

Participatory Forest Management Tool for Promoting Sustainable Forest Utilization in Chiradzulu, Malawi

Margaret Kunje

Department of Forestry, Forestry Research Institute of Malawi, P.O. Box 270, Zomba, Malawi

Edward Missanjo*

Department of Research, Malawi Assemblies of God University, P.O. Box 184, Lilongwe, Malawi

Email: edward.em2@gmail.com

Article History

Received: January 5, 2021

Revised: February 10, 2021

Accepted: February 12, 2021

Published: February 15, 2021

Abstract

A cross-sectional study was conducted to assess community perceptions towards environmental issues and Participatory Forest Management (PFM) in Chiradzulu, Malawi. The study revealed that majority (94%) of the households are aware that the forest cover has declined in the past two decade and recognised this as a major environmental problem. Firewood the main source of energy, poverty, as well as population growth were identified as the major cause of the forest decline. However, the study revealed that PFM is one of the helpful tools in overcoming this challenge. Most (66%) of the households acknowledged that PFM is partially meeting community's basic needs and interests. The basic needs that were observed included firewood, food, water, shelter, knowledge, skills, and income. This indicate that if PFM is implemented effectively, it would lead to sustainable management of forest resources. Therefore, the present study recommends that for sustainability of forest management to be achieved in the study area, communities should be fully empowered to make sound decisions for continued benefits for the entire community.

Keywords: PFM; Sustainability; Empowerment; Forest cover; Forest resources.

1. Introduction

Perceptions of local people on environmental issues, particularly within rural communities, are essential in addressing deforestation, forest degradation, social vulnerability, and adaptation to climate change. Many studies have assessed people's attitudes in the context of community forestry and natural resources [1-8]. They all concluded that sustainable management of natural resources cannot be successful without the support from local people. Perceptions and attitudes influence people's willingness to participate in management activities. Thus, understanding people's perceptions and attitudes is essential as they can be useful input into the design, implementation, and evaluation of conservation programs [9].

Jumbe and Angelsen [10], indicated that attitude involves three things: an attitude object (not physical, but defined by the attitude holder), a set of beliefs (whether good or bad), and a tendency to behave toward the object. On the other hand, Anderson [11] stated that attitudes concern socially significant objects, groups, events, and symbols captured in such characteristics as good-bad, harmful-beneficial, pleasant-unpleasant, and likable-dislikeable. However, studies that are more recent have shown that this concept may be too simplistic [11]. Wilson [12], advance the concept of 'dual attitude', which proposes that people could hold two attitudes towards a certain object, implicit and explicit, at the same time. Studies to assess people's attitudes towards collective (community-based) natural resource management have shown that PFM could shape favourable local attitudes, as it provides the motivation for local people to invest in collective natural resource management [1-9, 13-21]. These studies provide useful input into the design, implementation, and evaluation of conservation programs. They have enhanced the understanding of people's perceptions and attitudes towards conservation programs and vice versa, and how this affects their willingness to participate. Favourable attitudes were influenced by the community's perceptions of costs and benefit and their role in influencing outcomes of the collective action [6, 18]. This is influenced by demographics and socioeconomic factors such as age, gender, education, and income class and the level of participation of communities in decision making and management activities [7, 18].

For participatory forestry programs, some studies reported that people had positive attitudes towards them and were more willing to participate in program activities [3, 7, 22]. These positive attitudes were attributed to increased understanding of PFM, the impact of the program on the livelihoods, and cordial relationships with forestry staff. In other instances, however, participation in these programs was negatively associated with attitudes, and people were wary of taking over responsibilities of managing the resources [4, 23]. The differences in the attitudes suggest that strategies to involve people in participatory programs should recognize positive and negative attitudes to reflect the heterogeneity of communities.

*Corresponding Author

Malawi has a long history of involving local people in managing forests since the precolonial period. Since this time, however, five main forest regimes have emerged in succession: 1) community “management” through indigenous knowledge; 2) centralised management of forests (colonial era 1891-1964; 3) decentralised (district) (postcolonial era 1964-1985); 4) recentralised management (1985-1996), and 5) 1996 - present PFM [24]. However, studies on perceptions and attitudes on environmental issues and PFM in Malawi are limited.

This study, therefore, sought to answer the research question: what are the perceptions of small farmer households on environmental issues and Participatory Forest Management (PFM) in Chiradzulu, Malawi? And what is the participation level of small farm households in collective forest activities in Chiradzulu, Malawi?

2. Materials and Methods

2.1. Study Area

The study was conducted in Chiradzulu district, one of the eleven districts in the Southern region of Malawi. It was chosen because the district offered easy accessibility to the population of interest and therefore presented a higher response rate. The district is located at latitude 15.68° S and longitude 35.14 °E in the southern region of Malawi, approximately 25 kilometers from Blantyre, the commercial city of Malawi. The total population for the district was estimated at 290,946 [25] with a population density of 379 people per square km which is higher than the national population density of 139 people per square km [25]. The district has a land area of 767 km² and is subdivided into six political administrative areas called Traditional Authorities (TAs), namely, Nkalo, Kadewere, Likoswe, Mpama, Chitera and Tchema. This study was conducted in Mpama Traditional Authorities. The district has a mean and maximum temperature ranging from 21-28 degrees Celsius and rainfalls averaging 1109.8 mm per annum. However, variations in temperature and rainfall have been observed in the recent years (2011-2016) associated with extreme weather events, especially droughts and floods [26].

2.2. Study Design and Sample Size

This study used a descriptive study design. This is because descriptive studies are concerned with specific predictions, narrations of facts, and characteristics concerning individuals, groups, or situations.

Sample size was determined using the following formula [27]:

$$n = \frac{N * X}{X + N - 1},$$

where: n is the sample size, N is the population size, X is defined as:

$$X = z^2 pq / e^2,$$

p is the proportion of the population containing the major attribute of interest, q is (1-p), z is the standard variate at a given confidence level ($\alpha = 0.05$), and e is the acceptable error (precision). A recommended allowable error ranges from 1% to 10% [27]. In this study, a 10% error rate, a standard proportion (p) of 0.5, and z-score at 95% confidence level ($\alpha = 0.05$) of 1.96 were used. The total number of households in TA Mpama was 2014 [25]. Therefore, the expected minimum sample size was 92 households. However, 100 members were used as a sample size in this study.

2.3. Data Collection and Analysis

Data was collected between July 2014 and March 2015 and August to September 2015. The data was collected using a standard structured questionnaire administered through face-to-face interviews. The targeted respondents were heads of the households and in their absence the most senior member. Key informant interviews were also held. Among the key informants interviewed were village heads, extension staff, NGOs, and local and national forestry personnel. Focus group discussions were held with Village Natural Resource Management Committees (VNRMCs), Village Development Committees (VDCs), Women and Youth groups, separately, to clarify the missing information. The questionnaire was pretested on a few selected households and VNRMCs in one of the study areas, and the easiness of completion of the questionnaire and ambiguity of questions were noted and subsequently revised before a large-scale interview of the households, key informants and VNRMCs. Respondents were asked on socio-demographic characteristics, perceptions they have on environmental issues and PFM, and the participation level of community members in collective forest activities.

The data collected was analysed using Nvivo and Microsoft Excel software's to generate descriptive statistics (frequencies/proportions). Nvivo was used because of its ability to identify themes and enhance rigor of analysis when combined with researchers own impression of the data [28].

3. Results

3.1. Socio-demographic Characteristics of the Respondents

The village members interview represents smallholder farm household's dependent on subsistence living. The average age of interviewed village members was 55 years with the majority falling between 30 to 75 years. 11% of the respondents have no formal education, followed by primary or literacy level (71%) and secondary education level was (9%). Respondents owned land with customary freehold with (67%) indicating that they “owned” less than one hectare. Majority (81%) of the respondents belonged to collective forestry activities. The main livelihood for the study area was subsistence agriculture (Figure 1). All respondents were farmers relying on rain-fed agriculture.

Majority of the respondents were also engaged in other off-farm livelihood activities to generate household income. These activities included small business, piece work, kinship, remittance, few work in estates, petty trading, forestry dependent activities (NTFPs), and forestry-based enterprises (Figure 1). However, during FGDs, participants

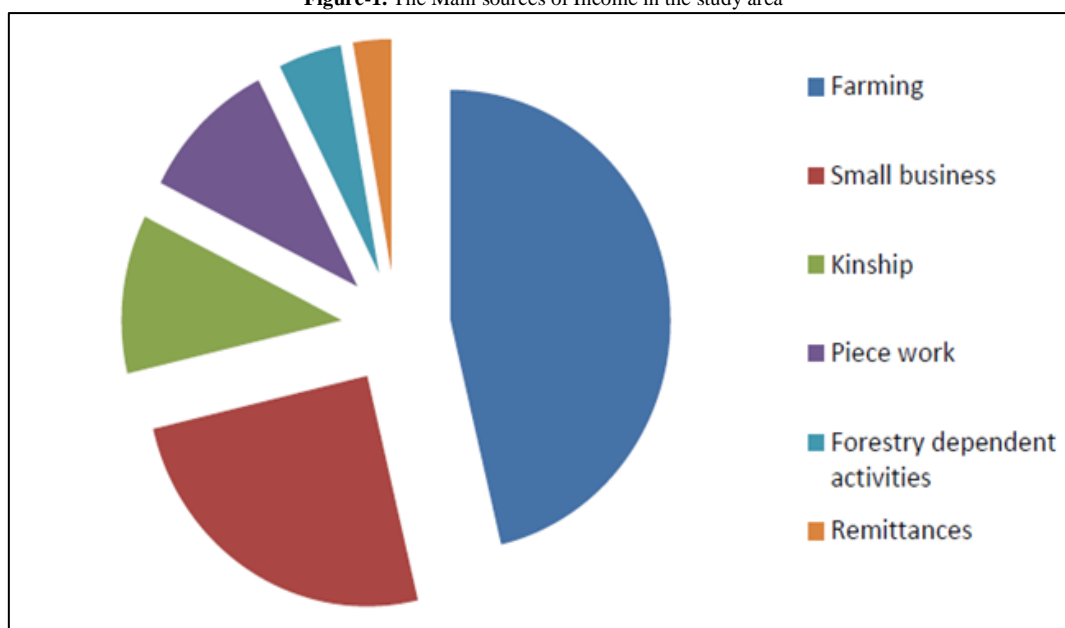
revealed that there had been changes in people’s engagement in livelihood activities over the last 30 years, in terms of participation as well as intensity.

The study also observed that forestry-based enterprise (i.e. honey) were not common regardless of most VFAs having mature trees and some patches of closed canopy trees for apiary. Out of 12 VFAs visited, only 2 VFAs had beehives (i.e., Chingozi) donated by NGOs. This was due to lack of partnership. On the other hand, selling of forest products was also not common in the study area compared to Lilongwe district where men transport firewood for sale in the city. Out of 12 VFAs, only 2 VFAs were conducting wood sales in terms of firewood and the money was being deposited into government account. This was due to lack of Forest Management Plan (FMP) and Forest Management Agreement (FMA) which could have allowed forest users access to products of high economic value such as timber, firewood, and bamboo. However, during FGDs, participants reported that the VFAs are being managed to achieve conservation objectives and bring back a mosaic of trees in agricultural landscapes.

Apart from that, charcoal production was also rare. During transect walk in the VFAs, there was no sign of charcoal burning and no live stump were recorded, an indication that charcoal burning was restricted by rules in use.

The study also revealed that most respondents owned livestock, the most common being chickens, goats and few households’ own cows that could be substituted to diversify livelihood strategies. Many of the respondents (93.4%) owned their houses with thatch grass as the common roofing material. Portable water was the only communal asset, to which most households had access through boreholes (89.1%). However, these were not sufficient to support the population throughout the year as the rainfall data of the area has shown that the rainfall pattern is variable and has constantly been reduced over time.

Figure-1. The Main sources of Income in the study area



3.2. Community Perceptions towards Environmental Issues

The study showed a high level of awareness and knowledge of environmental issues with most respondents (94%) agreeing that forest cover has declined in the past 20 years and that wood is now scarcer. During FGDs, participants reported a decrease in forest cover which has led to a decrease in the availability of forest products.

3.2.1. Causes of Forest Decline

3.2.1.1. Use of Firewood as Energy Source

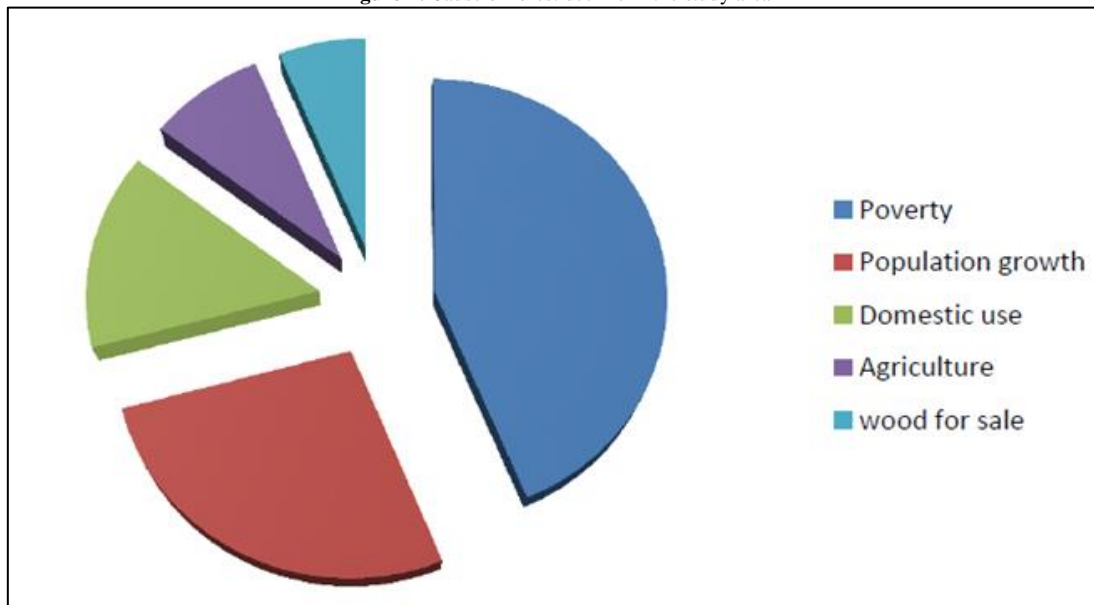
Firewood is the main source of energy for all major household energy needs such as cooking, heating, and lighting. From all focus group interviews, the use of fire wood for cooking and heating came first on the ranking list. During fieldwork, it was observed that firewood is also being used for kilning bricks for construction of community-led projects (i.e., school blocks, teachers’ houses) and that are being funded by Local Development Fund (LDF). During key informant interviews, village head of Dokotala reported that one of the requirements for villages to get funds from the community Window of LDF is to have own materials like bricks and timber. All these are dependent and products of trees.

It was further reported that the School Feeding Program (SFP), which is being funded by World Fund Program (WFP) and Mary’s Meals International, requires the learners to provide fuel for cooking and has also increased demand for forest products. On the other hand, firewood and charcoal are the main rural and urban household fuel in Malawi for almost 90% of households. Furthermore, the intermittent electricity supply in urban areas and high electricity tariffs further exacerbate the use of charcoal and firewood as sources of fuel in urban areas.

Despite firewood being the main source of energy for cooking in the study area, the majority of the respondents (77%) linked forest decline to poverty or low agricultural productivity (63%) cited population increase, (57%) admitted land clearance for agriculture, (24%) said its wood extraction for domestic use, (12%) said its land shortage

and (3%), democracy. To the respondents, poverty was by far the biggest cause of forest decline due to subsistence agricultural productivity (Figure 2). However, recent flood (2014/15 and 2015/16) have exacerbated local poverty.

Figure-2. Cause of forest decline in the study area



3.2.1.2. Population Growth

Malawi has experienced a persistently high population growth for over half a century. The population tripled to 15.5 million between 1952 and 2012, and has grown at a rate of 1.35% during the last decade. The growing population and its changing consumption behaviour have led to an increased pressure on forest land and forest products.

3.2.1.3. Political Change

The study findings also revealed that political change and popular politics also contributed to forest decline in the area. The change from one-party dictatorship under Dr Hastings Banda to democracy in 1993/94 was misinterpreted. Many thought that democracy is a license for free exploitation of forests and disregarding the authorities. During key informant interviews, one of the FG reported that:

in “.....some politicians politicized forests, promising access to forests and its land during their political campaigns. This undermined the efforts of DoF and the delegated authority of traditional leaders to protect and manage forest resources in a sustainable manner. However, the shift of the forestry policy from policing to community forestry has changed the mindset of the politicians and communities”.

In the study area, politicians are the ones leading in tree planting activities during National Forestry Seasons (Figure 3).

Figure-3. The councillor-leading tree planting exercise in the study area



3.2.2. Effects of Forest Decline on Livelihood

The declining forest resources base is one of the main stresses on livelihood-dependent communities. The loss of forests diminishes households' income and livelihood options due to limited alternatives. Interviews with village members revealed that households perceived a decline in the availability of nontimber forest products (i.e. mushrooms). Another key informant in Dokotala reported that loss of forest has moved the bees away and they no longer harvest honey for sale or domestic use. It was further reported that forest clearance has led to households losing revenue which was once realized from sale of fruits NTFPs (i.e. mango).

Forest decline is further increasing people's vulnerability to stresses and shocks. In 2014 and 2015 planting season, Malawi experienced floods and dry spells including the study area. These problems were accompanied by other environmental effects such as dry spells, droughts, soil erosion, and degradation and reduced water flow. Since forests offer an important coping strategy to household income shocks, especially among poorer households, forest decline is hampering the coping strategies of households. Apart from that, productive time is spent searching for tree products, which could have otherwise been used for other livelihood activities.

It was further reported that most of the preferred wood products for traditional medicine (*Albizia antunesiana*), hoe handling (i.e., *Pterocarpus angolensis*), and construction (i.e. *Bragystegia*) are no longer available making people to walk long distances in search of these products. Almost all respondents (94%) aware of the growing wood scarcity have adopted adaptive strategies, the main ones being:

- Planting trees (an average of 10 per household in 2015) – 86%
- Participating in collective forestry activities - 68%
- Using crop residues or bamboos for fuel – 54%

3.3. Community Perceptions towards Forest Management

The results from in-depth interviews with village members revealed that most of the respondents (86%) agreed that a lot is being done to improve forest management and the status and condition of the VFAs have improved for the last 5 years. Similarly, about 82% believed that VFAs will still be standing in 5 years to come to provide forest products and services (Table 1).

3.3.1. Local Criteria for Well-Managed Forest

The respondents were also asked about their perceptions on local criteria for well-managed forests. The results show that the level of protection from people and fire was first, followed by timely tending operations, improved forest cover, and species diversity, which led to increases in forest products and equitable benefit sharing (Table 1).

Table-1. Community Perceptions Towards Forest Management and Criteria for Well Management Forest

Aspect	Agree (%)	Disagree (%)
A lot is being done to improve forest management	86	14
The status and condition of the forest is improving	82	18
Local criteria for well managed forest		
Criteria	Frequency / Percentage	
Level of protection from people/fire	54	
Improved forest cover and species diversity	28	
Timely tending operations	18	

3.3.2. Forest Management Activities

During transect walk, it was observed that most VFAs received minimal silvicultural operations activities. The main collective silvicultural activity done in most VFAs was firebreak maintenance in which half of respondents had participated. Firebreak maintenance was done to avoid bush fires. Setting fire is illegal as expressed in formal rules which are allowed in formal regulation and benefit vegetation growth only. However, fire was reported in some of the VFAs as a major problem in the study area where most of the communities are not willing to conduct fire break maintenance as a seasonal activity on free labour. The FG also reported that the presence of fire in some VFAs was a sign of lack of enforcement capacity of rules and in some VFAs, based on the use of the fire for hunting mice for food.

Interviews revealed that VNRMCs did all the patrols as part of their roles and responsibilities. Villagers helped in monitoring and forest monitoring was all year-round activity. Other tasks such as watering were done mostly by women, while weeding was done by both men and women. Community members of many villages initially participated cooperatively engaging up to 50 people for work.

3.4. Community Perceptions on Implementation of PFM

Despite the lack of participatory forest management planning, almost three quarter of the respondents (78%) did know about PFM and its objective. For those that are aware of its objectives, they indicated that they were related to ownership and empowerment. Majority (66%) of the respondents acknowledged that the program is partially meeting community's basic needs and interests. The basic needs that were observed included firewood, food, water, shelter, knowledge, skills, and income. A greater proportion of the respondents (80.6%) interviewed indicted firewood as the most important of these basic needs which was met through homestead tree planting. Those who

agreed that PFM objectives met community basic needs and interests felt that it would lead to sustainable management of forest resources.

However, in general, VFAs are too small to provide the needs of local communities in the future even when the trees mature. Most of the VFAs also require participatory forest management planning for sustainability and form a good apiary. Otherwise, it will be difficult for the entire villages to access forest products because most of the VFAs are dominated by medium diameter classes (Figure 4).

Figure-4. Kanjuchi Village Forest Area, dominated by medium diameter class



3.5. Participation of Communities in Forest Activities

Summary of the results on the participation of communities in forest activities are presented in Table 2. All respondents indicated that they are planting or managing trees and forests either individually or communal to deliver a range of livelihoods and benefits. Majority of the respondents (95.6%) indicated firewood as one of their main purposes for participating in tree planting and management. This was followed by 79% and 52.5% who indicated their main purpose of participation to be for shed and fruits, respectively. Only 11.5% indicated medicine as their main reason for participation in tree planting and forest management. Almost 73% of the respondents further indicated that tree planting and management activities have increased in the area for the past 10 years. These activities included homestead tree planting, natural regeneration of tree species, enrichment planting, demarcating, and protecting areas of forest (VFAs).

The results revealed that people participated more in tree planting than in activities related to management of natural forests and woodlands. Majority of the respondents (81%) indicated that homestead is much better as compared to conventional forests like VFAs and Forest reserves. The respondents mentioned the high right to exclude the other as one of the reason for their choice over the conventional forest. At least 50.7% of the respondents think that homestead tree cover has increased in their area. This perhaps may be due to small land holding size, complicated land tenure, high energy needs, and acute land degradation in the study area.

When respondents were asked why they participated in collective forest activities. Many reported that they participated based on the recognition of the need to restore and sustain forest resource for future generations and that tree planting is everyone's responsibility. Similarly, many (78%) believed that they had control over participation in collective forester activities. More importantly, they felt they had control over the decision to participate in the management of the forest resources.

The findings of this study also reveal that 85.5% of the respondents mentioned extension agents as their best source of information on tree planting and management followed by community interactions (64.1%), and radio (11%). 87% of the respondents think that extension workers and traditional leaders have performed a crucial role in influencing their attitude to participate in tree planting and management.

On the other hand, the study findings revealed that most institutions participate in tree planting and management to produce timber for construction, firewood, and provision of sheds. These results are not surprising because institutions like schools are also compelled to grow trees to produce timber for the construction of school blocks for Local Development Fund projects. It is a prerequisite for the communities to have their own materials (i.e., timber, bricks) before funds are provided for construction. In addition, it is a requirement for environmental safeguards in schools to include tree planting in their environmental management plan. This means every school has a special subcommittee to take care of tree planting activities.

Table-2. Community participation in forest activity

Aspect	Frequency / Percentage
Planted trees in the last five years	
Yes	100
No	0
Main use for planted trees	
Domestic use	76
Environmental Services	26
Product for sale	34
Extent of participation in collective activities	
Tree planting	77
Management of natural regeneration	52
Protecting forest areas	21
Adaptation to forest decline	
Planting trees and protecting indigenous woodland	86
Participating in collective forestry activities	68
Use of crop residues for fuel	54
Walking longer distance on wood collection	38
Buying	6

4. Discussion

The concept of perception refers to the outcome of applying knowledge to a situation [29], and local environmental conditions shape the concern that people have in relation to their environment [30]. Sustained community participation in PFM is dependent on these perceptions and attitudes towards collective forest activities. This study examined people's perceptions to environmental issues and their participation in collective forest activities. The perceptions were assessed by examining their awareness of environmental issues and their impressions of forest management in general.

Finding from the study has shown that participants are aware of environmental issues. Majority agreeing that forest has declined in the area, and that wood products are scarce, mainly as a result of increased demand for forest products due to poverty, population increase, and agricultural expansion, among others. The findings have shown that forest clearance has led to households losing revenue which was once realized from sales of forestry-related income generating activities (i.e., honey, mushrooms, fruits), which have increased people's vulnerability to stresses and shocks. These results agree with other studies that reported that forest depletion was one of the most serious environmental issues and was accompanied by many other environmental and economic effects [31]. In Banda, *et al.* [32] and Walker [33], reported that people perceived deforestation as a major problem, which would lead to other problems in future.

The study findings revealed respondents have shown a great interest in tree planting to deliver a range of livelihoods and benefits, and to overcome the problems. However, a lot needs to be done if community participation in tree planting and management is to lead to sustainable development. The development of social capital through the formation and strengthening (i.e. partnership) of forest management groups is vital. According to German and Keeler [16], social capital can improve household welfare through information sharing, collaborative working (reduction of opportunism), and improved collective decision making.

5. Conclusion

The study revealed that the local people are aware that the forest cover has declined in the past two decade and recognised this as a major environmental problem. Poverty, population growth as well as use of firewood as a main source of energy were identified as the major cause of the forest decline. However, the majority of the respondents acknowledged that PFM is partially meeting community's basic needs and interests. The basic needs that were observed included firewood, food, water, shelter, knowledge, skills, and income. This indicate that if PFM is implemented effectively, it would lead to sustainable management of forest resources. Therefore, the present study recommends that for sustainability of forest management to be achieved in the study area, communities should be fully empowered to make sound decisions for continued benefits for the entire community.

Acknowledgements

The authors are grateful to World Wild Fund for Nature (WWF) and Schlumberger Foundation (Faculty for the Future Fellowship) for the financial support.

Conflict of Interest

The authors declare that they have no conflict of interest.

Funding

World Wild Fund for Nature (WWF) and Schlumberger Foundation

Availability of Data and Materials

The data that support the findings of this study can be obtained from the corresponding author upon request.

References

- [1] Batterburry, S. P. J. and Fernando, J. L., 2006. "Rescaling governance and the impacts of political and environmental decentralization: An introduction." *World Development*, vol. 34, pp. 1851-1863.
- [2] Blaikie, P., 2006. "Is small beautiful? Community-based natural resources management in Malawi and Botswana." *World Development*, vol. 34, pp. 1947-1957.
- [3] Matiku, P., Mireric, C., and Orgl, C., 2011. "Participatory natural resources management – policy and institutional framework (Part1)." *Environmental policy and Law*, vol. 41, pp. 232-239.
- [4] Meltem, B., Gaye, T., and Hamide, E., 2011. "Emphasizing local features for effective environmental education: Environmental attitudes of elementary school students living in ancient halicarnassus (Turkey)." *Science Education International*, vol. 22, pp. 119-132.
- [5] Silori, S. C., 2007. "Perceptions of local people towards conservation of forest resources in nanda devi biosphere reserve, North-Western Himalaya, India." *Biodiversity and Conservation*, vol. 16, pp. 211-222.
- [6] Timko, J. A., Waeber, P. O., and Kozak, R. A., 2010. "The socio-economic contribution of non-timber forest products to rural livelihoods in Sub-saharan Africa: Knowledge gaps and new directions." *International Forestry Review*, vol. 12, pp. 284-294.
- [7] Zulu, 2013. "Bringing people back into protected forests in developing countries: Insights from co-management in Malawi." *Sustainability*, vol. 5, pp. 1917-1943.
- [8] Zulu, 2012. "Neoliberalization, decentralization and community-based natural resources management in Malawi: The first sixteen years and looking ahead." *Progress in Development Studies*, vol. 12, pp. 193-212.
- [9] Horning, N. R., 2005. "The cost of ignoring rules: Forest conservation and rural livelihoods outcomes in Madagascar." *Forests, Trees and Livelihoods*, vol. 15, pp. 149-166.
- [10] Jumbe, C. B. L. and Angelsen, A., 2006. "Forest dependence and participation in CPR management: Empirical evidence from forest co-management in Malawi." *Ecological Economics*, vol. 62, pp. 661-672.
- [11] Anderson, K., 2006. "Understanding decentralized forest governance: An application of institutional and analysis and development framework." *Sustainability: Science, Practice, and Policy*, vol. 2, pp. 25-35.
- [12] Wilson, D. C., 2003. *Conflict and scale. A defense of community approaches in fisheries management. The fisheries co-management experience: Accomplishments, challenges and prospects*. Academics Publications.
- [13] Biran, A., Abbot, J., and Mace, R., 2004. "Families and firewood: A comparative analysis of the costs and benefits of children in firewood collection and use in two rural communities in sub Saharan Africa." *Human Ecology*, vol. 32, pp. 1-25.
- [14] Chanley, S. and Poe, M. R., 2007. "Community forestry in theory and practice: Where are we now?" *Annual review of Anthropology*, vol. 36, pp. 301-336.
- [15] Gautam, A. P. and Shivakoti, G. P., 2005. "Conditions for successful local collective action in forestry: Some evidence from the hills of Nepal." *Society and Natural Resources*, vol. 18, pp. 153-171.
- [16] German, L. A. and Keeler, G., 2010. "Hybrid institutions: Applications of common property theory beyond discrete property regimes." *International Journal of the Commons*, vol. 4, pp. 571-596.
- [17] Kellert, S. R., Mehta, J. N., Ebbin, S. A., and Lichtenfield, L. L., 2000. "Community natural resources management: Promise, rhetoric, and reality." *Society and Natural Resources*, vol. 13, pp. 705-715.
- [18] Larson, A. M., 2008. "Indigenous peoples, representation and citizenship in Guatemalan Forestry." *Conservation Society*, vol. 6, pp. 35-48.
- [19] Oyono, R., 2004. "Assessing accountability in Cameroons' local forest management. Are representatives responsive?" *African Journal of Political Science*, vol. 9, pp. 126-136.
- [20] Stern, P. C., 2011. "Design principles for global commons: Natural resources and emerging technologies." *International Journal of the Commons*, vol. 5, pp. 213-232.
- [21] Tieguhong, J. C., Ndove, O., Grouwels, S., Mala, W. A., and Betti, J. L., 2012. "Rural enterprise development for poverty alleviation based on non-wood forest products in Central Africa." *International Forestry Review*, vol. 14, pp. 363-379.
- [22] Anold, J. E. M., Kohlin, G., and Persson, R., 2006. "Woodfuels, livelihoods, and policy Interventions; Changing Perceptives." *World Development*, vol. 34, pp. 596-611.
- [23] Kamanga, P., Vedeld, P., and Sjaastad, E., 2009. "Forest incomes and rural livelihoods in Chiradzulu, District, Malawi." *Ecological Economics*, vol. 68, pp. 613-624.
- [24] Zulu, 2009. "Politics of scale and community-based forest management in Southern Malawi." *Geoforum*, vol. 40, pp. 686-699.
- [25] NSO, 2009. *Population and housing census 2008, Main report*. Zomba, Malawi: National Statistical Office.
- [26] Chiradzulu Meteorological Office, 2016. "Annual Report."
- [27] Daniel, W. W. and Cross, C. L., 2013. *Biostatistics: A foundation for analysis in the health sciences*. 10th ed. New York: Wiley.
- [28] Welsh, E., 2002. "Dealing with data: Using nvivo in the qualitative data analysis process." *Forum Qualitative Social Research*, vol. 3, pp. 1-9.
- [29] Knowler, D. and Bradshaw, B., 2007. "Farmers adoption of conservation agriculture. A review and synthesis of recent research." *Food Policy*, vol. 32, pp. 25-48.

- [30] Baidu-Forson, J., 1999. "Factors influence adoption of land-enhancing technology in the Sahel: lessons from a case study in Niger." *Agricultural Economics*, vol. 20, pp. 231-239.
- [31] Agrawal, A., 2007. "Forests, governance, and sustainability: Common property theory and its contributions." *International Journal of the Commons*, vol. 1, pp. 111-136.
- [32] Banda, W., Senganimalunje, T. T., and Missanjo, E., 2015. "Community attitudes and perceptions towards management of Kaning'ina Forest Reserve in Malawi." *Journal of Basic and Applied Research International*, vol. 8, pp. 34-40.
- [33] Walker, P. A., 2004. "Root of crisis: Historical narratives of tree planting in Malawi." *Historical Geography*, vol. 32, pp. 89-109.