and cultivating forest areas. The other economic activities in the district include charcoal making and livestock keeping, to mention a few (Movik et al., 2012; Kajembe et al., 2013). Similar to shifting agriculture, charcoal making and livestock keeping, especially cattle, have been identified as the major threats to the forests (Kajembe et al., 2013).

Research Design and Sampling Procedures

We applied a quantitative approach to data collection, analysis and interpretation was applied (Creswell, 2014; Plano & Ivankora, 2015). The rationale and assumptions for using the quantitative approach were based on the nature of the study that focuses on community perceptions and generalisation of the results. According to Babbie and Mouton (2010), a quantitative approach is one of the methods recommended for measuring and describing perceptions, attitudes and beliefs. Similarly, de Vaus (2002) noted that the use of a quantitative approach could be appropriate for making generalisations. A multistage sampling procedure involving taking samples in stages using smaller and smaller sampling units at each stage was employed to identify the sample households for the study (Creswell, 2014). The studied villages were selected purposely, focusing on villages involved in the REDD + project, with two villages from the highland (Kisongwe and Mfuruni) and two from the lowland areas (Chabima and Dodoma Isanga). This selection was important to get a representative sample of the study area. Stratified sampling was applied to classify the households into three groups as per Table 1 presented earlier (poor, medium and better-off). According to Uisso (2018), the stratification of the three wealth groups based on the community’s criteria was carried out with a few selected key informants (who know the community well) together with the community leaders. Simple random sampling (Creswell, 2014) was used to select 328 households proportionally from the studied villages based on the stratified groups for the household survey (Table 2). To avoid sampling biases, the sample size (328) was obtained by using Eq. (1) at a 95% confidence level and precision of 0.05 (Yamane, 1967).

Table 2. Sample size for the study

Village	Number of Household	Samples based on wealth categories			Sample size	Sampling intensity (%)
		Better-off	Medium	Poor		
Kisongwe	696	16	44	65	125	38.2
Dodoma Isanga	488	10	22	56	88	26.8
Chabima	378	6	30	33	69	21.0
Mfuruni	264	9	13	24	46	14.0
Grand total	1 826	41	109	178	328	100

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

where n is the sample size, N is the population size (total number of households = 1 826), and e is the level of precision (significance level = 0.05).

$$n = \frac{1\ 826}{1 + 1\ 826 (0.05)^2}$$

$$n = \frac{1\ 826}{1 + 1\ 826 (0.0025)}$$

$$n = 328$$

However, after excluding the partly filled questionnaires, the final sample size was 301 households.

Data Collection and Analysis

Data collection was done between July 2016 and January 2017. The household interview was used to collect quantitative data and focused on the following issues; i) the extent of community awareness of the forest management and conservation activities happening or existing in the area, ii) the community's perceptions of the rate of occurrence of forest management and conservation attributes/indicators, iii) the community's perceptions of the presence of forest management and conservation activities, iv) the community's willingness to participate in forest management and conservation, and v) the community's perceived uses of the forest. The quantitative data obtained through a questionnaire (household interview) were analysed using the IBM statistical package for social sciences (SPSS) version 24 to generate descriptive and inferential statistics. This study's main hypothesis was that the community's perceptions vary across wealth groups. Thus, for statistical analyses, the Chi-square (χ^2) test was used to analyse the level of independence across wealth groups. A p-value of ≤ 0.05 was considered statistically significant, and since the matrix was more than 2×2 , Pearson's values were considered (Pallant, 2013). Table 3 summarises the main issues analysed and their subsequent measurement and analytical tools.

Table 3. Description of the main issues analysed, methods of data collection, measurement level and analytical tool

Main issues analysed	Methods of Data Collection	Measurement level and type	Analytical tool
i) Extent of community awareness of the forest management and conservation activities happening or exist in the area	Household Questionnaire	Likert scale—five level ordinal (very high, high, neutral, low, very low)	<ul style="list-style-type: none"> • Descriptive statistics (frequencies and percentages) • Chi square (χ^2)
ii) Community's perceptions on the rate of occurrence of forest management and conservation attributes/ indicators	Household Questionnaire	Likert scale—five level ordinal (very high, high, neutral, low, very low)	<ul style="list-style-type: none"> • Descriptive statistics • Chi square (χ^2)
iii) Community's perceptions on the presence of forest management and conservation activities	Household Questionnaire	Nominal—Binary (Yes/No)	<ul style="list-style-type: none"> • Descriptive statistics • Chi square (χ^2)
iv) Community's willingness to participate in forest management and conservation	Household Questionnaire	Nominal—Binary (Yes/No)	<ul style="list-style-type: none"> • Descriptive statistics • Chi square (χ^2)
v) Community's perceived uses of forest	Household Questionnaire	Nominal—Binary (Yes/No)	<ul style="list-style-type: none"> • Descriptive statistics • Chi square (χ^2)

Results and Discussion

Community Awareness of Forest Management and Conservation Across Wealth Groups

The analysis of the community awareness found a significant difference ($p < 0.05$) among respondents across wealth groups in terms of their awareness of forest management and conservation. About 40% of the respondents from better-off compared to 52% and 50% of the respondents from medium and poor, respectively, were highly (very high) aware of forest management and conservation. This suggests that the respondents from medium and poor households were more aware (more than half) as compared to better-off households (less than half) (Table 4).

Table 4. Extent of community's awareness of forest management and conservation

Awareness	Wealth categories			Inferential statistic	
	Better-off (n = 40)	Medium (n = 101)	Poor (n = 160)	χ^2 value	p-value
Very low	0 (0)	0 (0)	0 (0)		
Low	0 (0)	4 (4)	1 (0.6)		
Neutral	10 (25)	10 (9.9)	15 (9.4)	13.668	0.034*
High	14 (35)	34 (33.7)	64 (40)		
Very high	16 (40)	53 (52.5)	80 (50)		

Figures in brackets are in percentages

*Significant at 0.05; the inferential statistic is based on Pearson values

Although the approach to implement the project was participatory and strove to ensure equal participation and representation of all groups in the community, the observed low awareness of the better-off group compared to other groups is surprising. This is because, as earlier noted, villagers were ready and willing to participate in REDD + activities. Thus, the low awareness of this small group of wealthy people could be that they were relatively few attending awareness programmes during REDD + implementation. This could be the case, as noted earlier, that it is claimed that an initiative being participatory does not mean that all people will be involved in the process (Magessa et al., 2020). However, 75% and more (combined high and very high in Table 4) of the respondents in all wealth categories were aware, suggesting that over time the favourable impact on respondents who are high to very high would spill over to neutral, low and very low groups resulting in high to very high awareness. These results are important in informing future conservation interventions in the area and other areas with similar contexts.

Perceptions of Community Across Wealth Groups on Forest Management and Conservation Indicators/Variables

The results generally showed that forest boundary conflict, frequency of accessing forest, frequency of forest fire, rate of deforestation, conversion of forest to other land uses, grazing in forest and change in forest boundaries were mainly low to very low (Table 5). On the other hand, forest regeneration, benefits (goods and services), and watershed protection were exceptionally high (Table 5). This highlights improved management, conservation and benefits of the forests in the area.

Table 5. Perceptions of community across wealth groups on forest management and conservation indicators under Land Use Plans

Indicator	Response	Wealth categories			Inferential statistics	
		Better-off (n=40)	Medium (n=101)	Poor (n=160)	χ^2 value	p-value
Forest boundary conflict	Very low	19 (47.5)	41 (40.6)	66 (41.3)	3.837	0.872 ^{ns}
	Low	6 (15)	20 (19.8)	35 (21.9)		
	Neutral	7 (17.5)	16 (15.8)	30 (18.8)		
	High	5 (12.5)	16 (15.8)	23 (14.4)		
	Very high	3 (7.5)	8 (7.9)	6 (3.8)		
Frequency of accessing forest	Very low	13 (32.5)	38 (37.6)	63 (39.4)	3.419	0.905 ^{ns}
	Low	20 (50)	40 (39.6)	65 (40.6)		
	Neutral	3 (7.5)	12 (11.9)	18 (11.3)		
	High	3 (7.5)	5 (5)	6 (3.8)		
	Very high	1 (2.5)	6 (5.9)	8 (5)		
Frequency of wildfire	Very low	14 (35)	46 (45.5)	72 (45)	5.267	0.729 ^{ns}
	Low	15 (37.5)	34 (33.7)	52 (32.5)		
	Neutral	7 (17.7)	9 (8.9)	15 (9.4)		
	High	0 (0)	4 (4)	7 (4.4)		
	Very high	4 (10)	8 (7.9)	14 (8.8)		
Rate of deforestation	Very low	19 (47.5)	39 (38.6)	78 (48.8)	8.048	0.429 ^{ns}
	Low	13 (32.5)	34 (33.7)	48 (30)		
	Neutral	3 (7.5)	19 (18.8)	19 (11.9)		
	High	3 (7.5)	3 (3)	10 (6.3)		
	Very high	2 (5)	6 (5.9)	5 (3.1)		
Forest regeneration	Very low	0 (0)	0 (0)	0 (0)	3.550	0.737 ^{ns}
	Low	1 (2.5)	3 (3)	4 (2.5)		
	Neutral	6 (15)	25 (24.8)	28 (17.5)		
	High	18 (45)	35 (34.7)	69 (43.1)		
	Very high	15 (37.5)	38 (37.6)	54 (36.9)		
Forest benefits (goods and services)	Very low	1 (2.5)	0 (0)	7 (4.4)	10.944	0.205 ^{ns}
	Low	3 (7.5)	10 (9.9)	14 (8.8)		
	Neutral	9 (22.5)	11 (10.9)	18 (11.3)		
	High	17 (42.5)	37 (36.6)	58 (36.3)		
	Very high	10 (25)	43 (42.6)	63 (39.9)		
Presence of wild animals	Very low	1 (2.5)	5 (5)	7 (4.4)	3.734	0.880 ^{ns}
	Low	5 (12.5)	7 (6.9)	10 (6.3)		
	Neutral	16 (40)	42 (41.6)	72 (45)		
	High	15 (37.5)	35 (34.7)	50 (31.3)		
	Very high	3 (7.5)	12 (11.9)	21 (13.1)		
Conversion of forest to other land uses	Very low	14 (35)	32 (31.7)	62 (38.8)	9.221	0.324 ^{ns}
	Low	16 (40)	39 (38.6)	58 (35.3)		
	Neutral	7 (17.5)	9 (8.9)	20 (12.5)		
	High	2 (5)	10 (9.9)	6 (3.8)		
	Very high	1 (2.5)	11 (10.9)	14 (8.8)		
Change in forest boundary	Very low	12 (30)	28 (27.7)	45 (28.1)	5.471	0.706 ^{ns}
	Low	12 (30)	21 (20.8)	36 (22.5)		
	Neutral	7 (17.5)	20 (19.8)	36 (22.5)		
	High	1 (2.5)	13 (12.9)	19 (11.9)		
	Very high	8 (20)	19 (18.8)	24 (15)		
Watershed protection	Very low	1 (2.5)	0 (0)	1 (0.6)	7.269	0.508 ^{ns}
	Low	0 (0)	2 (2)	1 (0.6)		
	Neutral	4 (10)	6 (5.9)	8 (5)		
	High	11 (27.5)	40 (39.6)	57 (35.6)		
	Very high	24 (60)	53 (52.5)	93 (58.1)		
Grazing in forest	Very low	25 (62.5)	65 (64.4)	96 (60)	4.981	0.760 ^{ns}
	Low	9 (22.5)	16 (15.8)	25 (15.6)		
	Neutral	4 (10)	10 (9.9)	15 (9.4)		
	High	0 (0)	4 (4)	8 (5.8)		
	Very high	2 (5)	6 (5.9)	16 (10)		

In addition, the χ^2 test showed no significant difference in the community perceptions of the extent of occurrence of these attributes across all wealth groups. This implies that the community perceptions across all wealth groups were similar regarding forest management and conservation attributes. This similarity could be related to the commitment of all wealth groups to observing forest management and conservation attributes. A closer look at the χ^2 test and the responses from the households, as they vary from “very low” to “very high”, clearly implies that the understanding of forest management and conservation attributes vary but do not appear to depend on wealth. The possible reason could be attributed to the participation of all wealth categories in the REDD + implementation activities. This argument is supported by Vatn et al. (2017) and Uisso et al. (2018) in the same study area who claimed that the implementation of the REDD + initiative in the Kilosa District was transparent and inclusive as every member of the community (including wealth groups) was invited to participate in the process. This common perception is important and necessary for achieving collective actions and a common goal of the REDD + initiative. Collective action has been recognised as essential for effectively managing and conserving forests (Ostrom, 1990; Shrestha & McManus, 2008). This argument assumes that collective actions would enhance collaboration in responsibilities across community wealth groups, leading to long-term management and conservation of forests. Collective actions through various forums are appropriate for information sharing and exchange to improve cooperation in management and forest conditions (Antinori & Rausser, 2007).

Perceptions of Community Across Wealth Groups on Forest Management and Conservation Activities

Forest management and conservation activities carried out in the area are shown in Table 6. More than 50% of the respondents in all wealth categories perceived that forest patrol, tree nursery, fire fighting, forest boundary maintenance and training/workshops/meetings were the activities carried out in the area, except for tree planting, for which the perception was below 5%. In addition, the χ^2 test indicated no significant ($p < 0.05$) difference in perceptions across the wealth groups in each forest management and conservation activity. Based on the χ^2 test results and that the responses from the households vary from “very low” to “very high”, it implies that the understanding of the situation does not appear to depend on wealth but varies considerably across the community. Further, knowing the management and conservation activities carried out in the area (by all wealth groups) motivates them to participate in the activities and achieve a common goal of forest management and conservation. This understanding has also important implications for developing sustainable forest management practices in the area.

Table 6. Perceived forest management and conservation activities across wealth groups (N = 301)

Activity	Response	Wealth categories			Inferential statistics	
		Better-off (n = 40)	Medium (n = 101)	Poor (n = 160)	χ^2 value	p-value
Forest patrols	Yes	37(92.5)	100(99)	157(98.1)	5.651	0.059 ^{ns}
	No	3(7.5)	1(1)	3(1.9)		
Tree nursery	Yes	25 (62.5)	62 (61.4)	84 (52.5)	2.605	0.272 ^{ns}
	No	15 (37.5)	39 (38.6)	76 (47.5)		
Tree planting	Yes	2 (5)	2 (2)	4 (2.5)	1.043	0.594 ^{ns}
	No	38 (95)	99 (98)	156 (97.5)		
Fire fighting	Yes	35 (87.5)	95 (94.1)	149 (93.1)	1.915	0.384 ^{ns}
	No	5 (12.5)	6 (5.9)	11 (6.9)		
Forest boundary maintenance	Yes	35 (87.5)	74 (73.3)	123 (76.9)	3.293	0.193 ^{ns}
	No	5 (12.5)	27 (26.7)	37 (23.1)		
Training/workshop/Meeting	Yes	33 (82.5)	95 (94.1)	141 (88.1)	4.586	0.101 ^{ns}
	No	7 (17.5)	6 (5.9)	19 (11.9)		

Figures in brackets are in percentages

ns = Not significant at 0.05; the inferential statistics are based on Pearson values

Community's Willingness to Participate in Forest Management and Conservation

The majority of the respondents in all wealth groups, better-off (97.5%), medium (91.1%), and poor (85.6%) stated that they were willing to participate in forest management and conservation in the area. In addition, χ^2 test showed a non-significant difference between the respondents' willingness to participate in forest management and conservation across all wealth groups ($p = 0.071$). Table 7 shows the main activities in which the respondents were ready to participate across wealth groups.

Table 7. Main activities that the community is willing to participate (N = 301)

Activity	Response	Wealth categories			Inferential statistics	
		Better-off (n = 40)	Medium (n = 101)	Poor (n = 160)	χ^2 value	p-value
Forest patrols	Yes	26 (65)	64 (63.4)	91 (60.1)	1.554	0.462 ^{ns}
	No	14 (35)	37 (36.6)	69 (39.9)		
Tree nursery	Yes	22 (55)	53 (52.5)	80 (50)	0.379	0.827 ^{ns}
	No	18 (45)	48 (47.5)	80 (50)		
Tree planting	Yes	1 (2.5)	2 (2)	1 (0.6)	1.35	0.509 ^{ns}
	No	39 (97.5)	99 (98)	159 (99.4)		
Fire fighting	Yes	23 (57.5)	62 (61.4)	105 (65.6)	1.104	0.576 ^{ns}
	No	17 (42.5)	39 (38.6)	55 (34.4)		
Forest boundary maintenance	Yes	20 (50)	53 (52.5)	71 (44.4)	1.714	0.424 ^{ns}
	No	20 (50)	48 (47.5)	89 (55.6)		
Training/workshop/meeting	Yes	30 (75)	67 (66.3)	95 (59.4)	11.043	0.026*
	No	10 (25)	34 (33.7)	65 (40.6)		

Figures in brackets are in percentages

ns = Not significant at 0.05; inferential statistics are based on Pearson values

*Significant at 0.05

Even though the previous results showed that the better-off group was less aware than the others, this group emerged to be highly willing to participate in forest management and conservation in the area. This result is rather controversial, and the better-off group's willingness could be linked to the fact that they didn't want to be seen as not participating in

forest management and conservation. In general, better-off people may have responsibilities and influence within the community, and some may benefit more from forests, so they could also have a strong interest in contributing and, perhaps not the least, as such being known in the community as persons who contribute to community forest conservation activities. Thus, it can be postulated that the better-off group might have been participating in forest conservation activities to a certain extent.

Results show that willingness to participate in tree planting is low in all wealth groups. In addition, better-off households are more willing to participate in training than other groups. Villagers' low interest in tree planting is probably because it is seen as an inefficient strategy, as noted in various discussions, trees take longer to realise their benefits. However, other factors could be linked to the unwillingness to participate in tree planting in all wealth groups, which needs further investigation. Regarding the willingness to participate in training, this could probably be linked with some of the trainings accompanied by economic benefits (training participants being paid). In addition, the other groups may be inferior because of their less decision-making power. Thus, they fear attending training (Adhikari et al., 2014; Blomley et al., 2017).

However, it is worth noting that all wealth groups were highly willing to participate in forest management and conservation. There was no significant difference in almost all activities they were willing to participate in. The willingness of the better-off group is surprising as the major livelihood activity in the area is agriculture. This group might have strived to maintain their wealth status by generating more income from alternative sources, which may result in low participation in forest activities (Lestari et al., 2015). However, their participation in forest management and conservation activities might likely have an exclusive benefit to them which may result in high participation (Lise, 2000). From a wider perspective, it could also be inferred that community willingness to participate was more likely driven by the village by-laws which encourage every community member to participate in forest management and conservation activities. Thus, the project proponents must maintain this observed willingness to ensure sustainable implementation of REDD+. This could be achieved via policy arrangements to safeguard and enhance the community's benefits from the forests. Finally, the fact that more than 85% of the respondents in all wealth group categories were willing to participate in forest management and conservation activities indicates that they recognise the potential value of their forest and demonstrate significant support for their management. The perceived activities they were willing to participate in, irrespective of tree planting (which was less likely preferred), also reinforce the value of these forests to the community.

Community Perceptions on the Use of Forests

Community perceived uses of forests across wealth status are presented in Table 8. All wealth categories recorded the use of forests for various activities and for obtaining products. The χ^2 test indicated that the perceptions of the community across wealth status did not show any significant ($p > 0.05$) difference in all activities/uses. This suggests that all wealth groups depend on the forest in the same way. This could be due to the influence of the nominal-binary measurement used. Further, there is an internally correlated use of forests in those people who use one product or conduct activity may also use/conduct others. However, if the measurement used was open-ended rather than a nominal-binary one, there could be a possibility that some wealth groups not embracing a certain use. Thus, generally, it can be inferred that the forest is important to all wealth groups in the area. This is critical to the livelihoods of the community in the area. The results of this study are contrary to that of Lund

and Treue (2008), in other decentralised forest management, especially in Mfyome village in Iringa where the poorer households rely more on forests than the wealthier stratum. They further noted that restricted use of the forests could affect more the poorer segments of the local community (the most forest-dependent).

Table 8. Community perceived main uses of the forest across wealth groups (N = 301)

Activity/use	Response	Wealth categories			Inferential statistics	
		Better-off (n = 40)	Medium (n = 101)	Poor (n = 160)	χ^2 value	p-value
Timber	Yes	21 (52.5)	58 (57.4)	77 (48.1)	2.154	0.341 ^{ns}
	No	19 (47.5)	43 (42.6)	83 (51.9)		
Charcoal	Yes	17 (42.5)	43 (42.6)	63 (39.4)	0.313	0.855 ^{ns}
	No	23 (57.5)	58 (57.4)	97 (60.6)		
Poles	Yes	22 (55)	49 (48.5)	63 (39.4)	4.146	0.126 ^{ns}
	No	18 (45)	52 (51.5)	97 (60.9)		
Firewood	Yes	18 (45)	57 (56.4)	76 (47.5)	2.470	0.291 ^{ns}
	No	22 (55)	44 (43.6)	84 (52.5)		
Farming	Yes	9 (22.5)	21 (20.8)	20 (12.5)	4.228	0.121 ^{ns}
	No	31 (77.5)	80 (79.2)	140 (87.5)		
Grazing	Yes	6 (15)	7 (6.9)	19 (11.9)	2.520	0.284 ^{ns}
	No	34 (85)	94 (93.1)	141 (88.1)		
Collection of herbs	Yes	15 (37.5)	32 (31.7)	54 (33.8)	0.441	0.802 ^{ns}
	No	25 (62.5)	69 (68.3)	106 (66.3)		
Hunting	Yes	12 (30)	22 (21.8)	24 (15)	5.246	0.073 ^{ns}
	No	28 (70)	79 (78.2)	136 (85)		
Wild food (eg. berries, mushrooms)	Yes	23 (57.5)	61 (60.4)	83 (51.9)	1.896	0.387 ^{ns}
	No	17 (42.5)	40 (39.6)	77 (48.1)		
Beekeeping	Yes	28 (70)	69 (68.3)	101 (63.1)	1.106	0.573 ^{ns}
	No	12 (30)	32 (31.7)	59 (36.9)		

Figures in brackets are in percentages

^{ns} = Not significant at 0.05; inferential statistics are based on Pearson values

Further analysis shows that among all uses, there was high perceived use of the forest for wild food and beekeeping across all wealth status. This could be possible as, for example, beekeeping was encouraged as an alternative income-generating and conservation activity under the REDD + implementation in the area (Uisso et al., 2019). According to Chidumayo (2011) if activities such as beekeeping and wild food are adequately planned, they can be carried out in forest reserves. The other uses were relatively low except for timber, poles, and firewood which showed mixed results across wealth groups. For example, the forest is slightly more perceived to be used for timber by medium and better-off households. This could be the case, as asserted by Uisso et al. (2019), that access to the forest for timber demands payments the poor households could, in most cases, not be affordable. In addition, note that timber is mainly harvested for commercial purposes, of which poor households could be excluded (in this study, although not significant, poor households who use the forest for timber are less than 50%). This could be linked to Dokken and Angelsen (2015) argument that better-off households have higher total income from forest products than poor and medium-wealth groups.

Similarly, in the same study area, Dyngeland et al. (2014) reported that better-off households obtain more income from the forest than the other income categories, especially firewood for family and commercial purposes. Furthermore, despite the results of this study showing the insignificant differences in the use of forests for farming across all wealth groups, the better-off group has been reported to cultivate and clear more land than the poor under illegal

procedures (Dyngeland et al., 2014). Thus, it could be inferred that insignificant perceptions of the use of forests do not necessarily mean equal access or use of forest resources. These results could assist in better planning and developing policies targeting the inclusiveness of marginalised people in poor wealth group categories to forest resources for domestic and commercial purposes.

Conclusion

This study addressed the issue of community members' and wealth groups' perceptions of management and conservation activities with forests in a REDD + area. Variation in perceptions across wealth categories is important and useful when implementing REDD +. Thus, this study provides an insight into the community perceptions of forest management and conservation across wealth groups (poor, medium, better-off) which are important and useful for future implementation of REDD +. The study indicated that general community awareness of forest management and conservation varied significantly across wealth groups suggesting a different way of understanding that forest management and conservation co-exist in the area. This has implications for implementing REDD + and suggests improvement in extension services for better-off households, indicating low awareness. Community perceptions on the extent of occurrences on several aspects/attributes of forest management and conservation were relatively symmetrical across all wealth groups. This reflects the interest/consciousness of all wealth groups in forest management and conservation despite their varied awareness of REDD +. It was further noted a non-significant difference in perceptions across the wealth group about the indicators of forest management and conservation. Community willingness to participate in forest management and conservation activities was also not significantly different across all wealth categories, except for participation in trainings/workshops. The uses of forests didn't vary substantially across the wealth group suggesting similar uses of forests across the wealth group, albeit at different levels. This result allows us to know which uses were important to the community across the wealth category and that the forest offers an opportunity for several uses to all income groups albeit at varying levels. Conclusively, there is a general view that the perceptions of communities on forest management and conservation both vary and at some point, are similar across wealth groups. These similarities and variations observed across wealth groups within the community are key to informing future REDD + implementation. Thus, policies, plans and strategies related to REDD + should consider similarities and variations across wealth categories. Possible policy take could be emphasis on extension services and safeguard and enhancement of the community's benefits from the forests and their management. This is for all socio-economic categories as opposed to considering only rural poor communities.

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Contributions

Amani J. Uisso, Tanzania Forestry Research Institute, Morogoro Tanzania - conceptualised the original research idea, participated in collection and analysis of data, and wrote the draft

manuscript; Paxie W. Chirwa, University of Pretoria, Pretoria South Africa - supervised data collection, analysis and writing the draft manuscript; Pierre A. Ackerman, Stellenbosch University, Capetown, South Africa - supervised data collection, analysis and writing the draft manuscript; Siima S. Bakengesa, Tanzania Forestry Research Institute, Morogoro Tanzania - participated in writing the draft manuscript.

Ethics declarations

Ethical Approval and Consent to Participate

The study was approved by the Research Ethics Committee: Social Behavioural and Education Research (REC: SBE) at the Stellenbosch University (SU) in South Africa. It is hereby confirmed that the research was performed in accordance with relevant guidelines/regulations. Necessary informed consent was obtained from all research participants.

Consent for Publication

All authors provided consent to publish the manuscript.

Human and Animal Ethics

The study was approved by the Research Ethics Committee: Social Behavioural and Education Research (REC: SBE) at the Stellenbosch University (SU) in South Africa.

Competing Interests

The authors declare that there is no conflict of interest.

Data Availability

No any other data available/Not applicable

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