

## Article

# Participatory Forest Management in West Usambara Tanzania: What Is the Community Perception on Success?

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**Abstract:** Despite the increase in forest areas and villages under the participatory program over the last two decades in Tanzania, there is little insight into the communities' views regarding their participation. This study aimed to explore communities' participation in the participatory forest program in Tanzania. The survey involved 159 households, randomly sampled from four villages bordering state and community-managed forests, in West Usambara Mountains. The factor analysis summarised three components of participation. Economic, decision-making, and protection activities are used to formulate the participation intensity index. The study observed significantly higher levels and intensity of participation in the villages around the state compared to those around the community forest. Training attendance, trust on institutions, and location were significant predictors of participation intensity of the households. In conclusion, the perceived performance of the participatory programs in achieving the participation aims has been moderate with better results in the state forest jointly managed with the community. Raising awareness and improving communication with villagers, fulfilling promises for the communities, and provision of more forest-linked interventions are recommended to improve the situation in West Usambara.

**Keywords:** community; participatory forest management; Usambara mountains; participation; joint forest management; community based forest management

## 1. Introduction

Participatory programs have been central to the management of natural resources in many resource-rich countries in the past three decades [1]. Countries such as Tanzania, Indonesia, India, and Nepal have internalised the participatory approaches in which the communities participate in the forest resources management [2–5]. In essence, the participatory approach is the devolution strategy where resource management is brought closer to the community, responding to the challenges identified in the centralised management [6]. Some of the challenges experienced by the centralised management include the ever-increasing management cost [7], hostile relationship between communities and forest officers, and increased resistance from local people [8].

The result of community participation from literature has been mixed with some positive cases indicating the improvement to the communities and indicating resource enhancement [9]. In Tanzania, for example, some studies observed positive outcome in income [10–12] and forest condition improvement [13,14], while others reported no impact on income or poverty alleviation [15,16]. The direct poverty alleviation at households' level, however, was not promising because most benefits were shared at the community level [15]. Some of the documented conditions for success in these

studies include livelihoods' support at the households and communities' level, accountability, and transparency mechanisms as well as minimisation of elite capture [10,15].

In Tanzania, community participation is based on the participatory forest management (PFM) framework. In the PFM, two tiers of community participation (institutional regimes) are recognized. The first one involves the communities as co-managers in the state-owned forest known as Joint Forest Management (JFM), while, in the other, Community Based Forest Management (CBFM), communities are complete owners of the resource [17,18]. The JFM is legalised on the contractual agreement known as the Joint Management Agreement (JMAs). The JMAs signatories are villagers through the village chairman, and the state through the district forest manager, or in the local government through a district executive director [13,19].

On the other hand, the CBFM arrangement has to take place in the formally recognised village land [2,20]. The difference between JFM and CBFM is based on the tenure rights, which the communities enjoy, with maximum devolution to the villagers in the CBFM arrangement [21]. The challenge, however, lies in the fact that, in most African countries, the state devolves an already degraded forest to the communities [22], which imposes a high management cost.

Despite the challenges, Tanzania is often cited as a success case of participatory programs in Africa [21,23]. Notwithstanding the importance and benefits of the forest to the local population [24] and almost two decades of participatory programs, the perceived performance of the program by the communities in achieving the PFM goals is not clearly understood. The PFM intended goals include forest conditions enhancement, communities' livelihood improvement, and community involvement in resources' governance [16,17]. The lack of insight from the community perspective limits the gauging of the outcome of the participation program to improve community welfare and the forest condition. Though the actual increase in the number and areas of forest under the participatory program is reported [2,8], it is not clear if this increase eventually benefits the communities and resource condition. The few available studies [16–18] have assessed the intended outcome of the PFM on local people livelihoods, without consideration of the actual processes toward achieving those livelihoods. As a result, little is understood about the incentives for community participation, and this gap may hinder the development of informed policies.

The assessment of the participation process of the PFM in Tanzania through various indicators (components of participation) offers insight into the way fringe forest users engage in conservation. Furthermore, in the assessment of participation, Dietz and Stern [25] identified five dimensions of participation. The dimensions include assessment of the participant, their scale of participation, intensity, power, and influence of participants and the fifth dimension, which combines all others to achieve their participation goal [16,25]. This study, therefore, based on the assessment of participation and its dimension is essential to get the insight of the participatory approach. The degree of involvement in the participatory program enhances the quality of the relationship between communities and other stakeholders, which facilitate networking and skills development [26]. The PFM is likely to expand and continue to be central to the forest management policy in Tanzania since donors and non-governmental organisations (NGOs) influence for more community participation in many countries [27]. The donor funding and activities of strongly donor-funded organisations (Tanzania Forestry Community Network, Tanzania Forest Conservation Group, Mpingo Conservation and Development Initiative) (Strong and influential donor-funded Non-Governmental Organisations working on forest management with communities in Tanzania.) [18], as well as numerous calls to strengthen the achieved success [28], are likely to instill the community participation agenda.

The success of the participatory programs is determined by the active role of local communities in resource management [29]. The communities' participation is an important agenda in resource management and has been a topic of interest for research. Previous studies [30,31] have assessed the participation by the communities in forest activities. However, these studies lacked the perceived communities' viewpoints as the primary beneficiaries.

Due to its background and evolution in utilisation in a different context, there have been various definitions of the word participation [32]. This study defines participation as a process in which communities around the forest, as stakeholders, can influence and share the resources regarding the control, decision-making, and development initiatives [33,34]. Through community engagement, participation makes governments come closer to communities in which voices of poor people can be heard, and, in so doing, contribute to decision-making and, ultimately, improve living conditions [35]. Community participation, therefore, is a well-realized link to the global agenda of sustainable development through forest improvement. Improved forests help in terms of fighting poverty (goal 1), reduce hunger (goal 2), and support climate initiatives (goal 13) and biodiversity by improving life on land (goal 15).

This paper, therefore, aims at assessing the communities' views on the perceived performance of the participatory program in West Usambara by considering the main goals stipulated by the Participatory Forest Management. The two following research questions were asked: (i) Are there perceived differences in levels of participation between communities engaged in a JFM and CBFM, and what reasons explain the difference? (ii) What are the factors explaining the variation in participation intensity? As the hypothesis, the study intends to test whether communities around JFM and CBFM forests perceive different benefits flow from the forest. If true, then the community perceiving higher benefits would have a higher motivation in forest activities' participation. Moreover, the study hypothesizes that training attendance and trust between the stakeholders positively influence the participation.

To achieve the study purpose, three objectives were considered: (a) to identify and assess the incentives and activities reflecting the community participation in JFM and CBFM forestry, (b) to compare the level of participation between institutional regimes based on participation components as well as analyse the factors that influence these components, and (c) to develop the participation index to categorise households in participation intensity and analyse factors influencing the intensity of participation.

Following this introduction, the paper further discusses the methods for data analysis. The findings and respective discussion are then elaborated on with the implications of the study. The conclusion summarises the study's findings and recommends interventions necessary to improve the situation in the study location.

## 2. Materials and Methods

### 2.1. Study Area and Data Sourcing

The Usambara Mountains (WUMs) are among the most famous mountain ranges in Tanzania, which receive more attention due to livelihood support from its ecosystem services, biodiversity, and historical population challenge [36–38]. Located in Lushoto district, the West Usambara Mountains is approximately 2250 m above sea level comprising 4,500 km<sup>2</sup> occupying about 80% of the Tanga Region [39].

The WUMs, as a stretch of the Eastern Arc Mountains (EAMs) [40], lie in latitudes 4°05' to 5°00' and longitudes 38°05' to 38°40', from Kenya (Taita Hills) to Tanzania (from Pare toward the Udzungwa Mountains). Three forest types characterise WUMs based on elevation, including those at the foothills, medium level, and the highlands [41]. A large population (over 50%) in Eastern Africa inhabit the Eastern Arc Highlands, which creates an immense pressure on important ecosystem services that originate from the mountains that influence these regions [42].

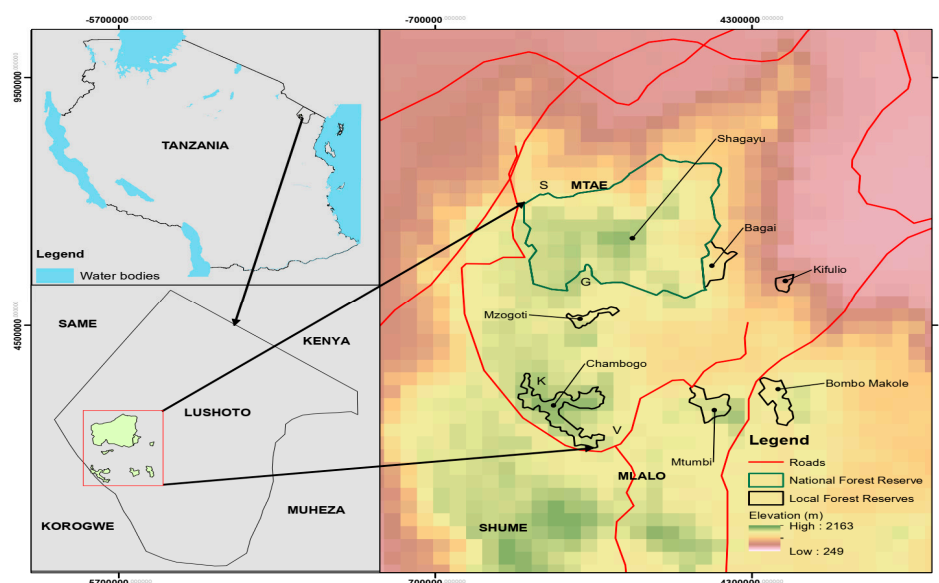
The challenges of mountainous ecosystems, particularly in developing countries, are many, which, therefore, constrains forest conservation, agriculture, livestock keeping, and human settlement in the WUMs [43]. The constraints in WUMs have resulted in the coverage of the efforts for the conservation [44] through devolution strategies on forest management. The conservation effort bodes well with recently introduced UN-Sustainable Development Goals (SDGs-Goal 15 (4)) targeting at the

conservation of ecosystems in mountainous areas to provide benefits necessary to support sustainable development by 2030 [45].

The population pressure has been a challenge in WUMs, with about 100 persons per km<sup>2</sup> [39]. In Tanzania, the national average of the population is about 60 persons per km<sup>2</sup> [46]. Therefore, with an estimated population of 492,441 individuals (2012 census) [47], the WUMs is considered among the highly populated areas. The major tribes include Sambia (78%), Pare (14%), Mbugu (5%), with the rest being other minor tribes [48]. The Sambia and Pare are Bantu speakings, while Mbugu is Cushitic speaking [49]. However, many years of interconnectedness and intermarriages have caused the culture to overlap [37].

The Usambaras experience a bimodal rain pattern with long rains known as *Masika* (March–May) and short rains known as *Vuli* (October–December) [39,41]. The precipitation averages from 600 to above 1200 mm annually, with the altitude determining the variation in temperatures [50]. At an elevation of 500 m, temperature ranges of 25–27 °C are experienced on a monthly mean, which drops to 13–18 °C on the 1500–2400 m plateau [50]. Agriculture, which is mostly rain-fed, constitute the primary economic activity of the population involving mixed farming systems, livestock, and off-farm activities [51]. The essential food crops include maize and beans, even though soil erosion seems to hinder high productivity [51].

Data acquisition involved both primary and secondary sources, which follows a multi-stage sampling to derive the study sample. The study took place in four villages of Sunga, Goka, Kibaoni, and Viti in the Lushoto District surrounding the WUMs ranges (Figure 1). All the necessary administrative and ethical procedure at district and village levels were followed, and the permission to conduct the study was granted. The study design is cross-sectional, and the data was collected from July to September 2016. The villages are about one and a half hours' drive from the Lushoto town.



**Figure 1.** Tanzania Map indicating study villages around Shagayu and Chambogo forest. (Credit to Giliba, 2019, S = Sunga, G = Goka, K = Kibaoni, V = Viti).

The study villages are found on the fringes of Shagayu and Chambogo mountainous forests. The two villages, Sunga and Goka, surround the Shagayu Forest reserve, which is a JFM forest with an area of 7830 hectares [13]. The difference between Sunga and Goka is the location relative to the main road with the Sunga households near the roadside, while Goka is in the interior. The other two villages, Viti and Kibaoni, surround the Chambogo Forest reserve, which is about 605 hectares [52].

The sampling frame included all households (obtained from village registers) available in the purposively chosen four villages. The choice of villages as strata was based on the variation of the forest management type (whether JFM or CBFM), relative location to the forest and road access.

In terms of the forest management (also referred as institutional regimes), both forests' administrations took a significant change toward more inclusion of the community members in the management known as PFM. The Joint Forest Management (JFM) under Shagayu forest reserve was established in 2002 [13], while the community forest (CBFM) around the Chambogo Village Forest Reserve was established in 1998 [52].

The analysis unit chosen was the household because of the possibility to assess utilisation and management practices related to the forest. We defined the household following other studies as a residential unit in which members occupy the same roof, organise production, and consumption activities by pooling resources together [11,53]. The policies and programmes on natural resource management, it is argued, affect communities at the household level [54]. The villages were chosen purposely to cater toward variation in the institutional regimes in forest management. The choice of the households in the respective villages was random. The study collected data from 159 households distributed across the Sunga and Goka (79 households) around the state forest (JFM) and Viti and Kibaoni (80 households) around the community forest (CBFM). The sample size was calculated following Reference [55]. The data was collected through households' survey capturing households' socio-economic information, questions on the participation indicators, gauging the villagers' trust in the village natural resource committees, non-governmental organisations, or local government as well as focus group discussions (FGDs). The study did not encounter a rejection rate likely because the research assistants came from Lushoto based at a forest research institute and had good rapport with villagers due to previous research experience in the area. The study disqualified one filled questionnaire because we observed the respondent was mentally disturbed.

The collected data was summarised, refined, and the needed information required to respond to the research question was extracted using the Excel and the Stata software.

## 2.2. Specific Methods

### 2.2.1. Factor Analysis on Participation Indicators

Participation indicators are statements that were asked to gauge the perception of respondents' in management activities and various benefits obtained from the forest. The listed participation indicators formed the essential components for the overall enhancement of forest management [56]. The PFM objectives are anchored into the three main goals. To enhance the forest condition, improve livelihoods, and governance [16,57], the objectives were used as the basis to formulate the participation components and subsequent participation index. These statements were compiled based on the perceived benefits and service flow and the various activities related to forest management experienced by the households' in WUMs, as well as adapting from other studies [30,58].

The villagers' rating of several statements indicating activities of forest enhancement or benefits realised from the forest was gauged using a 5-level Likert scale [30,56,59] (Appendix A). The scale endpoints were '1 = strongly disagree, 5 = strongly agree' (statements one to five), and '1 = very low, 5 = very high' (statements six to fourteen). However, four statements dropped were related to tree planting, firefighting, and environmental-related factors such as reducing soil erosion and floods since they were not consistent with others. The reason could be because tree planting is only seasonal activity in the JFM and only a few individuals are employed as labourers. On the other hand, the re-planting of the forest in the CBFM has been minimal. In addition, a fire occurrence has been minimal in recent years because of the improved prevention through fire-breaks and control of fire-risk activities in the forest.

The indicators, therefore, linked the perception of the households on the access of various benefits from the forest or opportunity cost incurred when participating in forest management activities.



The linkage is that, if the household perceives that the provision from the forest for fuelwood, for example, is satisfactory, then they would score on the higher end of the scale and vice versa.

A reliability test necessitated dropping some of the statements to improve the Cronbach Alpha scale. Four statements were deleted, which improved a Cronbach Alpha to 0.84 and indicated a high level of scale consistency. To identify principal component factors retained for the participation component analysis, the study employed factor analysis to the response of the indicators' statement. The Kaiser-Meyer-Olkin sampling adequacy measure (0.78), and the Bartlett Sphericity Test ( $X^2 = 766.53$ , d.f = 45,  $p < 0.0001$ ), satisfied the necessary conditions to run the factor analysis [60,61]. Based on factor analysis, the statements comprising each of the principal component factors were aggregated. From the aggregate, the mean level of participation of each component (Equation (1)) was compared between JFM and CBFM households to gauge the overall community participation in JFM and CBFM regimes.

From the factor analysis, the study operationalised each factor component as the dependent variable, which entered regression (OLS) to assess the factors influencing the participation in each of them [62]. The items from a factor analysis with factor loadings higher than 0.5 were chosen [63]. Based on the description statements, the three principal component factors of participation were summarised as the main participation components to gauge the level of participation. The participation component, therefore, composed the average score of the statements retained in each principal component factor. The components were calculated as follows.

$$Component_X = \frac{1}{N} \sum indicators\ statement\ score \quad (1)$$

where N = number of indicator statements retained by factor analysis on component X. X stands for a type of the component (economic/protection/meeting) summarised by factor analysis.

The levels of participation components between the villagers surrounding the JFM and the CBFM forest were then statistically compared using the *t*-test.

### 2.2.2. Hypothesised Factors Influencing Participation

The forest activities' participation is a function of households and contextual characteristics mediated by the institutional regime in place. The household as well as contextual and community-level characteristics determine the capability of a particular household interaction with the forest [30,56].

The age (+/−) increases a capability such as going into the forest for products up to a certain level from which a decline will naturally start [64]. In rural areas, older people command respect from others and are mostly engaged in decision-making [65]. The younger generation in WUMs leaves villages to seek employment elsewhere [3,43]. Similarly, household size enables labour capability, which gives an advantage for participation [62].

Concerning education, most people in the study villages are poorly educated with the majority only able to finish seven years of primary education. Studies have found that education (+/−) influences participation negatively since it increases the chance of educated people engaging in other income activities [30,66]. Conversely, educated people may comprehend the forest's benefits and participate more [3].

The gender aspect is an essential component in WUMs. The study surveyed some female-headed households. The females in WUMs engage themselves in various activities stimulated by the experience of several projects in the area [44]. Usually, the female-headed households (+) seek out various products to meet family needs. Therefore, they may participate more in the forest activities [62] in terms of benefits. However, they can be limited in protection and decision-making activities [63] due to cultural limitation.

The common assets owned by the villagers in WUMs include the land and livestock. However, in general, the land sizes are quite small, limiting productivity. The animals are limited, and usually kept in a stall. The increase in assets such as land, livestock, and overall income build the capability of the households and influence their relationship with forest participation. According to Akamani [67],

‘capability begets capability’ since assets-endowed households are likely to be powerful and, hence, able to negotiate with institutions and adapt to situations. Therefore, the area farmed (+/−) can influence negatively as the size of land farmed indicates family wealth and may be linked to food sufficiency and lack of time for forest activities and, therefore, less participation in forest activities [3]. However, a positive influence may be observed if farmers depend on water sources from the forest for their agriculture such as irrigation. Then participation in forest activities might be essential for them [52].

The Total Livestock Unit (TLU) (+/−) can also have a positive or negative influence since households with many livestock may depend more on the forest for fodder [62] to supplement the fodder from the farms, and, therefore, participate more. In the WUMs, however, the animals are stalled, and household members may spend more time fetching fodder from the farms.

Most of the villagers in WUMs are farmers since the primary occupation with the average income ranging from 149 to 435 Euros per AEU for low and high-income earners. The income (+/−) can play a positive or negative role as a household’s high income signifies a wealthy status and income from alternative sources, which may result in low participation in forest activities [3]. However, it is also common for wealthier people to benefit more from natural resources in rural communities through their influence, which may result in high participation [66].

Furthermore, the distance from a household to a forest and market (−) influence participation in a negative way since community members increasingly get less direct forest benefits [62]. In WUMs, the mountainous nature makes it hard for some households to go to the forest. The households near the forest have an opportunity to go into the forest, and, hence, have the potential to gather more NTFPs, whereas households located far from the forest but close to the market center with a road nearby may have income alternatives. Improved road infrastructure has been related to reducing poverty [68] due to the possibility of higher income from non-farming activities, off-farming employment, and higher market activities [69], and, hence, lower forest dependence.

The location of study villages, as separated by the JFM and CBFM forest institutions, provide a variation of the resource base. The assumption is that the JFM forest has a larger resource base benefiting the villages nearby. The institutional regime variable is included for analysis as the critical factor at the community level, which enables the resource access variation between the villages used in the study.

### 2.2.3. Participation Intensity Assessment

Participation index was developed as an aggregate measure to gauge for the intensity of participation using the participation components from the factor analysis (Equation (2)). The participation index enables grouping and assessing the characteristics of the low and high participation intensity households. Apart from other studies that divide the participants into groups of participating and non-participating households [70,71] for assessment, this study considered that all households are participating in the forest activities. The reason for such consideration is that each household is influenced through forest activities or benefits from the forest directly or indirectly. Therefore, the only difference in households is the scale on the extent of participation, but not the mutually exclusive categorisation of participants and non-participants.

Participation index =  $f$  (normalised weighted aggregation of the factors (components) based on the variance explained on the factor analysis) [56].

$$PI = \sum Vi \times Fi \quad (2)$$

where: PI = participation index. Vi = variance explained by the factor analysis corresponding to factor i. Fi = factor score of participation indicator summarised in the analysis.

The result of the normalised weighted factors (ranging between 0 and 1) were clustered using the k-means approach into two levels of participation, such that high participation households had a higher participation index [56]. Clustering aimed to find homogenous subgroups [72], which characterise the

villagers into distinct low and high groups to be able to explain their variation. The two groups were then assessed regarding the variability of the households' socio-economic and asset characteristics. The participation index then entered the regression model as a dependent variable to assess households' participation in forest activities [73].

$$PI = \alpha + \beta Xi + e \quad (3)$$

where:  $PI$  = participation intensity,  $\alpha$  = intercept,  $\beta$  = vector of regression coefficients,  $Xi$  = vector of input variables (e.g., household assets, institution regime, and trusting relationship between institutions), and  $e$  = error term.

Moreover, participation intensity is a function of linkages between the communities and various stakeholders such as village, state, and NGO institutions that may influence the capacity and behavioural change of community members. In order to work together, trust between these stakeholders with different levels of investment and interest in forest management is vital for the realisation of local people's participation since the sense of trust is highly valued in rural communities [3]. Exploration of the perception of trust between villagers and various stakeholders informs on the vital component of social capital for improving villagers' participation.

In WUMs, the assessment of trust in participation is essential because it relates to confidence between villagers and other stakeholders that each will act in conformity of what is expected as a measure of subjective reliability of the program [74] such as PFM. It is, without a doubt, that the success of many government programs and policies, such as PFM, depend on the level of trust, since it determines the compliance and co-operation of citizens [75].

The linkage between communities and other resource management institutions improve capabilities that influence communities' participation [67]. Therefore, in this study, trust between stakeholders and training to improve skills or raise awareness, are hypothesised to influence the intensity of participation. Individuals are most likely to engage in programs in which their concerns are heard, which will, consequentially, build trust and, ultimately, increase participation. Perception of trust is, therefore, crucial in the analysis of participation [76]. The perception of trust in this aspect was elicited by gauging the villagers' level of confidence in the operations of non-governmental organisations, village natural resource committee, or local government forest officials. The level of confidence was captured by four-level scales (1 = very little and 4 = high confidence).

Training, on the other hand, improves awareness, develops capacity, and enhances skills and might positively impact participation in forest programs [77]. The training was captured as a dummy variable by asking the respondents if they ever attended training on resource management or agricultural practices in general. Therefore, trust to other stakeholders and training attendance, together with other social-economic variables, were included to predict the association with the participation intensity. The independent variables were entered into the regression to identify influencing variables on participation intensity, such that:

$\beta = 0$ : the predictor does not influence the dependent variable.

$\beta \neq 0$ : the predictor influences the dependent variable.

### 3. Results and Discussion

#### 3.1. Description of the Villagers

The household characteristics and policy variables from the survey were assessed to explain features and variation of the study area (Table 1). The age range was 20 to 83 years, and there was a slight non-significant age gap regarding the household average age, with households under JFM being three years older (48), on average, than CBFM (45) households. Most people at the study site could be characterised as middle-aged. The observed situation could be caused by the emigration of many youths (15–35 years) to other cities for economic reasons, which was also reported by Songoro (2014), who observed the average age to be 47 years. In terms of gender, households surrounding JFM had more female-headed households, 42 (53%), as compared to 34 CBFM (42%), even though no significant



difference was observed. While the distribution provides a good gender composition for analysis, it also highlights that men often migrate to cities due to the land shortage, low productivity, and the need to search for jobs [43].

**Table 1.** The socio-economic characteristics of the communities in the West Usambara Mountains villages.

Variable	Institution Regime		
	Household Factors	JFM (N = 79)	CBFM (N = 80) Combined (N = 159)
Age (years)		48.2	45.4 46.79
Education (years)		6.39	6.09 6.23
Gender F (count (%))		42 (26)	34 (22) 76 (48)
Household size (AEU)		4.25	4.19 4.22
Food shortage (months) **		1.99	2.38 2.18
Forest dependency (1 = high) **		66 (42)	36 (22) 102 (64)
Occupation (farmers (%)) **		69 (44)	77 (48) 146 (92)
Area farmed (acres) **		3.09	2.35 2.73
Tropical Livestock Unit (TLU)		0.77	0.79 0.78
Home to forest (min) **		28.46	33.37 30.93
Home to market (min) *		25.46	29.5 27.59

\*\*, \* Significant difference at 5% ( $p < 0.05$ ) and 10% ( $p < 0.1$ ), respectively. The t-test and chi-square test are used for significance testing of the continuous and categorical variable, respectively. JFM = Joint Forest Management; CBFM = Community Based Forest Management.

The average number of years of schooling ranged from 6.11 to 6.38 for CBFM and JFM, respectively, which indicates a lower literacy level in the WUMs villages. The basic primary level of education in Tanzania is seven years [78]. Therefore, the assumption is that the majority of household members were only primary school leavers. The illiteracy level findings are similar to what was reported by References [43,48]. This situation may have necessitated villagers to supplement their needs from the forest due to fewer opportunities. The mean household size (AEU) range from 5.52 to 5.68 for CBFM and JFM, respectively. The larger size of households may give a slight advantage for NTFPs collection in households, which are under JFM.

From Table 1, what stands out is that many villagers were involved in farming activities as a principal economic activity, considering themselves as '*wakulima*' (Swahili term for people practising rain-fed agriculture.). The CBFM households recorded a significantly ( $p = 0.0471$ ) larger number of farmers, 77 (96%), as compared to JFM households of 69 (87%). However, on average, the CBFM households farmed at a significantly smaller area (2.35 acres) than JFM (3.09 acres) households. The smaller farmed area might explain a possible significantly ( $p = 0.001$ ) longer average months of a food shortage per annum in CBFM (2.84) compared to JFM (2.38). The significant negative correlation between the size of the farms with the length of the food shortage month ( $r = 0.172$ ,  $p = 0.0295$ ), usually the highest in May [79], confirms this fact. Food shortage prevalence in the WUMs was also observed by others [43,48].

The crops cultivated depended on household needs, but most were for subsistence and cash. The crops include maize, beans for food, Irish potatoes, and cash horticultural crops including carrots, cabbages, onions, and tomatoes. The farmers grow the Irish potatoes and horticultural products in the valley bottoms, which benefit with water from the forest. Despite the land size, agricultural productivity is limited by a poor soil condition [51] and farming technologies, which causes many households to experience a food shortage for an average of three months on an annual basis.

The survey also indicates that the JFM villagers' have a significantly higher perceived dependency on the forest ( $p < 0.0001$ ) in comparison to CBFM. The perceived dependency is based on the household's own reported ranking since the way they see the forest is important to them. Some villagers around the JFM forest benefit more from the forest due to the availability of products obtained in the *Taungya* arrangement. Therefore, this attaches more dependency on it. It has also been observed that, through

the *Taungya*, farmers gain flexibility on food crops [2]. Farmers in the study villages also diversify by keeping livestock to cover up for shortages or selling during needy times. Various livestock are kept by the farmers, including cattle, sheep, goats (shoats), chicken, rabbits, and ducks.

The average tropical livestock unit (TLU) (TLU values are 0.5 for cattle, 0.1 for sheep/goats, 0.03 for ducks, 0.02 for rabbits, and 0.01 for chicken [80,81]) ranged from 0.77 to 0.79 around JFM and CBFM households, respectively. The average TLU is, however, lower than what was reported in other villages in the WUMs at an average of 1.14 TLU [37].

What is also interesting from Table 1 is the fact that CBFM farmers take a significantly ( $p = 0.017$ ) longer time (33 min) to reach the forest areas as compared to JFM (28.46 min) on average, which is a possible explanation for a perceived lower dependency on the forest. The time taken could also be the result of the mountainous terrain around Chambogo, which is also a highly degraded area. Furthermore, CBFM villagers take longer (30 min) on average to reach the market center as compared to JFM (26 min) villagers.

To summarise, the communities in the study site are characterised by households that are generally poor, mostly engaging themselves in agriculture, which is typical for many villages in Tanzania with few assets such as livestock and small farming areas (Shambas) (Swahili name for a farming plot). The households are large-sized, with most of the households' heads being middle-aged and several women-headed households are prevalent. Due to a poor economic condition, most villagers are informed about high forest dependency to supplement their needs. The food shortage is also a recurrent situation for many villagers.

### 3.2. Indicators of Participation

Table 2 indicates the principal component factors summarised from 10 indicator statements used to capture the participation components from the factor analysis. The participation components were economic benefits (1–5), which meet benefits (6–8) and forest protection (9–10).

**Table 2.** Summary of indicators of participation and associated factors.

Description Statements	CODE	F1	F2	F3
		Economic Benefits	Meeting Benefits	Forest Protection
1. The forest is important for fuelwood provision in the household.	IMFW	727		
2. The forest is important for timber provision in the households.	IMTI	855		
3. The forest is important for NTFPs provision in households.	IMNT	765		
4. The forest is important for household employment benefits.	IMEB	800		
5. The forest is important for income provision in households.	IMHI	759		
6. The frequency of meetings on forest issues.	FRME		869	
7. Gain/learning about forest issues from meetings.	LEME		915	
8. Ability to lead or influence the decisions in meetings.	INFME		759	
9. Reporting on illegal forest activities.	RILA			798
10. Involvement in the preparation and maintenance of firebreaks.	INFB			863
Eigenvalues		3.19	2.35	1.67
Variance explained (%)		31.9	23.5	16.7

Note: The varimax with the Kaiser Normalisation is the rotation method used with five iterations resulting in rotation convergence (N = 159). NTFP = Non-Timber Forest Products.

The first principal component reflected economic benefits as incentives, which explained 31.9% of the variation. Villagers are interested in the availability of the various products from the forest,

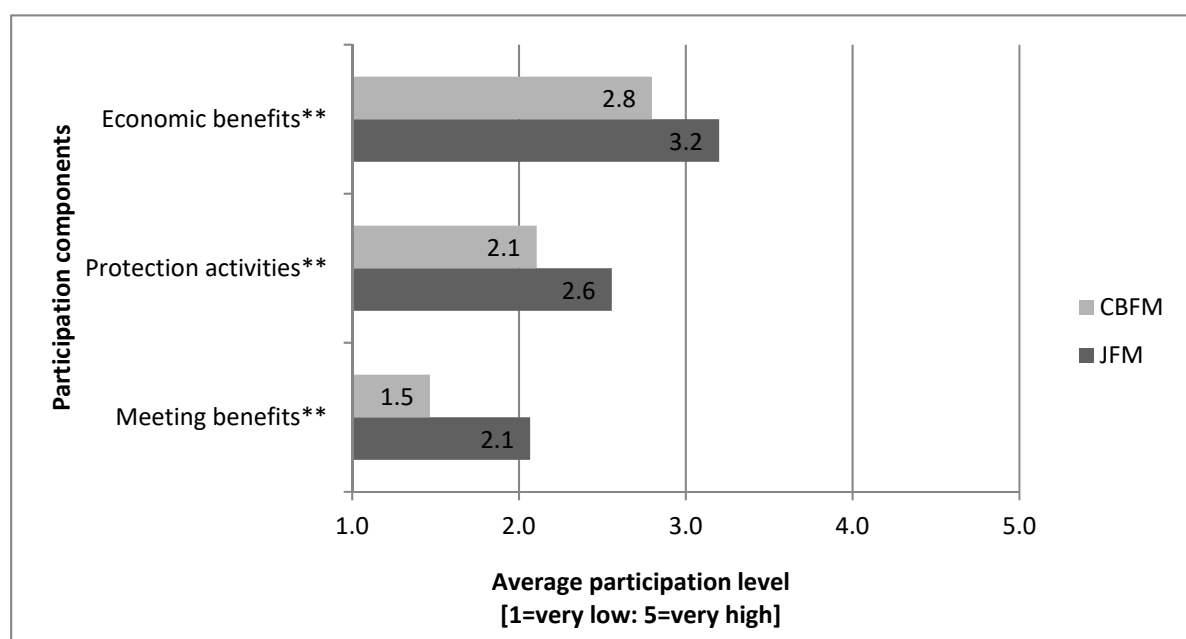
which benefit them directly, including timber, employment, non-timber forest products, and fuelwood. The statements for timber, income, and employment have strong loadings, and these indicators proved vital for the needs and incentives of the villagers to ensure their participation. Three indicators represented the importance of meetings for villagers' participation in forest-related issues: the frequency of meetings on forest issues, and the ability of participants to influence and learn about forest-related matters, termed as meeting benefits, accounted for 23.5% of the variation.

Learning about forest issues had the most significant priority (0.915) since villagers may be interested in learning about potential benefits from the forest. The frequency of meetings (0.869) may be interpreted as villagers' interest in following up on matters of interest. Additionally, villagers may be interested in more participation if they can lead and influence decision-making (0.759) so that the decision made is more favourable for them. As an advantage, meeting attendance provides villagers with access to information, and they can become motivated to take part in meetings, which improve their situation [5]. The villagers' participation in decision-making has an advantage since it increases their confidence and legitimises decisions, which, therefore, reduces friction and possible repulsion [82]. However, in some instances, villagers may attend the meetings and be passive [60] and unable to influence the decisions [83], such as in cases where power asymmetry exists between the villagers and their leaders or state officials.

The third factor included the items related to reporting illegal activities and fire control, which were named forest protection. These factors accounted for 16.7% of the variance. The villagers need the forest to be in a good condition to benefit from various products and are involved in clearing fire lines at the forest edges, fighting forest fires, and occasionally reporting illegal activities to village authorities. These activities have a positive impact on enhancing the forest well-being.

### 3.3. Level of Participation between Institution Regimes

The participation components from the factors' analysis were compared between the JFM and CBFM forest villagers. Figure 2 indicates the levels at which the villagers perceive these components. The mean scores indicated the significant perceived difference in economic ( $p = 0.003$ ), protection ( $p = 0.012$ ), and meeting benefits ( $p = 0.0001$ ).



**Figure 2.** Variation of the participation level between Joint Forest Management (JFM) and Community Based Forest Management (CBFM) villagers. \*\* indicate significant difference ( $p \leq 0.05$ ).

The economic incentive was rated the most important component for the villagers' participation, which was followed by villagers' support of the forest protection activities while meeting benefits had the lowest score (Figure 2). Accordingly, higher participation is associated with good forest conditions, high dependency on the forest, and associated benefits from the program [66,84], which are mostly found in JFM villages. Prior studies [30,63] indicated the importance of assessing participation so that people's motivation can be understood and the intended outcomes of participatory programs could be realised.

The villagers in the WUMs depend on the forest to provide for various needs continuously. The JFM villagers recorded a high participation rate based on the economic benefits obtained from the forest compared to CBFM villagers. Economic benefits, therefore, offer incentives to rural people to participate in the program [85].

### 3.4. Factors Influencing Participation Components

The villagers' interest and their ultimate participation are influenced by the number of factors (Table 3). A total of 13 variables (hypothesised in Section 2.2.2.) entered the regression. However, model simplification [86] allowed stepwise removal of the variables, which were non-significant predictors and remained with five significant variables. The independent variables explained 6.5%, 17.8%, and 20.6% of economic benefits, which met attendance and forest protection, respectively. At least two independent variables significantly explain the variation in each of the components of participation.

**Table 3.** Factors influencing participation components in West Usambara.

Variables	Economic Benefits	Meetings	Protection
Gender (1 = Female)	0.0500 (0.166)	0.193 (0.156)	−0.744 (0.153) ***
Education (Years)	−0.0146 (0.0425)	−0.0121 (0.0323)	−0.0843 (0.0398) **
Household size (AEU)	0.0500 (0.0538)	0.169 (0.0626) ***	−0.0257 (0.0510)
Food shortage (months)	−0.149 (0.0639) **	−0.115 (0.0694) *	−0.124 (0.0538) **
Institution regime (1 = JFM)	0.272 (0.159) *	0.566 (0.151) ***	0.164 (0.146)
Constant	0.0463 (0.416)	−0.759 (0.387) *	1.181 (0.411) ***
Observations	159	159	159
R-squared	0.065	0.178	0.206

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . Standard errors in parentheses.

From Table 3, villagers with longer food shortage months perceive less economic benefit, and those located in the JFM regime perceive more economic benefit from the forest. The food shortage is also linked to a negative correlation with farm size ( $p = 0.0295$ ). It implies that villagers might be spending time for other activities such as looking for casual wage labour and less time for NTFPs collection, and, therefore, perceive less economic importance from the forest. The JFM regime might offer increased access to the forest resource. Accordingly, villagers have improved economic participation.

Villagers benefit from their involvement in meetings as they acquire the opportunity to present their concerns. Households with many household members and those based in the JFM regime had a positive association with meeting attendance, while those that experienced severe food shortages also experienced decreased participation in the meetings. The heads of larger households took the opportunity to attend the meetings more because they might be at higher risk of being affected by unfavourable decisions.

Households that experienced more months of the food shortage were also less likely to benefit from meetings, likely because they might also be poor and, therefore, meetings come with a high opportunity cost for them. It might also be the case that poor people do not have as good a chance to influence decision-making, which is mostly dominated by powerful people [56], and, hence, less motivated to engage in such processes. Furthermore, in the JFM regime, households participated more in the meetings than those in the CBFM regime. During the mid-1990s, popularisation of JFM led to meetings between villagers and forest officials, which may have influenced meeting participation.

Moreover, the JFM regime offers villagers more access to resources than CBFM, and, thus, people were more interested in participating in the meetings.

In the WUMs, it is common for women to be household heads due to the emigration of men [43]. The female-headed households' increased years of education and increased food shortage months had a negative influence on participation in forest protection, such as patrol or firefighting, which women might also perceive to be dangerous. As such, protection activities are predominantly male in the WUMs. A study in Nepal [62] also indicated a similar tendency for men participation in forest protection. Furthermore, women mostly rely on various small products from the forest to support their livelihoods [87,88].

Women can, thus, participate in forest protection by reporting illegal activities. They might encounter while they collect, for example, fuelwood or other NTFPs. On the other hand, increased education resulted in less participation in forest protection since higher levels of education in WUMs, presumably, offer employment or alternative income opportunities, which reduced dependency on forest resources. Studies elsewhere [30,58,66] have shown education positively influence participation such as in forest conservation and social aspects. However, apart from the general education, villagers in WUMs had opportunity to other agricultural and resource management training, which improved the awareness of nature. Additionally, increased food shortage months decreased villagers' participation in forest protection because the villagers do not find the motivation to protect the forest since they experience food insecurity.

### 3.5. Participation Intensity

In this study, the participation intensity refers to the perceived extent to which households engage in forest activities based on the aggregated index of all participation components. The analysis indicates a difference in the participation intensity between institutional regimes with many households in higher levels of participation in the JFM than in the CBFM (Table 4). Given the duration of time since the introduction of the PFM in the 1990s, the sense of ownership and the security associated with it, community members under CBFM were expected to better engage in different resource management activities to sustain the forest. However, this has not been the case. Theoretically, though, the CBFM arrangement offers the highest level of resource management devolution to the communities [18,52] regarding a bundle of property rights [21]. According to Ostrom [89], access rights to resources, CBFM, as compared to JFM, provides the highest bundle of rights, including the ability to exclude others.

**Table 4.** Variation in participation intensity between the JFM and CBFM regimes.

Participation Intensity	Institution Regime		Chi-Square	p-Value
	JFM	CBFM		
High	51 (62)	31 (38)	10.5995	0.001
Low	28 (36)	49 (64)		

Note: JFM = Joint Forest Management; CBFM = Community Based Forest Management.

The findings in Table 4 might be associated with little direct benefits available from the forest for local peoples' direct consumption from fuelwood to edible products. The participation in itself is demanding in terms of resources and time [90]. Therefore, benefits from the forest should compensate and incentivize the community. Historically, in many regions in Africa, the benefits have been low since communities are required to manage ecologically degraded, low-value forests [22], which is a case similar to CBFM study villages. The effort on the enhancement of the resource has also been minimal due to the historical relationship between the communities and forest administration. The low level of investment might be associated with tenure insecurity resulting from villagers' low awareness, and local government forest officials' passivity toward the community forest. The FGDs in CBFM villages revealed that villagers seemed to have little awareness of the responsibility they have in forest management, still believing that management is completely the government's responsibility.



Such a lack of awareness of CBFM was also reported in a study more than a decade ago [52] and, seemingly, the situation has not improved. There is a view that tenure security is linked to better forest conditions [91]. A study of CBFM in other parts of Tanzania (Kilwa district) indicated that villagers had more awareness of the role of CBFM and its functions [18], which is likely associated with the presence of MCDI (Mpingo Conservation and Development Initiative is an NGO advocating community-based management). At the village level, villages under JFM benefit from the part of their income that originates from selling timber from the plantation, which is a benefit lacking in the CBFM regime. Under JFM, villages can collect cash or equipment for social services such as schools. For example, for the past five years, Sunga village had been receiving 10 cubic meters of the timber (equivalent to 3.4 million Tanzanian shillings) as their contribution from the Shagayu forest.

So far, without donor funding, the technical and material support from the local government for the community forest has been minimal or non-existent. The participatory programs are put to a real test in the absence of donor support. Like many other developing countries, Tanzania has a high dependency on donor support in forest management [28] with more than 90% funding in the forest sector sourced in this way [92]. The lack or little government investment in assisting management activities in the CBFM villages means that local people are on their own, which translates into reduced interest. Low budgets have also been an excuse by local governments' natural resources officials to explain why they cannot support village forest-related activities. Moreover, local forest officer's role in the CBFM program is reported to be technical advisory [21], but it is not stipulated in the job description, and, therefore, is not directly obliged to ensure the successful functioning of the CBFM under their jurisdiction.

The findings offer insight into the extent of participation over the past two decades in WUMs. From the results, it is possible to deduce that the mere handling of the ownership of the forest to the community does not automatically bring the expected results of better resource management and improved livelihoods. The community support on various activities might also create an aura of trust and a desire to invest and manage the forest in a better way.

Moreover, the regression (OLS) analysis indicates the factors influencing the participation intensity in WUMs (Table 5). A study in Morogoro [93] observed that training in the terrace preparation, trees nursery preparation, and planting influenced farmers' participation in watershed systems. Similarly, in Burkina Faso, training was important in influencing participation in forest activities [94], particularly in terms of surveillance. Training, therefore, is an important policy variable for influencing participation in the forest activities, and, as the model suggests, it should be a frequent undertaking in the WUMs.

**Table 5.** Factors influencing the participation intensity.

Variables	Participation Intensity
Age (years)	0.00137 (0.000990)
Area farmed (acres)	0.0159 (0.0112)
Training (1 = yes)	0.144 (0.0343) ***
Trust on NGOs (1 = high confidence)	0.196 (0.0328) ***
Trust on VNRC (1 = high confidence)	0.0417 (0.0493)
Trust on LG (1 = high confidence)	−0.0627 (0.0568)
Institution regime (1 = JFM)	0.104 (0.0306) ***
Constant	0.0871 (0.0914)
Observations	159
Adjusted R-squared	0.439

\*\*\*  $p < 0.01$ , standard errors in parentheses. Note: NGOs = Non-Governmental Organisations. VNRC = Village Natural Resource Committee. LG = Local Government.

Based on Table 5, the villagers developed a sense of trust with the NGOs operated in the WUMs, more than with the local administrative institutions. Trust is necessary social capital since it strengthens the relationship between the parties working in collective action to achieve a particular goal. The villagers lamented on the unfulfilled promises and lack of consultation from the local

institutions. In one instance, a VNRC committee member in Sunga complained that forest officials were planting trees near the water source without consulting the villagers, which villagers considered disrespectful and trees near the water source were harmful. The low trust level of villagers in local administrative units slows down the support in forest activities since low trust reflects the perception of unreliability [74]. The study in Mandawa, southern Tanzania, reported a substantial drop in CBFM support due to the villagers' low trust in environmental committee leaders, which cites bribery and indicates the importance of trust for participation [18].

Similarly, the intensity of participation is positively correlated with the location, which favours households under JFM compared to CBFM while controlling for other factors. The high participation might be linked with the availability of the benefits from the forest, which, in turn, depends on the resource condition and accessibility. The size difference between Shagayu and Chambogo might translate into more advantages to villagers around Shagayu regarding the area for resource access. Shagayu's size is at least 13 times larger than that of Chambogo. However, the size-effect is controlled by three key factors such as the institution in place, which regulates access to the forest since villagers are only allowed to collect NTFPs and not allowed to cut trees in natural forest areas for a specific reason. Second, the area's physical condition, which limits accessibility due to its hilly nature, therefore, ease in spotting illegal activities. Third, the JFM arrangement is between the state and the villages bordering the forest. Therefore, villages control each other from accessing forest areas under their management. The Shagayu Forest borders 13 other villages [43]. The greater accessibility to the Shagayu forest could, therefore, be primarily attributed to the resource base that supports the claim that communities in Chambogo are mostly charged with managing forests that are already in a poor condition.

In order to improve resource access in Chambogo, there is a need for forest restoration. The challenge of the long wait before the forest benefits are realised means that, without other forest-related benefits, incentives that motivate villagers to participate will be low. Activities such as beekeeping could help link the benefits flow to forest restoration, which takes advantage of the beekeeping officers who are employed at local government levels. A Madagascar-based study [73], for example, indicated the potential of beekeeping in motivating participation due to linkage to the forest benefits.

The Tanzanian forest policy (statement 11) advocates for the incorporation of beekeeping activities in the forest reserves [92,95], while beekeeping policy (statement 2 and 16) encourages the establishment of bee reserves by the communities and apiaries in public lands by individual or co-operative beekeepers [95].

However, beekeeping dissemination has not been convincing, which denies communities' potential benefits and development. Linked to alternative income activities, the support of the environmental groups in villages should be motivated since these might influence other villagers to engage in positive forest practices. It is known that, if the community members realise more benefits from the forest, they tend to organise and protect the forest [96].

The finding of the high confidence level of the NGOs operated in the WUMs is somewhat surprising given the time interval since NGOs ended project activities in the villages. Despite the reported difficult start of operations of projects such as Soil Erosion Control and Agroforest Project (SECAP) [44], the communities became acquainted with the NGOs' operations and trust developed among them. The findings indicate the overall importance of social capital regarding the trust necessary to instill motivation and participation in forest management. The low confidence in the local administrative structures could be due to unfulfilled promises to the villagers. Furthermore, forest management appears to be the lowest priority sector in the local administration. Therefore, few resources are allocated.

The findings, generally, can be described in the perspective of the participation dimensions [25], giving insightful practical situation of the community participation in the WUMs. The participation dimensions were assessed based on the participants, level of involvement, the participation intensity, participants power and influence, and the participation process aim or goals [25,32]. The assessment

focus was the villagers bordering the JFM and CBFM forests, which offer a good variation of the success of the PFM program as beneficiaries.

The level of participation, as applied in this study, informs on the scale in which the households rate the program in the provision of benefits and the way community members take part in the forest activities. The message from the analysis is the fact that villagers around the JFM (state-community management) forest participate more than the CBFM (community management) regime. It appears that the JFM-based villagers are motivated by forest-based incentives both at the village and household levels. Similarly, JFM villagers reported higher perceptions on participation levels in the management through protection, and meeting participation.

The intensity of participation gives a deeper understanding of the individual households by qualifying them through an aggregate index, which has been used to classify the households into low and high participating groups. The index also renders itself as a 'tool,' which can be used by the policymakers to gauge and improve the situation by understanding the characteristics of high participating and low participating households. Based on the participation index, the bigger number of high-intensity participation households in the JFM regime indicates a relatively better situation compared to the CBFM regime. Notwithstanding, the situation calls for an improvement in both regimes, which is more so in the CBFM.

The power and influence of the stakeholders were not assessed by the study. However, gauging from the FGDs, the knowledge of the villagers regarding tenure rights on the forest on the CBFM side, and information flow seemed to be limited. The limitation gives community little power or influence in various aspects of forest management.

The last aspect from the findings was to understand the achievement of the intended goals or aims of the participation. From the PFM perspective, the goals of resource enhancement through management and governance activities, and benefits flow to the communities has only been achieved at the average level in WUMs, as per villagers' perception. The normative goals of the participation, however, need the actual empowerment of the communities, which is a long-term endeavour [71]. The situation in WUMs, especially in the CBFM arrangement, reflects stagnation after the initial foundation investments, which limits empowering the communities on the PFM aims and the overall benefits for the participation in the forest activities.

The findings in this study warrants insightful discussion. It was expected that, however, when the forest management is devolved to the local people such as in CBFM arrangement, the perceived benefit flow, and tenure security will stimulate incentives in the management and improvement of forest conditions [2]. With the improved benefits and tenure security, the expectation was that, in comparison, villagers in the CBFM arrangement would participate more in forest management. This study, however, has not been able to demonstrate higher levels of participation in the CBFM regime. Instead, the findings indicate that villagers under the JFM regime participate more in both participation components likely facilitated by improved resource condition and better access. Studies in Miombo woodland and coastal forests in Tanzania [97,98] indicated improvement in forest conditions after PFM with a better situation under JFM, which is followed by CBFM, while those under a complete state and open regimes had a worsening pattern.

This study hypothesis was found from a historical trend that, in many communities in Africa, are given to manage fragmented low-value forests [22] similar to CBFM villages. This fact is captured in our study through institutional regimes that proxied forest conditions' variation between JFM and CBFM. A review study [99] indicated an information gap linking biophysical conditions with livelihood benefits captured in this study. The study indicated the importance of forest benefits as an overriding component with few benefits indicated in CBFM. The finding is also echoed in other studies in Tanzania related to challenges to livelihood [38] and revenue generation [98] in a community-managed forest. In another study [17], it is argued that longer implementation of community management may result in improved benefits, even though this is not the case in this study, especially in CBFM.

The interesting message is the relationship between forest conditions and perceived benefits flow that attract incentives for high participation such as JFM in our study. Therefore, in WUMs, improving the forest conditions may enhance benefits flow, which are community incentives. With the improvement of the forest condition, there is optimism to improve benefits flow due to existing regulatory conditions in place notably waiving (avoidance of state royalties), exemption (taking all income from the selling of the products), and levying (income from the fines and penalties) [98]. The other important aspects in this study are the decision-making expressed in terms of meeting involvement and taking part in the forest protection, which were both low in CBFM. The observation in this study regarding decision-making diverge from Persha and Blomley [38], which associated more participation in decision-making in the community-managed forests. The situation may be linked with more benefits flow from the JFM forest. The allocation of farming plots through Taungya in the JFM, for example, necessitate communities' engagement in decision-making since they have interest to protect. Thus, it implies that community ownership and management should go hand-in-hand with benefits flow for the communities to participate. The same applies to the difference of levels of protection activities as the community members protect the forest providing the farming plots and occasional wage labour in the JFM.

The levels where community members can influence the decision-making are also important, for example, in strategic or operational sphere. In WUMs, as was the case in the study in Mexico [100], the communities in the CBFM engaged to the operational matters such as deciding on the days to access the forest. This was not the case in JFM in which farmers complained about the distribution procedure of Taungya farming plots, which was a contentious issue. However, the communities in both cases had a limited room to question or influence higher levels' strategic decisions, which is similar to a situation in Mexico where the communities' influence was limited to the operational level [100].

Training emerged as critical aspects to improve the participation situation in WUMs, which is similar to studies elsewhere [27,101,102]. Therefore, continuous communities' trainings are very important for the realization of PFM goals, even though care is necessary not to impose completely outside views while disregarding the community approaches [100]. The training should align themselves in improving the resource condition as well as the households' livelihood situations, such as beekeeping [103], which can bring a better synergy.

Trust in this study has shown to influence participation as an important component of social capital. Management of the resources in WUMs is a collective action that needs state and communities in the JFM and between community members in the CBFM to work together. Trust is a delicate affair, easily eroded with conflicts or parties not fulfilling their expected obligations. The evidence of mistrust between villagers and officials is a historical challenge in PFM transformation in Tanzania [38], which needs repairing for community effective participation and successful resource management. Overall, due to an interrelationship of various aspects of communities' resources management, similar to Hajjar et al [101], the participation might be improved through holistic consideration of the PFM goals. For example, forest benefits are realized from a well-stocked forest with access rights to the communities, which, in turn, should be maintained through strong institutions built on the foundation of social trust with informed communities through regular communication, training, and support. However, the optimal balance of the requirements of all the aspects remains a huge task.

The study offers insights for the assessment of the PFM in Tanzania. In terms of the methods, the approach dissected the two PFM tiers (JFM and CBFM) as well as its components (economic, decision-making, and protection), which enabled a comparison. The authors view that an approach is suitable in other areas of Tanzania for the assessment of the participatory programme. The suitability bases on the argument that the method profiles the main goals of the PFM in Tanzania [2,16], which, therefore, ensures objectivity. The findings may highlight the situation in other areas in Tanzania with similar conditions because, in most rural areas, the community members are generally poor, low educated, and have less resource access. However, care should be taken not to generalize the findings for the communities around a rich-forest resource base and experience of NGOs support.

This study is limited by the fact that it is based on community self-reporting of various activities in dealing with the forest that display the intention, and may not reflect the actual behavior. Therefore, the study concedes that variation may exist, which is also highlighted by the planned behavior theory that slight variation might occur between the intention and behavior [104]. The study also acknowledges that the participation concept is multiscale and can be assessed in different dimensions. For example, our assessment is based on the views of the community only, even though there are other stakeholders in participation such as the state actors or NGOs. Therefore, this study approach is not the only possible way to profile the participation and the ultimate forest management challenge. Future studies might consider different approaches as well as multiple stakeholders and, therefore, understand the problem in the WUMs and the Tanzanian perspective better.

#### 4. Conclusions and Recommendations

Our study findings paint a picture of the community perceived participation in forest decision-making as well as economic and protection activities. Community views are very important for stakeholders in direct contact with the forest. In comparison, the villagers around the JFM perceived higher levels in all components of participation and more households in overall participation intensity. In the wake of the findings, the hypothesis posed on the difference in the perceived difference of the benefits for the villagers around the JFM and CBFM forest proved significant, as well as important for training and trust. Furthermore, based on the community views, the PFM performance in empowering the community members to benefit and take part in the forest management has only been moderate. Without a balance of economic incentives and the community effort for management, the sustainability of the forests in West Usambara will continue to be under threat.

The study recommends raising awareness through regular communication to empower the community with knowledge and information on forest management, which has to be an on-going activity. The implementation can be through regular contact with the villagers and communication innovations such as mobile technology to contact villagers with forest-related information. Furthermore, interventions offering forest income alternatives may offer incentives as income sources for the villagers. The income can be improved by business-related conservation opportunities to make communities engage in forest activities. The conservation and income may be linked, for example, through potential, yet underutilised interventions such as beekeeping, which may improve villagers' welfare and directly provide incentives for forest management. Lastly, the shortage of funds has been a common complaint and an excuse given by local forest officers to support management activities. However, various sources provide funds (including TaFF (Tanzania Forest Fund introduced in 2010 under the Forest Act Cap 323 (2002) to "financially support the sustainability of forest management in the country" [105]) in Tanzania) for conservation activities that require sourcing through proposals. Therefore, training of the forest officers and technicians on skills to prepare proposals to acquire funds will reduce the financial deficit and motivate forest officers and villagers to work together toward CBFM activities.

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## Appendix A

**Table A1.** Statements to gauge the perception of villagers on participation indicators.

Item	Mean	S.D.	Item-Total r	Alpha if Deleted
1. The forest is important for fuelwood provision in households.	3.38	1.17	0.447	0.751
2. The forest is important for timber provision in the households.	2.85	1.04	0.423	0.754
3. The forest is important for NTFPs provision in households.	3.18	1.06	0.473	0.749
4. The forest is important for households' employment benefits.	2.82	1.08	0.454	0.751
5. The forest is important for income provision in households.	2.75	1.05	0.473	0.749
6. Frequency of meetings on forest issues.	1.82	1.15	0.546	0.741
7. Gain/learning about forest issues at meetings.	1.75	1.06	0.562	0.741
8. Ability to lead or influence decisions at meetings.	1.72	0.98	0.590	0.741
9. <sup>d</sup> Extent of involvement in tree-planting activities.	3.10	1.36	0.006	0.797
10. <sup>d</sup> Extent of participation in firefighting activities.	3.04	1.30	0.380	0.758
11. Reporting on illegal forest activities.	2.11	1.26	0.537	0.741
12. Involvement in the preparation and maintenance of firebreaks.	2.55	1.31	0.465	0.749
13. <sup>d</sup> Importance of forest in reducing soil erosion.	3.90	0.83	0.218	0.770
14. <sup>d</sup> Importance of forest in mitigating adverse effect (e.g., floods).	3.25	1.20	−0.021	0.795

<sup>d</sup> indicate the deleted items; NTFPs = Non-Timber Forest Products; S.D = Standard Deviation.

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