HUMAN AND WILDLIFE CO-EXISTENCE IN MBOMIPA, IRINGA, TANZANIA: IS IT A LONG-LASTING AND EQUATABLE EQUILIBRIUM?

ABSTRACT

Matumizi Bora ya Malihai Idodi na Pawaga (Mbomipa) is among the community-based wildlife management approaches (WMA) within the Ruaha-Rungwa Ecosystem. The major purpose is to promote wildlife conservation among communities living adjacent to the ecosystem. This study was conducted around MBOMIPA in four villages of Tungamalenga, Mapogoro (in Idodi Division), Itunundu and Kinyika (in Pawaga Division) to assess the effectiveness of the approach in biodiversity conservation and its contribution to local communities' livelihoods. Data were collected through questionnaire survey, key informant interviews and focus group discussions. The Data were analysed using Statistical Package for Social Sciences (SPSS) version 16.0. The results showed that there was a significant difference (Chi-square; $p<0.05$) in responses towards community awareness on biodiversity activities and their contribution to biodiversity conservation; whereby the majority of the respondents were aware of biodiversity conservation.. The study found that majority of the respondents participated in conservation activities through reporting illegal activities, rescuing animals, scaring animals, tree planting and anti-poaching control. Furthermore, the study found that local communities benefited from the MBOMIPA WMA, although their primary source of income was linked to agricultural activities. Revenue and employment opportunities obtained from investors were among the benefits local community gained. The study concludes that it is important to involve communities in the management of wildlife within their localities. Finally, the study is contribution towards understanding functioning of the wildlife management areas in the face of increasing human population associated with economic activities such as agriculture and pastoralism.

Key words: MBOMIPA, Ruangwa, Ruaha, WMA, Idodi

1.1 Introduction

Habitat loss has been the most severe threat to biodiversity and humans worldwide (Galli et al., 2015; Cardinale et al., 2019). According to BirdLife International (2012), human activities are the main drivers for habitat loss and fragmentation leading to the reduction and extinction of species including the near-threatened status of the Bateleur Eagle (*Terathopius ecaudatus*) and the vulnerability of the Southern Ground Hornbill (*Bucorvus leadbeateri*. On the other side, species are globally being over-hunted for food, traditional medicine, ornaments, skins and even sport (Lanzen et al., 2012). These activities are expanding in line with the growth of the human population and an increase in poverty (Lazarus et al., 2015).

The loss is most widespread in developing countries, especially Africa, which is where currently estimated at 60 per cent has been wiped out (Galli et al., 2015). These losses in biodiversity have been huge and irreversible and included the disruption of ecosystem processes, species extinction and the erosion of genetic diversity within species (IUCN, 2013). Accordingly, the WWF (2020) asserts that the extinction of plant and animal species is an irreparable loss with potentially serious environmental and economic consequences for developing and developed countries.

The observed decline prompted the initiation of different management initiatives. In Tanzania and other sub-Saharan Africa, efforts have been made to promote the involvement of local communities in natural resource management in addition to the mainstay conservation involving government-supported protected areas (PAs) (Bowler et al., 2010; Dressler et al., 2014; Saito-Jensen et al., 2010). In Tanzania, for example, Joint Forest Management (JFM), Participatory Forest Management (PFM) (PFM), Community Based Forest Management (CBFM) and Wildlife Management Areas (WMAs) have been established. These approaches advocate for better management of the PAs, sustainable use of wildlife resources, devolution of wildlife user rights to the communities and sharing of the benefits derived from wildlife uses and resources (Barrow et al., 2000; IRG 2000; Baldus and Siege 2001). This is supported by the 1998 wildlife policy which provides local communities and private land holders the rights to manage wildlife in allocated lands for their benefits (MNR 1999b: 14). Furthermore, the Wildlife Policy of Tanzania (MNRT, 2007) recognises local communities as key stakeholders in the conservation of wildlife and their habitats. The policy recognises WMA as a new wildlife Protected area category that seeks to conserve wildlife resources through the involvement of local communities. The government devolves the management responsibility of those areas to local communities.

The main objective of WMA is biodiversity conservation through community participation, however, the organ has been facing many challenges including low community participation (Kiwango, 2017). This emanated from the fact that the initial processes of designing and planning for implementation were not participatory from the beginning leading to low community participation. According to a research

conducted at Wami-Mbiki WMA by Mariki, (2018), WMAs play a great role in emphasising conservation, however, community participation is low due to lack of awareness about WMA, a lack of clarity on ownership of the available resources (wildlife), the notion that the area belongs to foreigners, the belief that management is the responsibility of Villages Natural Resource Committees (VNRCs) and that conservation activities are not well articulated thus communities do not see the rationale for conserving wildlife (Eylers and Forster (1998); John, 2010). MBOMIPA's effectiveness in accomplishing the aims has been assessed in several research studies such as potential human large carnivore conflict (Dickman, 2005 &2008), and benefit sharing (Sosovele, 2004; WWF, 2010; Kiwango, 2017). None of these studies has managed to widely elucidate and provide a true version of the human-wildlife interaction interphase within the MBOMIPA WMA.

3.0 RESEARCH METHODOLOGY

3.1 Description of the Study Area

3.1.1 Location

The study was conducted at MBOMIPA WMA (Figure 1). The area is located in Idodi and Pawaga Divisions of Iringa District in Iringa Region, Tanzania. The study area is located between 6.9ºS and 8.0ºS and between 34.8ºE and 35.7ºE. The southern boundary of the Ruaha National Park forms the northern boundary of the WMA while to the west id the grazing lands of the villages in Idodi Division to the south notably Mahuninga, Makifu, Tungamalenga, Mapogoro, Idodi, Malinzanga and Mafuluto and the grazing lands of the following villages in Pawaga Division: Isele, Kisanga, Kinyika, Luganga and Ilolompya (WMA, 2006).

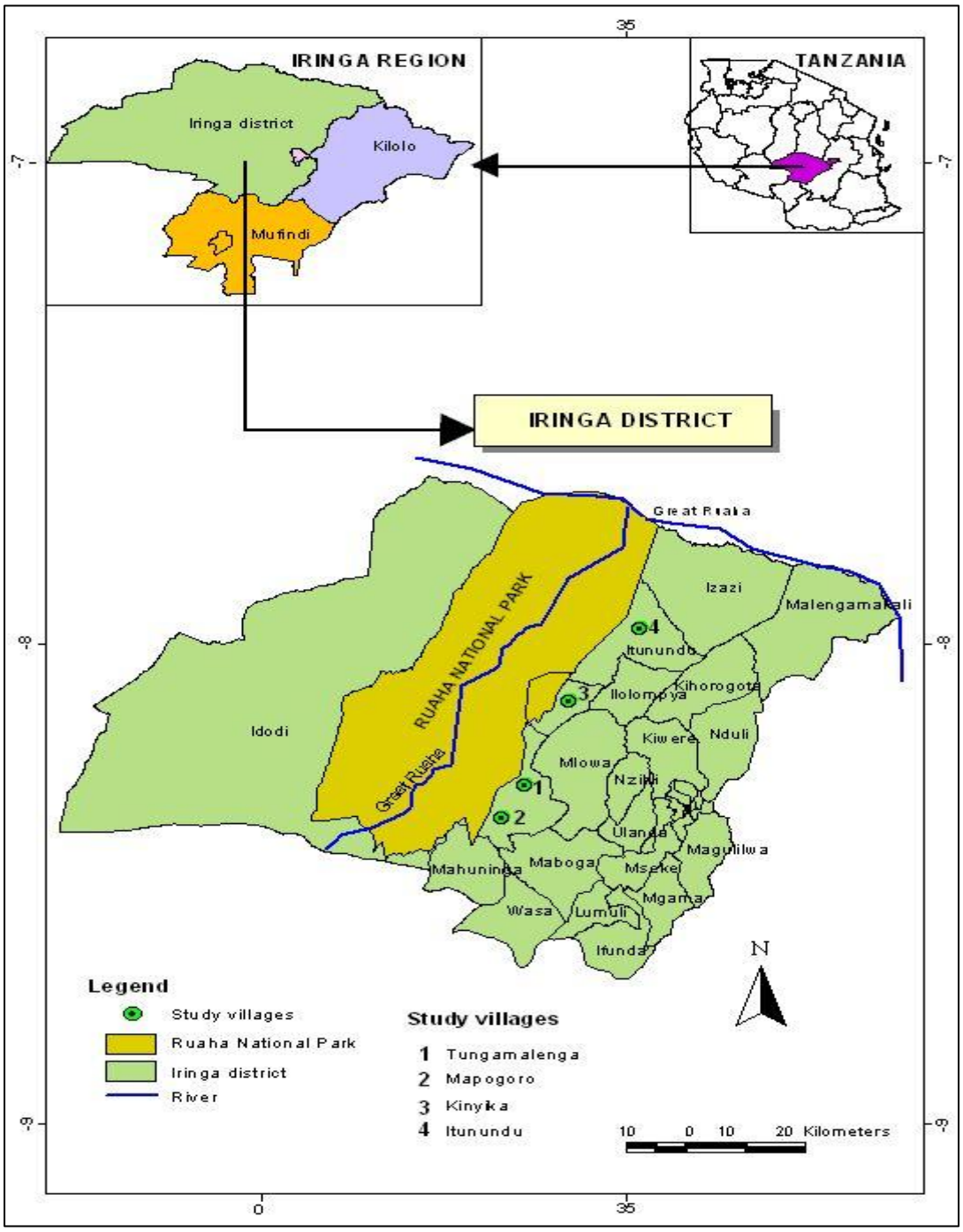

Figure 1: Map of Iringa District showing locations of the study villages

3.2.1 Sampling Procedures

Four villages were randomly selected for this study, two from Idodi Division and two from Pawaga Division. A total of 30 households were selected from each village,

amounting to 120 households selected for the questionnaire survey. A semi-structured questionnaire containing both open and close-ended questions were administered to the respondents (Appendix 4). The method was used to obtain information on the contribution of wildlife management areas to biodiversity conservation and community livelihood. Also, the technique was used to obtain villagers' views on the significance of the contribution of MBOMIPA WMA to biodiversity conservation and their livelihood. The survey was conducted in Kiswahili and translated into English for analysis.

Important key informants were also consulted; these included one VGS from each village, MBOMIPA WMA Officials (the Chairman and the Administrative Secretary), Village Natural Resource Committee (the Chairman and the Director) from each village, and one famous elder from each village. Thus, 18 key informants were involved. The key informants were identified through village government leaders. The discussion was guided by a checklist (Appendix 5) and aimed at obtaining clarification on issues concerning community awareness on biodiversity conservation, WMA activities and their contribution to biodiversity conservation and socio-economic activities linked to WMA and their contribution to community livelihoods. These data supplemented the data collected through household questionnaire surveys.

Focused Group Discussion (FGD) involved representatives from special groups namely, environmentalists, women, pastoralists and farmers amounting to 8 people in each village. Four FGDs were conducted, and these helped to obtain information on the community awareness towards biodiversity conservation in MBOMIPA WMA, local communities participation in economic activities linked to WMA and the effects these have on their livelihood. Information on WMA activities and their contribution to biodiversity conservation were also collected. Focus group discussions were guided by a checklist.

To supplement the primary information obtained through the above-explained methods, a range of secondary data about WMA and its effects on biodiversity conservation and community livelihoods was collected from relevant documents including journal articles, books and the wildlife policy. Other documents and publications were obtained through a literature search using the Internet and the MBOMIPA WMA Office. This information was important in broadening perspectives and providing an in-depth understanding of the research topic.

3.4.0 Data Analysis

3.4.1 Qualitative Data

Qualitative data and information from the discussion with key informants and FGD were analysed through Content analysis. Content analysis is a set of methods for analysing the symbolic content of any communication to reduce the total content of communication to some sets of categories that represent some characteristics of research interests (Singleton et al. 1993). Therefore, information collected through verbal discussions with the key informants and from FGD was broken down into the smallest meaningful units of information.

3.4.2 Quantitative data

Quantitative data from household surveys were processed and analysed in the Statistical Package for Social Sciences (SPSS) version 16.0. Most of the analyses under quantitative data fall under the domain of "descriptive statistics," which were applied to determine frequencies, percentages and cross-tabulation.

The Chi-square test was used to test if there were significant differences in response about community awareness on biodiversity and WMA activities and their contribution to biodiversity conservation.

RESULTS

4.1. Economic Activities

The results in Table 1 show that the majority (82.5%) of the surveyed households were farmers followed by both farmers and livestock keepers (6.7%), petty business (5.0%), livestock keepers (1.7%), formal employees (1.7%), carpentry and masonry (1.7%) and casual labourers (0.8%).

Table 1: Main economic activities

Occupation	Frequency	Percentage
Farming	99	82.5
Livestock keeping	2	1.7
Formal employment	2	1.7
Casual labour	1	0.8
Small businesses	6	5.0
Agro-pastoralist	8	6.7
Carpentry and Masonry	2	1.7
Total	**120**	**100**

4.2 Community Awareness of Biodiversity Conservation in MBOMIPA WMA

4.2.1 Awareness of the Biodiversity Conservation

Four villages were interviewed during the study. The results in Table 2 show that 13 (add percent) respondents had very good awareness about biodiversity conservation, 42 (72.5%t) had good awareness and 32 (27.5%) had a fair awareness about biodiversity amounting to 87 (add percent) respondents among 120 respondents.. The results in Table 2 show no significant statistical difference ($P > 0.05$) among the respondents' awareness levels in the four surveyed villages. Such results imply that almost the same proportion of the respondents from each of the four surveyed villages had a similar level of awareness about the importance of biodiversity conservation.

Table 2: Awareness of biodiversity conservation

	Response (n=120)							
	Very Good		Good		Fair		Poor	
Village	n	%	n	%	n	%	n	%
Tungamalenga	7	5.8	7	5.8	5	4.2	11	9.2
Mapogoro	2	1.7	8	6.7	10	8.3	10	8.3
Kinyika	3	2.5	15	12.5	6	5.0	6	5.0
Itunundu	1	0.8	12	10.0	11	9.2	6	5.0
Total	13	0.1	42	0.4	32	0.3	33	0.3

Chi-square = 16.1, P = 0.066 * : Note * significant at 1%

4.2.2 Awareness of the Importance of Biodiversity Conservation

The results in Table 3 show that 8 (6.7) respondents reported having a very good awareness of the importance of biodiversity conservation, 61 (50.8%) reported

having good awareness and 30 (25%) reported having fair awareness making a total of 99 respondents. This implies that 82.5% of the respondents were aware of the importance of biodiversity conservation while 17.5% were not aware. On the other hand, the results in Table 3 show significant statistical differences (P= 0.046). Such results show significant variation in the respondents' awareness of the importance of biodiversity conservation among the four surveyed villages.

Table 3 Awareness of the Importance of Biodiversity Conservation

	Response (n=120)							
	Very Good		Good		Fair		Poor	
Village	n	%	n	%	n	%	n	%
Tungamalenga	5	4.2	11	9.2	9	7.5	5	4.2
Mapogoro	1	0.8	15	12.5	12	10.0	2	1.7
Kinyika	1	0.8	19	15.8	4	3.3	6	5.0
Itunundu	1	0.8	16	13.3	5	4.2	8	6.7
Total	8	6.7	61	50.8	30	25.0	21	17.5

Chi-square = 17.2, P = 0.046 **, Note: ** significant at 5%

4.2.3 Knowledge of Human Activities Contributing to Biodiversity Conservation

As for knowledge on human activities contributing to biodiversity conservation, the results in Table 4 show that 91 respondents, equals 76% of the respondents from the surveyed villages reported to have been aware of human activities contributing to biodiversity conservation while the remaining 24% were not aware. Concerning variation of awareness among the respondents from the four surveyed villages, the results in Table 4 show no statistically significant difference (P=0.690). Such results imply that knowledge of human activities contributing to biodiversity conservation among the study respondents did not differ across villages.

Table 4: Knowledge of human activities contributing to biodiversity conservation

	Response (n=120)			
Village	Very Good	Good	Fair	Poor

	n	%	n	%	n	%	n	%
Tungamalenga	1	0.8	10	8.3	11	9.2	8	6.7
Mapogoro	0	0.0	9	7.5	13	10.8	8	6.7
Kinyika	0	0.0	6	5.0	17	14.2	7	5.8
Itunundu	0	0.0	7	5.8	17	14.2	6	5.0
Total	1	0.8	32	26.7	58	48.3	29	24.2

Chi-square = 6.5, P = 0.690, Note: ns means not significant

4.2.4 Knowledge of Negative Human Activities that Threaten Biodiversity

Table 5 presents results about respondents' knowledge of negative human activities that threaten biodiversity. The results show that 5.8% respondents reported having very good knowledge of negative human activities that threaten biodiversity conservation, 36.7% reported to have good knowledge and 35.% had fair knowledge making the majority 78% of the respondents from the four surveyed villages reported to know about negative human activities threatening biodiversity conservation. On the other hand, The results in Table 5 knowledge of negative human activities threatening biodiversity conservation significantly differ across the four villages involved in the study ($P \leq 0.01$)

Table 5: Knowledge of negative human activities threatening biodiversity

	Response (n=120)							
	Very Good		Good		Fair		Poor	
Village	n	%	n	%	n	%	n	%
Tungamalenga	7	5.8	10	8.3	5	4.2	8	6.7
Mapogoro	0	0.0	16	13.3	8	6.7	6	5.0
Kinyika	0	0.0	8	6.7	15	12.5	7	5.8
Itunundu	0	0.0	10	8.3	14	11.7	6	5.0
Total	7	5.8	44	36.7	42	35.0	27	22.5

Chi-square = 31.2, P = 0.000 ***, Note: *** significant at 1%

4.2.5 Knowledge about Non-Human Drivers with Positive/Negative Influence on the Biodiversity

The results in Table 6 show that the majority (55%) of the study respondents reported having poor knowledge of non-human drivers with positive and negative influence on biodiversity conservation. The results in Table 6 show further that there is no significant statistical difference in knowledge of non-human drivers with positive and negative influence on biodiversity conservation among the respondents across the four surveyed villages.

Table 6: Knowledge about non-human drivers with positive/negative influence on the biodiversity

	Response (n=120)							
	Very Good		Good		Fair		Poor	
Village	n	%	n	%	n	%	n	%
Tungamalenga	1	0.8	4	3.3	9	7.5	16	13.3
Mapogoro	4	3.3	3	2.5	5	4.2	18	15.0
Kinyika	1	0.8	6	5.0	8	6.7	15	12.5
Itunundu	2	1.7	7	5.8	4	3.3	17	14.2
Total	8	6.7	20	16.7	26	21.7	66	55.0

Chi-square = 7.9, P = 0.542 ns Note: ns means not significant

4.3 WMA Activities and Their Contributions to Biodiversity Conservation

Four villages were interviewed during this study and the results indicated that 76.7% of the activities were on controlling poaching, 5.8% were on controlling illegal harvesting of woody products and only 17.5% of the activities were on controlling fire (Table 7).

Table 7: WMA Activities

Wma Activities in controlling	Frequency	Percent
Poaching	92	76.7
Wildlife	7	5.8
Illegal Harvest of wood products and encroachment	21	17.5
Total	120	100.0

4.3.1 Response on the Participation of Community Members in Biodiversity Conservation Activities

As for community participation in biodiversity conservation activities, the results in Table 8 show that the majority (72.5%) of the respondents participated in biodiversity conservation activities. Statistically, there was no significant difference in response between respondents from the four study villages.

Table 8: **Response on the participation in biodiversity conservation activities**

	Yes		No	
Village	Frequency	Percent	Frequency	Percent
Tungamalenga	23	19.2	7	5.8
Mapogoro	26	21.7	4	3.3
Kinyika	21	17.5	9	7.5
Itunundu	17	14.2	13	10.8
Total	87	72.5	33	27.5

Chi-square = 16.1, P = 0.067 * : Note * significant at 1%

4.3.2 Community Members" Participation in Biodiversity Conservation Activities

The results of community members' involvement in biodiversity conservation (Table 9) show the majority (63.2%) of respondents participated by reporting illegal activities such as illegal hunting, fire, encroachment, illegal harvesting of forestry resources. About16.1 percent participated through rescuing animals, 8.0 per cent were involved in tree planting, 6.9 per cent were involved in ant-poaching patrols and 5.7 per cent were involved in scaring animals (Table 9).

Table 9 How community members participate in biodiversity conservation activities

	(n = 87)	
Activity Type	**Frequency**	**Per cent**
Reporting illegal activities	55	63.2
Rescuing animals	14	16.1
Scaring wild animals	5	5.7
Tree planting	7	8.0
Ant-poaching control	6	6.9
Total	**87**	**100.0**

4.3.3 Contribution of WMA activities to Biodiversity Conservation

4.3.3.1 Poaching before WMA Implementation

The results in Table 10 on the trend of poaching before WMA implementation show 90.8% of the study respondents reported that poaching was high before WMA implementation, and only 1.7% of the respondents reported that poaching was eradicated and the rest had either observed no change or did not know anything.

Table 2: Poaching before WMA implementation

Response	Frequency	Percentage
High	109	90.8
No change	1	0.8
I don't know	8	6.7
Eradicated	2	1.7
Total	120	100

4.3.3.2 Poaching after WMA Establishment

As for the trend of poaching after WMA establishment and implementation, the results in Table 11 show that the majority (89.2%) of the respondents said that poaching was low after the establishment and implementation of the WMA in comparison to the situation before WMA implementation (Table 11).

Table 3: Poaching after WMA establishment

Response	Frequency	Percent
High	1	0.8
Low	107	89.2
No change	4	3.3
I don't know	4	3.3
Eradicated	4	3.3
Total	120	100

4.3.3.3 Illegal Off take of Woody Products, Fire Events and Encroachment before WMA Establishment

Given the illegal off-take of woody products, fire events and encroachment before the WMA establishment, the results in Table 12 show that 82.5% of the respondents reported that the illegal off-take of wood products was done at a high rate, while 49.2% reported that encroachment was at a high rate and 81.7% reported that fire event was high. In addition, the results in Table 12 show that 11.7% of the respondents reported being ignorant about the illegal off-take of forest products, 25.8% were ignorant about encroachment and 10 were ignorant about fire events.

Table 12 Illegal off-take of woody products, fire events and encroachment before WMA

	High		Low		No change		I don't know		Eradicated	
Type of Activity	n	%	n	%	n	%	n	%	n	%
Illegal off take of forest products	99	82.5	4	2.5	1	0.8	14	11.7	2	1.7
Encroachment	59	49.2	10	8.3	1	0.8	31	25.8	19	15.8
Fire events	98	81.7	4	3.3	2	1.7	12	10.0	4	3.3

4.3.3.4 Illegal Off take of Woody Products, Fire Events and Encroachment after WMA Establishment

Table 13 presents the results about Illegal off-take of woody products, fire events and encroachment after WMA implementation. The results in Table 13 show that 70% of the respondents reported that Illegal off-take of wood products was low, 41% reported that encroachment was low and 67% reported that fire event was low. The results show a positive impact of WMA implementation on biodiversity conservation. The study also revealed slight improvement in the respondents' awareness of illegal off-take of woody products, encroachment and fire events. Before WMA implementation, 13% of the respondents were not aware of illegal off-take of woody products, encroachment and fire events, this figure dropped to 11% after WMA implementation. Similarly, with regards to encroachment, the percentage

dropped from 21 to 18% and on fire events, the proportion dropped from 6 to 5 per cent.

Table 13 Illegal off-take of woody products, fire events and encroachment after WMA

	High		Low		No change		I don't know		Eradicated	
Type of Activity	n	%	n	%	n	%	n	%	n	%
Illegal off-take of forest products	**2**	**1.7**	**84**	**70**	**7**	**6**	**13**	**11**	**14**	**12**
Encroachment	**1**	**0.8**	**94**	**41**	**9**	**8**	**12**	**18**	**40**	**33**
Fire events	**1**	**0.8**	**80**	**67**	**5**	**4**	**6**	**5**	**28**	**23**

4.4 Participation of Local Communities in Economic Activities Linked to WMA and its Effects on Local Communities' Livelihoods

Table 14 presents the results on local community participation in economic activities linked to WMA and its effects on local communities' livelihood. The results in Table 14 show that the majority (93.3%) of the respondents did not participate in socio-economic activities related to MBOMIPA WMA while the minority (6.7%) participated in the economic activities linked to WMA.

Table 14: Participation of local communities in economic activities linked to WMA

	(n = 87)	
Response	**Frequency**	**Percent**
Yes	8	6.7
No	112	93.3
Total	**120**	100

DISCUSSION

5.2 Community Awareness of biodiversity Conservation

5.2.1 Awareness of the Phrase "Biodiversity Conservation"

This is the first time to assess the aspect of awareness on biodiversity to the local communities in the area. In this area, participation of local communities in conservation has helped the community to know the meaning of conservation. The study revealed that the phrase "biodiversity conservation" was well understood in the study area. The community reported that biodiversity conservation includes the protection of natural resources that surround their environment including wild animals, plants, insects and water sources Moreover, some community members were of the view that biodiversity conservation means the protection of wildlife for future generations.

Similar results are reported in a study by Jones (2001) who revealed that Etosha National Park in Kunene region in Namibia the residents enjoyed the existence of Community -based Wildlife Management and wished their children and grandchildren to be able to enjoy the same. The provision of education on biodiversity conservation has been highly successful. As such, the participation in various seminars during the establishment of MBOMIPA WMA contributed to good understanding of the phrase biodiversity conservation. Communities' awareness has been reported to be of prime importance in promoting the conservation of wildlife and in changing people's attitudes towards the effective use of wildlife resources (MNRT, 2007).

5.2.2 Knowledge of the Importance of Biodiversity Conservation

It was revealed that the majority were knowledgeable about why we conserve. They reported that conservation enables wildlife to flourish and this will enable future generations to see the wealth of the country's natural resources such as animals and forests. Also, this may attract tourists to visit the WMA resulting in the generation of foreign currency which will help to improve the national income. Similar findings are reported in a study by Bauer (2003) that a local community living close to Waza National Park in Cameroon appreciated the natural intrinsic value and agreed there is a necessity of protecting forests and their wildlife for their future generations. In addition, conservation provides them with fresh air, firewood, shade, a recreational environment, enough rainfall which would, in turn, bring good crop harvests and construction materials. Similarly, conservation helps to maintain hospitable habitats for animals and thus helping people meet their needs around the area and thus reducing the risks of being killed by poachers.

According to community members, conservation enables them to get traditional medicine from both animals and plants and sacred places for worship. A study by Nitasha (2005) reported similar results that the community enjoys conservation since it provides them with all their daily needs including food, building material, fodder, medicines and a variety of other products. Furthermore, traditional societies have

played an important role in preserving their biodiversity as part of their livelihood as well as cultural and religious beliefs.

Key Informants reported that conserving biodiversity enables the community to enjoy the beauty of the scenery, provide employment opportunities to work as local guides and village game scouts. They reported that seminars and the presence of most respondents during MBOMIPA implementation were the reasons for good understanding of why we conserve biodiversity. Similar results are reported in other studies such as Nkembi (2003) which shows that local community awareness of natural resources and their recognition of natural resources as natural heritages are important factors in promoting tolerance towards conservation.

5.2.3 Knowledge of Human Activities Favouring Biodiversity Conservation

Human activities promoting biodiversity conservation included tree planting in general land, attending meetings concerning WMA, and controlling illegal poaching. this was Perhaps well known due to their long stay in the areas and their level of participation. To attain biodiversity conservation, tree planting and retention should be done in the general land and this is essential to ensure expansion and regeneration of natural forests for the improvements of biological resource base, ecological and hydrological system (Njana, 1998; Kajembe et al., 2004a). Tree planting is important not only for economic development but also for relieving human pressure in the natural forests thereby doing away with biodiversity degradation (Mbwambo, 2000; Winfred, 2004).

5.2.4 Knowledge of Negative Human Activities Threatening Biodiversity

Threats to biodiversity come from many sources, but mostly humans (Nitasha, 2005). The study results indicate that communities in the surveyed villages were well knowledgeable of the negative human activities that threaten biodiversity. They cited activities such as poaching, deforestation, bushfire setting, fuel wood gathering, farming and free grazing. Historically, humans have always taken what they needed from the earth itself and its plant and animal species with no regard as to whether the resources being consumed were finite or otherwise (Groombridge & Jenkins, 2002).

The results from the respondents, key informants and during the focus group discussion revealed that poaching was the main human activity that threatens biodiversity although it has decreased a lot for the past few years after the WMA implementation in their areas. However, poaching especially of elephants was said to have increased and this was attributed to an increase in the demand for ivory products globally (WWF, 2014).

Deforestation has left acres of former forests bare and inhospitable to animals and plants that depended on them for food and sustenance (Gaston & Spicer,2004). The main cause of deforestation in the study area is fuel wood harvesting, since most of the respondents had no trees in the general land they were forced to collect fuel wood from the wild. A similar result is reported in a study by Woven (2006) that the main

source of energy for the people is fuel wood, which is the energy source of choice, because of its availability, affordability and ease of use. Most users harvest fuel wood from the wild; few of them buy it from the market while others collect fuel wood from their farms after burning. Fuel collection is mostly done by women who use fuel wood to prepare food and local brews whose preparation uses a lot of large logs.

Bushfire is also a negative activity. According to the respondents, the main source of bushfire is poachers, honey harvesters or farmers who set for clearing vegetation on land for cultivation. Whereas poachers set fire to conceal their footprints from being tracked by game scouts, and honey harvesters set fire to drive away bees from their hives.

Communities are also encroaching conserved areas due to a lack of security and a shortage of land for cultivation. For example, in Mbolimboli village, at MBOMIPA, farmers encroached on the area and are carrying out agricultural activities. Also, a study by Lalika (2006) cited farming as the main problem against biodiversity conservation since people are clearing forests to get areas for cultivation. Similarly, a study by Monela (1995) and Kiwale (2002) report that the loss of biodiversity is attributed to human economic activities, specifically the conversion of forest land for farming purposes.

5.2.5 Knowledge of Non-Human Drivers with Positive/Negative Influence on the Biodiversity

Study results showed that a few respondents were knowledgeable about non-human drivers that can have a positive or negative influence on biodiversity. Heavy rainfall, floods and drought are non-human activities that can affect biodiversity either positively or negatively. Poaching, deforestation, burning of forests and agricultural activities close to water sources were taught as the main factors that damage natural resources. These results imply that more seminars are needed to enable people to become aware of the activities that are not environmentally friendly, and which not only cause the extinction of animals, forests or drying of water sources but which can also lead to climate change that can be harmful to animals, forests and people as well.

5.3 WMA Activities and their Contributions to the Biodiversity Conservation

controlling poaching was reported as the main activity of the WMA because an effective and sustainable wildlife management system under Community authority was the responsibility of the MBOMIPA WMA.

in addition to controlling poaching, the WMA was dealing with other illegal activities inside and around the WMA.

5.3.1Response on Participation of Community Members in Biodiversity Conservation Activities

Education and sensitisation about the responsibilities, rights and expected return assure the full participation of the people in conservation. The majority of community members participated in biodiversity conservation activities as the result of knowing that conservation is the responsibility of all and not only village game scouts and WMA leaders.

A study by John (2010) at Wami-Mbiki WMA also shows that the majority of community members did not participate in conservation activities due to lack of awareness of WMA, the belief that the area belonged to foreigners, communication gap among villagers, village leaders and WMS leaders, and the belief that conservation is the responsibility of VNRCs, VGS and WMA leaders.

5.3.2 Community Members' Participation in Biodiversity Conservation Activities

Reporting illegal activities to the Village Game Scout (VGS), Village Natural Resource Committee (VNRC) and leading WMA were among the domains the communities participated in biodiversity conservation in the study villages. According to Key Informants, although people participated by providing information on illegal activities, the number of people reporting such cases was decreasing with time. in addition, people were not ready to reveal poachers for fear of losing their lives as no one could show interest in protecting them after giving such information. Strange as it may seem, leaders were said to have no secret, they could tell poachers who gave them such information, and eventually, the lives of volunteers reporters were put at risk just because of lack of confidentiality.

rescuing animals by revealing their presence in villages or out of the conservation areas was another means by which community members participated in Biodiversity Conservation. Communities also participated through scaring animals by making noises (shouting), climbing on the house roofs and beating iron sheets, lighting fires, especially in agriculture areas where many animals follow crops, throwing pieces of burning wood and using watchdogs. This finding is supported by Belt, (2005) who reported that communities mainly chased animals away and made noises (shouting), drumming, lighting fires (sometimes using kerosene and diesel), throwing pieces of burning wood, throwing stones and sticks at the animals and using alarm dogs.

Again, it was discovered that following the wood in the forest is not only disruptive to and damaging the environment, it is also dangerous for the lives of community members because they can be attacked by dangerous animals such as lions, buffalos and elephants. Therefore, planting their trees is believed to be a way of meeting the demand for forest resources from the trees they planted.

5.3.3 Contributions of WMA Activities to Biodiversity Conservation

5.3.3.1 Poaching Before WMA Implementation

During this study, it was observed that before the commencement of the WMA poaching was high. The exclusion of local people in conservation activities and lack of conservation education were the main reasons for an increase in illegal activities before the MBOMIPA WMA implementation. According to George (2002), lack of conservation awareness and legal access to natural resources result in low community participation and a negative attitude towards wildlife. Communities were also not benefitting from the available resources thus, they did not see to the rationale of conserving biodiversity. In addition, park rangers were few thus they could not move around in all the areas of the park, thus there were no law enforcement agents, revenge killing of large carnivores after livestock loss or crop damage was a way of minimising human-wildlife conflicts.

In this respect, people did not feel that natural resources were theirs but belonged to TANAPA and foreigners, hence there was non-participation in biodiversity conservation. thus people thought destroying the available natural resources equals causing loss to TANAPA.

Similarly, a study by John (2010) at Wami-mbiki WMA showed that community members were not participating in wildlife conservation due to the belief that the area belonged to foreigners. Furthermore, people were involved in poaching to get meat and raise income through selling animal products.

Finally, Gandiwa (2011) reported that the need for bushmeat as a source of protein and alleviating poverty was the main reason for residents to engage in illegal hunting of wild animals. Generating money from the commercial sale of animal products was cited as another major reason for illegal hunting in the Gonarezhou ecosystem.

5.3.3.2 Poaching After WMA Establishment

Huge efforts have been made in Tanzania including communities' involvement because it was realised that to have successful conservation the concerned community needed to be part of the conservation and enjoy the benefits associated with conservation. The study results show that community participation, conservation education and associated benefits from the MBOMIPA project helped a lot to decrease poaching. Making villagers part of conservation also helped in controlling poaching. Participation makes the community members feel part of the resources and thus feel responsible for protecting them. Conservation education also helps community members to recognise the importance of conservation and realise the benefits obtained from conservation. Similar results are reported in a study by Gandiwa (2011) which revealed that conservation awareness, education under the CAMPFIRE programme and associated benefits such as cash dividends and bush meat helped in decreasing illegal activities.

Community members are also no longer engaged in poaching for fear of the law and penalties given for breaking the rules. In addition, an increase in security also helps

to reduce illegal activities; currently, there are game scouts in each village who are engaged in patrols, before the commencement of WMA security depended on park rangers who were few and unable to conduct patrol in all the areas surrounding the park. Similar findings are reported in a study by Gandiwa (2011) who cited poachers' fear of being arrested or imprisoned due to strengthened law enforcement as the main reasons for the decline in illegal hunting in the Gonarezhou ecosystem.

Illegal activities especially poaching is mostly done during rainfall period when infrastructure especially roads are impassable and lack of resources among game scouts to conduct patrol in all areas to counter poachers who were well equipped.

similarly, during these periods, forests become heavy making it difficult for the game scouts to see poachers.

Furthermore, lack of insurance and compensation to VGSs once injured while on patrol was a limiting factor for game scouts to play their role effectively. This caused a hot discussion because WMA did not take care of them, at least by paying their hospital bills. According to Songorwa (1999b) in SCP, a VGS was injured while on patrol and his injury became a burden only to his family. In that case, VGS members are not ready to go for patrol during dangerous periods.

Although poaching is high during the rainy season it is also common during the dry season because during this time the roads are passable, thus it is easy to spot animals for hunting. This is also the time the villagers are already done with their agricultural activities so they do not have other activities to do for income generation, they, therefore, opt for poaching. Communities are engaging either directly or through supporting the poachers who come out of their villages. Weapons used by poachers are guns, bows, arrows, poison, wire, spears, nests and dogs.

This finding is supported by findings in a study by Gandiwa (2011) who reported that common hunting methods used both inside the Gonarezhou National Park and adjacent areas were snaring, hunting with dogs, bow, arrows poisoning, firearms, nets and wildfires.

Besides, there has been a continuous decrease in poaching in recent years since 2013, particularly of elephants as shown in Appendix 1. This is attributed to a decrease in the demand for ivory in the world market, the high price of these products and also the participation of leaders and influential people in fighting against the ivory business.

Participation of the community in conservation is not only benefiting the local community but also helps in the recovery of the wildlife population. This is consistent with the findings in other studies conducted in different parts of Africa. For example, the contribution of Community -based Natural resource Management (CBNRM) to the recovery of wildlife populations across large parts of northern

Namibia including endangered species such as black rhino, elephants and Hartmann's zebra is well documented. According to the Namibia Association of CBNRM Support Organisation (NACSO, 2004), the general trend for all these species over the past 15 years or more has been an upward increase. The number of elephants in north-western Namibia is increasing and elephants are expanding their range in both northwest and northeast (Jones, 2004). There is consensus that without community commitment to conservation, species such as the black rhino would not survive and be increasing on communal lands as they are at present (Durbin, Jones & Murphree, 1997).

5.3.3.3 Illegal Off take of Woody Products, Fire Events and Encroachment before WMA Establishment

Although the main activity of WMA is fighting against poaching, WMA also deals with all illegal activities within the PA. The high rate of illegal activities was due to the absence of law enforcement, lack of clear boundaries between the PA and villages and lack of knowledge on the effects of environmental degradation due to lack of conservation education.

5.3.3.4 Illegal Off take of Woody Products, Fire Events and Encroachment after WMA Establishment

It was learnt during this study that illegal activities had decreased at a high rate after the establishment of the WMA due to an increase in people's understanding of the importance of preserving the forests and the negative impacts if they continued destroying them. Key informants reported that people understanding the impact of deforestation was not the only reason for not cutting down the trees, but also because many forests were harvested at the time when there was no proper management of natural resources, so the large trees that could provide wood and logs were no longer available.

Encroachment of PAs is almost over if you compare it with what was observed before. However key informants reported that this problem was almost over in some villages, especially at Idodi, but in Pawaga Division it was still a problem due to conflicts between farmers and herders, caused by the existing land conflicts making people invade the PAs and carry out farming activities. Fire incidents especially caused by poachers were reported to have decreased; most alarmingly reported fire incidents are nowadays are caused by farmers who fail to control them during farmland preparation. Before the WMA, the rate of poaching was high and this was also causing frequent occurrences of fire incidents whereby poachers were setting fires so that they could lose evidence of footprints. Additionally, some poachers were engaged in honey harvesting and would therefore set fires to drive away bees. A similar finding is reported in a study by Mugisha (2002) who revealed that the benefits obtained from conservation lead to the reduction of encroachment and of incidences of fire.

5.4 Participation of Local Communities in Socio-Economic activities Linked to the WMA and its Effects on Local Communities' Livelihoods

The study results show that since the main source of income in the surveyed villages was agriculture, a few people are involved in socio-activities linked to the WMA. It was also observed that low level of education, lack of capital to conduct these activities, absence of workshops to motivate people to involve themselves in such activities and distance of villages from the park were among the reasons why the community members were not engaged in socio-economic activities linked to the WMA.

The people involved were from only one village of Tungamalenga. This village is situated very close to the park 15 km from the park gate. The village has the least tourist infrastructures such as hotels and campsites compared to other villages.

The activities carried out include selling toys, camping, cultural dance, and local guide services. People who are engaged in these activities reported that there was no significant difference in the income before or after the introduction of MBOMIPA because tourism activities at MBOMIPA were not acknowledged, so it was not easy to get customers, especially during the low season. This situation discouraged people from engaging in WMA socio-economic activities which were thought of as a wastage of time.

In addition, some traditional dance groups were reported to have gone moribund because of low tourist activities. Again, a snake park was also closed due to a lack of customers. Key informants reported that if photographic tourism was put into operation at MBOMIPA these activities would bring benefits and villagers would see it as an employment opportunity.

Although the WMA socio-economic activity has no direct impact on the community livelihoods, MBOMIPA helped them through a revenue-sharing scheme as shown in Appendix 2. These revenues help the community in social services development such as building school classrooms, toilets, teachers' houses, clinics, water services and other infrastructures. Other benefits are paying for school fees for orphans as shown in Appendix 3. The dividends from the funds also helped to reduce the cost of service sharing. Before MBOMIPA, community members were required to contribute money, labour force and building materials for social development, but now they are contributing less money. Besides benefits offered by MBOMIPA, other important stakeholders such as TANAPA, WWF and several other community based conservation societies contribute significantly in support livelihoods among communities in the villages..

These results are similar to the results reported in a study by Karidozo, (2007) who revealed that the administrative management design for game management (ADMADE) programme in Zambia has been funding different development projects such as building classrooms, houses for teachers, clinics, shelters for hammer mills

used to grind maize, village shops and provided capital for cottage industries. The programme also trains village game scouts in order to reduce poaching and expand the scope of local communities' involvement in wildlife conservation. Similarly, Mathew (2013) in a study conducted at Mbarangadu WMA, Songambele village found that the main direct positive impact of the WMAis that the local people at the community level benefited through revenue sharing schemes. It is through the shared revenues that the community constructed Korido Secondary School classrooms and built an office for teachers, toilets for students and four houses for teachers. Other benefits are in the form of the sponsorship from the tourism investor to orphans to school and training of village game scouts who are employed in the anti-poaching unit in the WMA in question.

CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

Unlike other studies in the same and other areas where communities indicated receiving less benefits from WMA (Mariki, 2017; Kimango et al,m, 2018), this study revealed that the success of biodiversity (wildlife) conservation largely depends on the participation of local communities in conservation activities. This study revealed that the participation of local communities living adjacent to MBOMIPA WMA contributed to biodiversity conservation. It was revealed that illegal activities have been reduced compared to before the MBOMIPA implementation. The involvement of communities in conservation activities made them feel part of the resources and realise that conservation is their responsibility. This made them participate in different ways such as being village game scouts, reporting illegal activities, rescuing animals, scaring animals, tree planting and anti-poaching patrol. Thus, the involvement of the community from the planning, implementation and evaluation phases reflects genuine participation of the stakeholders in pursuing conservation activities.

The study also found that communities were benefiting both directly and indirectly from MBOMIPA WMA. They were benefiting through revenue obtained from investors and this revenue has been used for village development activities that the village has been using these funds for the construction of school facilities such as classrooms, toilets and health facilities. Sometimes the funds were used to support orphans to study in secondary schools. Also, few local people have directly benefited through access to employment in the WMA as village game scouts whereby three local people were recruited from each village. The study recommends regular involvement in the planning and intervention issues. Focus should be directed towards agriculture, pastoralims and tourism investment may form a key platform to livelihood improvement and strengthening. Interventions in the form of making sure that revenue from investors is used for agricultural development to counteract poor food security, supporting some non-land-intensive agricultural options such as poultry, horticulture or beekeeping.

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Appendix 1: The number of poachers arrested by year 2007 to 2013

Year	Number	Poaching type
2007	16	Giraffe, lesser kudu, dikdik, and impala
2008	5	Giraffe, lesser kudu, dikdik,
2009	none	None
2010	11	Warthog, impala, dikdik, lesser kudu
2011	6	Elephant 3, lesser kudu , and hyena
2012	3	Elephant 2
2013	2	Elephant 10

Source: Community wildlife conservation MbomipaJune, 2014

Appendix 2: Distribution of income for 21 village members

2007/2008	2008/2009	2009/2010	2010/2011	2011/2012	2012/2013
147,333,052	125,130,253	182,596,240	16,800,000	148,374,777	28,000,000

Source: Mbomipa Wildlife Management area June 2014

Appendix 3: Payment of fees for orphans pupils at idodi , pawaga and mlowa secondary from 2008-2011.

Year	School	Amount	Purpose
2008/2011	IDODI SECONDARY	10,612,000	FEES AND HOSTELI
2008/2011	PAWAGA SECONDARY	11,136,000	FEES AND HOSTEL
2008/2011	MLOWA SECONDARY	1,312,500	FEES AND CONTRIBUTION

Source: Mbomipa Wildlife Management area 2011

APPENDICES

Appendix 4: HOUSEHOLD SURVEY QUESTIONNAIRE

A: General Information

Questionnaire No…….....Name of Respondent.....

Date of interview.....Village.....

Division.....Ward.....

.....

District.....Region.....

.....

B Personal Details

1. **Sex** (1) Male (2) Female
2. **Age** (1) 18-30 (2) 31-50 (3) 51-60 (4) above 60
3. **Marital status** (1) Single (2) Married (3) Divorced (4) Widow/widower (5) Separated
4. **Relation to household** (1) Head (2) Spouse (3) Brother/sister (4) Child (5) Grandchild (6) in-law (7) other (specify)

5. Place of origin/birth

(1) In this village

(2) Out of this village

6. Level of education
(1) Non formal (2) Adult education classes (3) Basic primary
(4) Secondary (form 1-4/5-6)
(5) Vocational training
(6) College (Diploma/Certificate)
(7) University (first degree/second degree/third degree)

7. Occupation
(1) Peasant/farmer (2) Livestock keeper/pastoralist
(3) Formal Employment (4) Casual labour/worker
(5) Small business (6) Agro-pastoralist (7) other specify

C. Community Awareness towards biodiversity conservation

8. Knowledge on the term biodiversity conservation (What do you understand by the term "Biodiversity conservation'?) 1) Very good 2) Good 3) Fair 4) Poor

9. **Knowledge on the importance of conserving biodiversity (**Why do we conserve biodiversity?) 1) Very good 2) Good 3) Fair 4) Poor

10. **Knowledge on human activities that contribute to biodiversity conservation (**What human activities enhances biodiversity conservation?)
1) Very good 2) Good 3) Fair 4) Poor

11. **Knowledge on human activities that threaten biodiversity conservation (**What human activities are likely to threaten biodiversity?)
1) Very good 2) Good 3) Fair 4) Poor

12. Knowledge on non-human drivers with positive/negative effect on biodiversity (What non-human activities may affect (positively/negatively) biodiversity?)
1) Very good 2) Good 3) Fair 4) Poor

D.WMA activities and their contribution to Biodiversity conservation

13. What are the WMA activities?
1) Tree planting
(2) Controlling poaching
(3) Controlling wild fire
4) Attending meeting concerning WMA
(4)Controlling illegal harvesting of forestry resources and encroachment
(5) Tradition dances
(6) Others, specify……

14.Do your village members participate in biodiversity conservation activities?
- **i. Yes**
- **ii. No**

15. How do your village members participate in the biodiversity conservation activities?

(1) Reporting illegal activities (illegal hunting, fire, encroachment, illegal harvesting of forestry resources) (2) rescuing animals 3) scaring wild animals 4) Tree planting 5) anti-poaching patrols 6) Others, specify …….....

16. What can you say about poaching before WMA implementation?

i) High ii) Low 3) no changes iv) I don't know v)Eradicated

17. What can you say about poaching after WMA implementation?

i) High ii) Low iii) no change iv)I don't know v)Eradicated

18. What can you say about illegal off take of woody products before WMA implementation?

i) High ii) Low 3) no changesiv) I don't know v)Eradicated

19. What can you say about illegal off take of woody products after WMA implementation?

i) High ii) Low iii) no change iv)I don't know v)Eradicated

20. What can you say about encroachment before WMA implementation?

i) High ii) Low iii) no change iv)I don't know v)Eradicated

21. What can you say about encroachment after WMA implementation?

i) High ii) Low iii) no change iv)I don't know v)Eradicated

22. What can you say about fire events before WMA implementation?

i) High ii) Low iii) no change iv)I don't know v)Eradicated

23. What can you say about fire event after WMA implementation?

i) High ii) Low iii) no change iv)I don't know v)Eradicated

E. Household socio-economic activities and its effect on the livelihood

24. Do you undertake socio-economic activities linked to Wma?

i. Yes
ii. No

25 What socio-economic activities linked to the WMA activities do you undertake for a living?

1)
2)
3)
4)
5)

26. What has been your average annual income before the WMA?

27. What is your average annual income after the WMA?

28. What other non-cash benefits is your household experiencing?

1) Improved road 2) improved medical services 3) Provision of school/provision of facilities 4) Provision/improvement of water service 5) reduced conflicts over natural resources 6) Others, specify……..

Appendix 5

<u>Guide question for focus group discussion</u>

Name of the village.....

Name of the Group …….....

Date…….....

<u>A. Community Awareness towards biodiversity conservation</u>

1. Knowledge on the term biodiversity conservation (What do you understand by the term "Biodiversity conservation'

2. Knowledge on the importance of conserving biodiversity (Why do we conserve biodiversity?)

3.Knowledge on human activities that contribute to biodiversity conservation (What human activities enhances biodiversity conservation?)

4. Knowledge on human activities that threaten biodiversity conservation (What human activities are likely to threaten biodiversity?)

5. Knowledge on non-human drivers with positive/negative effect on biodiversity (What non-human activities may affect (positively/negatively) biodiversity?)

B.WMA activities and their contribution to Biodiversity conservation

6. What are the WMA activities?

7. How do your village members participate in the biodiversity conservation activities?

8. What can you say about poaching/illegal off take before WMA implementation?
9. What can you say about poaching/illegal after WMA implementation?
10. What can you say about illegal off take of woody products before WMA implementation?
11. What can you say about illegal off take of woody products after WMA implementation?
12. What can you say about encroachment before WMA implementation?
13. What can you say about encroachment after WMA implementation?
14. What can you say about fire events before WMA implementation?
15. What can you say about fire event after WMA implementation?

C. Household socio-economic activities and its effect on the livelihood
16. What socio-economic activities linked to the WMA activities do you undertake for a living?
17. What other non-cash benefits is your household experiencing?

Appendix 6
Guide question for focus group discussion

Name of the village.....
Name of the Group …….....
Date…….....
A. Community Awareness towards biodiversity conservation
1. Knowledge on the term biodiversity conservation (What do you understand by the term "Biodiversity conservation'
2. Knowledge on the importance of conserving biodiversity (Why do we conserve biodiversity?)

3.Knowledge on human activities that contribute to biodiversity conservation (What human activities enhances biodiversity conservation?)
4. Knowledge on human activities that threaten biodiversity conservation (What human activities are likely to threaten biodiversity?)

5. Knowledge on non-human drivers with positive/negative effect on biodiversity (What non-human activities may affect (positively/negatively) biodiversity?)

B.WMA activities and their contribution to Biodiversity conservation
6. What are the WMA activities?
7. How do your village members participate in the biodiversity conservation activities?
8. What can you say about poaching before WMA implementation?
9. What can you say about poaching after WMA implementation?
10. What can you say about illegal off take of woody products before WMA implementation?

11. What can you say about illegal off take of woody products after WMA implementation?
12. What can you say about encroachment before WMA implementation?
13. What can you say about encroachment after WMA implementation?
14. What can you say about fire incidentsbefore WMA implementation?
15. What can you say about fire incidentsafter WMA implementation?

C. Household socio-economic activities and theireffects on the livelihood

16. What socio-economic activities linked to the WMA activities do you undertake for a living?
17. What other non-cash benefits is your household experiencing?