IMPLICATIONS OF WILDLIFE MANAGEMENT AREAS IN BIODIVERSITY CONSERVATION AND COMMUNITY LIVELIHOODS: A CASE OF MBOMIPA WILDLIFE MANAGEMENT AREA IN IRINGA, TANZANIA

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A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN MANAGEMENT OF NATURAL RESOURCES FOR SUSTAINABLE AGRICULTURE OF SOKOINE UNIVERSITY OF AGRICULTURE. MOROGORO, TANZANIA.

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ABSTRACT

This study was conducted to assess the role of MBOMIPA, Wildlife Management Area (WMA) in biodiversity conservation and its contribution to local communities' livelihoods in surrounding villages. The study was conducted between November 2014 and January 2015 in Iringa District, in four villages of Tungamalenga, Mapogoro (in Idodi Division), Itunundu and Kinyika (in Pawaga Division). Data were collected through questionnaire survey, key informant interviews and focus group discussions. The analysis of the data was done by quantitative and qualitative approaches. In qualitative analysis data were transcribed, manually sorted and analysed through content analysis while in quantitative analysis data were processed and analysed using Statistical Package for Social Sciences (SPSS) version 16.0.Results showed that there was significant difference on responses towards community awareness on biodiversity and WMA activities and their contribution to biodiversity conservation(Chi square; $p<0.05$) whereby the majority of the respondents were aware of the biodiversity conservation. This asserts that MBOMIPA WMA contributes significantly towards biodiversity conservation manifested in the reduction of a number of illegal activities such as poaching, fire events, illegal off take of woody products and encroachment and also low numbers of poachers arrested. The study further establishes that majority of respondents were participating in conservation activities through reporting illegal activities, rescuing animal, scaring animal, tree planting and anti-poaching control. Furthermore, the study establishes that, communities were benefiting from MBOMIPA WMA despite the fact that majority of respondents were not depending on activities linked to the WMA as their main source of income instead agriculture was the mainstay of their living. They were benefiting through revenue obtained from investors and also through employment. Study concludes that it is important to have proper planning of all activities at WMA so that they complement with local community livelihoods' activities to impact on

conservation activities. Finally, the study recommends a need on expanding the WMA area since the existing initiatives have shown some good prospects of biodiversity conservation.

DECLARATION

I, Janeth Mdete, do hereby declare to the Senate of Sokoine University of Agriculture, that this dissertation is my own original work done in the period of registration and that it has neither been submitted nor being concurrently submitted in any other institution.

_____ _____

Janeth Mdete Date

(MSc. MNRSA)

The declaration is hereby confirmed by:

_____ _____

Dr. Mbije, N.E Date

(Supervisor)

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LIST OF ABBREVIATIONS AND ACRONOMYS

AA	Authorised Association
ADMADE	Administrative Management Design for Game Management Areas
CAMPFIRE	Communal Areas Management Program for Indigenous Resources
CBFM	Community –based Forest Management
CBNRM	Community -based Natural Resource Management
CBWM	Community-based Wildlife Management
FAO	Food and Agriculture Organisation
FGD	Focus Group Discussion
GMP	General Management Plan
IUCN	International Union for Conservation of Nature
JFM	Joint Forest Management
LMGCA	Lunda-mkwambi Game Controlled Areas
MBOMIPA	*Matumizi Bora ya Malihai Idodi na Pawaga*
MNRT	Ministry of Natural Resources and Tourism
NACSO	Namibia Association of CBNRM Support Organisation
NBS	National Bureau of Statistics
OECD	Organisation for Economic Co-operation and Development
PA	Protected Area
PFM	Participation Forest Management
SCP	Selous Conservation Programme
SLA	Sustainable Livelihood Approach

SMUWC	Sustainable Management of the Usangu Wetlands and the Catchment
SPSS	Statistical Package for Social Sciences
SUA	Sokoine University of Agriculture
TANAPA	Tanzania National Parks
URT	United Republic of Tanzania
USAID	United States Agency for International Development
VGS	Village Game Scout
VNRC	Village Natural Resource Committee
WCED	World Commission on Environment and Development
WCS	Wildlife Conservation Society
WD	Wildlife Division
WMA	Wildlife Management Area
WRI	World Resource Institute
WWF	World Wide Fund for Nature

CHAPTER ONE

1.0 INTRODUCTION OF THE STUDY

1.1 Background Information

Biodiversity is the variety of life on earth and includes variation at all levels of biological organization from genes to species to ecosystems (Gaston and Spicer 2004). Furthermore, depending on specific management or policy goals, biodiversity may be used to express the relative abundance of species, age, structure of populations, pattern of communities in a region, changes in community composition and structure over time and even such ecological processes such as predation, parasitism and mutualism (WRI, 1992). Biodiversity contributes in many aspects of people's livelihoods and wellbeing. In general, ecosystem provides service such as water, timber and non- timber forest products (NTFPs) while also regulating climate and supplying opportunity for recreational and spiritual benefits (Bonavick *et al*., 2010). In this context, human societies have for long time been depending on biodiversity for cultural identity, spirituality, inspiration, aesthetic enjoyment and recreation (UNEP, 2006).

Despite its importance, biodiversity is facing continued decline due to a variety of natural and anthropogenic instigations. Habitat loss has emerged as the most severe threat to the integrity of biodiversity worldwide (Brooks *et al*., 2002b; IUCN, 2004). The culprits responsible for the world-wide observed habitat loss are practices such as overgrazing, deforestation, bush fires, mining, urbanization and cultivation (Kideghesho, 2007). These anthropogenic actions have caused huge losses in biodiversity, including the disruption of ecosystem processes, species extinction and the eroding of genetic diversity within species. These are compounded by the rapid human population growth and the associated poverty. In many cases, species are globally being over-hunted for food, traditional medicine, ornaments, skins and even sport (OECD, 2001).

This is caused by existence of huge demand for these natural resources in many parts of the world. The anthropogenic impacts are intensified by major natural disturbances such as unexpected heavy downpours, storms, gusty winds and prolonged dry spells together brought about by the global climate changes (IUCN, 2013). The observed extinction of plant and animal species is an irreparable loss with potentially serious environmental and economic consequences for developing and developed countries (IUCN, 2013). With more than 7 billion people occupying earth's surface compared to 2.5 billion in 1950s, the unprecedented increase is bound to decimate biodiversity thus complicating poverty alleviation strategies across the globe, though much so in developing world.

The rate at which natural resources continue to be degraded and the continued deterioration of human welfare in developing countries have been a concern at local, national, and international levels. This is based on the fact that it is threatened in many parts of the world (Johnson, 1995). One of the approaches to conserve the rapidly dwindling biodiversity under the constraints of limited funding has been through designation of protected areas (PAs) in identified biodiversity "hotspots" (Myres *et al.* 2000; Bruner *et al.,* 2001). In response to this, in Tanzania several sectoral initiatives have been established and implemented including Joint Forest Management (JFM), Participating Forest Management (PFM), Community Based Forest Management (CBFM) and WMAs.

The introduction of WMAs in 2003 as a new category of protected area management aimed at improving management, regulate use of wildlife resources as well as devolution of wildlife user rights to communities and sharing of benefits derived from wildlife uses and resources. The Wildlife Management Areas are areas set aside by village governments to enable local communities to benefit from wildlife resources and at the same time conserve these areas which are crucial as wildlife migratory routes and/or dispersal areas.Under this

category (i.e. WMAs), rural communities are allowed to establish WMAs, defined in the policy as "an area declared by the Minister to be so and set aside by village governments for the purpose of biological natural resource conservation" (MNRT, 1998). Communities may lease trophy hunting or game viewing concessions to tourist outfitters or they may engage in hunting for food. Shekhar (2003) asserts that benefits from tourism have motivated communities to be more positive towards biodiversity (wildlife) conservation. However, a strong enabling legislation for the new Wildlife Policy of 2007 is needed to ensure that communities exploit on WMAs opportunities. This policy, however, retains state ownership and control of wildlife resources (MNRT, 1998).

1.2 Problem Statement and Justification

The Wildlife Policy of Tanzania (MNRT, 2007) recognises local communities as key stakeholders in the efforts to conserve wildlife and their habitats. This was due to the fact that existed protected areas network was insufficient to accommodate diverse Tanzania's (Paulo, 2010). In recognition of that, the country implemented Community- based wildlife management (CBWM) in early 2000s. In this context the government decided to devolve management responsibility of those areas to village communities (MNRT, 2007). This gave local communities powers, responsibility and rights for wildlife management on village lands so that they can benefit and value wildlife as a form of land use. Furthermore, The Wildlife Policy of 2007 recognises WMA as a new wildlife Protected area category that seeks to conserve biodiversity (wildlife) through involvement of local communities.

Although the main objective of WMA is biodiversity conservation (wildlife) through community participation, WMA initiative still has been facing numerous challenges on its operations. The study conducted by Kaswamila (2012) revealed that, lack of transparency in revenue uses, slack contracts, non-empowerment of local communities in decision-making,

low comunity participation and absence of regulations and implementation strategies to operationalize the new 2009 Wildlife Act, among others, were the main challenges facing WMAs. Low comunity participation is the most serious challenge in the general operation of WMAs. This results from a number of reasons including ownership of available resources (wildlife) not clear, the notion that the area belongs to foreigners, belief that management is the responsibility of Villages Natural Resource Committees (VNRCs) and conservation activities are also not well articulated (John, 2010). Consequently, Lack of community awareness and communication gap have often been seen as a major reason for low participation in many initiatives despite having good intention (Eylers and Forster 1998).

Located in Idodi and Pawaga divisions, MBOMIPA originated from MBOMIPA project that developed out of the Ruaha Ecosystem Wildlife Management Project (REWMP). The objectives was to establish an effective and sustainable wildlife management system under community authority and responsibility and to promote sustainable management of biodiversity as a means of enhancing local economic development and contributing to the reduction of poverty in the member villages. Like in many similar initiatives across the country, MBOMIPA is facing a number of challenges include inadequate financial resources, unavailability of appropriate and qualified staff, lack of resources such weapons and conflicts. Of the conflicts, human wildlife related is serious challenge in the area. Despite provision of WMA management to the community, still there exist many problems which jeopardise biodiversity. Consequently, while effort to resolve some of these challenges are being redesigned on regular basis, much remain unknown on implication of WMAs in Biodiversity conservation and community livelihood in MBOMIPA WMA. Although at the local level there has been some studies conducted in MBOMIPA WMA focusing on assessing pastoralists' attitude towards wildlife management especially large

carnivores (Dickman, 2005), Human- Wildlife conflicts particularly large carnivore and assessment of benefits sharing (Dickman, 2008; Sosovele, 2004) little has been done in MBOMIPA WMA on implication of WMA in biodiversity conservation and community livelihood. This study therefore contributed to the filling of this knowledge gap.

1.3 Study Objectives

1.3.1 Main objective

The main objective of this study was to assess the role of MBOMIPA WMA in biodiversity conservation and its contribution to local communities' livelihoods in the area.

1.3.2 Specific objectives

i. To assess the community awareness about the biodiversity conservation in MBOMIPA WMA.
ii. To determine WMA activities and assess their contributions to biodiversity conservation.
iii. To examine the participation of local communities in economic activities linked to WMA and assess its effects on local communities' livelihoods.

Research questions

i. Are the communities aware about the biodiversity conservation in MBOMIPA WMA?
ii. What are WMA activities and their contributions to biodiversity conservation?
iii. To what extent do local communities participate in economic activities linked to WMA and what are the effects to communities' livelihoods?

1.4 Conceptual Framework

The conceptual framework prevents fragmentation of knowledge into diverse segments of unconnected statements. According to Katani (1999), conceptual framework binds facts together and provides guidance towards collection of realistic data or information. The conceptual framework of this study is centred on Sustainable Livelihoods Approach (SLA), Sustainable wildlife management and Biodiversity and Livelihood outcomes. The framework comprises of development targets, transforming assets and biodiversity and livelihoods outcomes. Development targets in this context include sustainable livelihoods and sustainable wildlife management.

As a matter of fact, sustainable livelihoods targets are WMA to reduce poverty through income generating projects, social service improvement, reduce financial contribution to community development projects and also to achieve sustainable natural resource management through conflict resolution mechanism. Besides, sustainable wildlife management targets include WMA imparting appropriate knowledge to the villagers on natural resources management (conservation education), community participation by participating in conservation activities.

In addition, the conceptual framework shows that transforming assets, mainly processes and structures are key components in attaining sustainable livelihoods and natural wildlife management. According to the framework, transforming processes include laws, policies, regulations, institutions and technology; while transforming structures characterising mainly governance issues, such as cultural values, local government, donors, and park**.** The framework helped in assessing development goals and targets, development channels and outcomes of the MBOMIPA WMA.

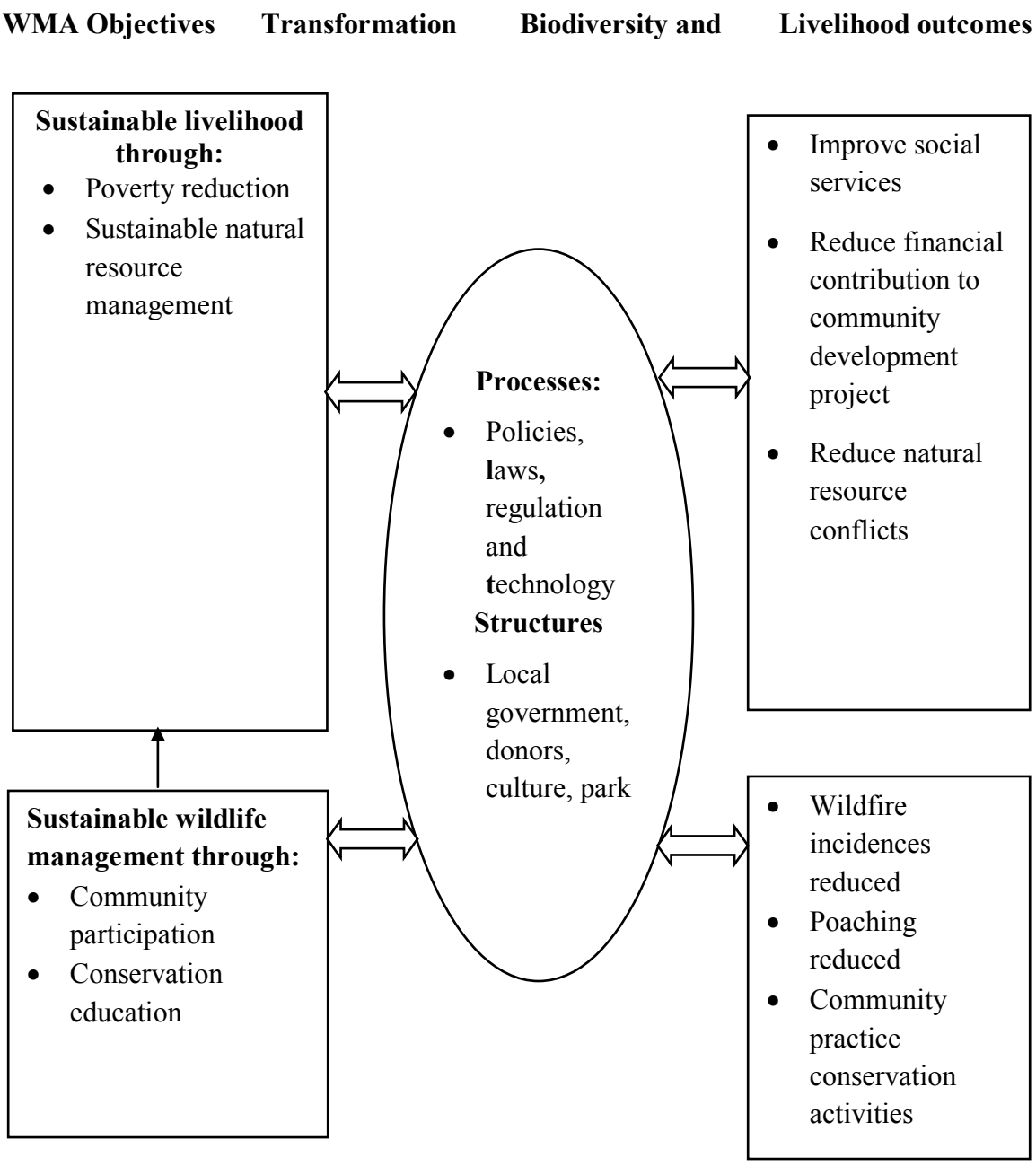

Figure 1: Conceptual framework

1.5 Limitations of the Study

"Any study normally has some limitations. This particular study had two limitations as explained below."

1.5.1 Lack of Cooperation from Respondents

Giving information needs motivation of some sort. However, some household respondents were not willing to give information through the interview method because they thought this study would not change the situation and they would not benefit from answering the researcher's questions. This gap of information was nevertheless supplemented through the discussion with key informants and focus group discussion.

1.5.2 Communication barriers

During the study communication barrier was experienced whereby some respondents in the study area were using their ethnic languages the Hehe and Maasai which compelled researcher to find a translator and interpreter to turn questions from Swahili into their respective languages and vice versa.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Colonial and Post-Colonial Analysis of Biodiversity (Wildlife) Conservation

2.1.1 Colonial Analysis of Biodiversity (Wildlife) Conservation

The history of wildlife conservation in Tanzania goes back to 1891 when colonial laws controlled the use and management of wildlife resources. When colonial governments were established in Africa, they placed the control and management of all wildlife and the lands on which they existed under state ownership. Introduction of the new management structures by colonial regime under 'fences and fines' conservation approach, (relocate, prohibit and exclude local communities to access the resources they formerly had right over) caused conflicts and local resentment towards conservation policies (Mugisha, 2002). Due to this top-down approach to conservation, integration of wildlife conservation into rural development was not a priority.

Despite of the conflicts and various problems, post-colonial governments continued to embrace and carry on colonial conservation policies. However, following the reduction of the wildlife populations, destruction of the wildlife habitat, pollution and deforestation due to human population growth, rural poverty, globalization of markets in animal products e.g. rhino horns and ivory, and local resentment towards the fences-and fines approach proved failure to sustainably conserve biodiversity (wildlife) resources (Songorwa, 1999a). This encouraged searching for alternative approach (Kideghesho, 2006). Since then, many governments have adopted a participatory approach to biodiversity conservation as a result of pervasive loss of wildlife species and challenges of such an approach.

2.1.2 Post Colonial Historical

In more recent years, however, the goals of protected areas have shifted from strict preservation of big game to conservation of biodiversity, and from the closed access for the rich few to be open to all, especially for tourism. The increased poaching of game, famine, human tragedies and the resulting environmental degradation of the 1970s led to the questioning of the traditional ideologies and conservation approaches of "setting aside" PAs for preservation of wildlife. For example, Hulme and Murphree, (2001) argue that the colonial designs were mostly based on scientific considerations and lacked a human dimension that would integrate conservation with human development needs. In the 1980s, conservationists, international conservation organizations and African wildlife departments conceded that the exclusion approach of managing PAs was increasingly becoming ineffective for a number of reasons (Jones, 2001). First, the approach was believed to be too expensive to be sustained over a long period as it would require many rangers to patrol vast areas of the PAs. Second, it was realized that local people are the main offenders of biodiversity conservation laws, so if they could become the guardians of biodiversity, then Africa biodiversity would have a secure future. Third, it was pointed out that local people bear the biggest costs from wildlife by way of damaged property such as crops, loss of human lives and lost opportunities to use PA land, yet, they benefited least from wildlife conservation programs (Gibson, 1999). This revelation, which coincided with the more general global trend in development studies, led to the initiatives to include local communities in biodiversity conservation especially wildlife management in Africa's PAs (Gibson and Marks, 1995).

2.1.2.1 Community based Conservation Approach

Community Based Conservation aims at devolving much of the decision-making process and significant control over important biodiversity conservation to the community level.

This active participatory approach is also called Community Wildlife Management (CWM). The underlying thinking of CBC/CWM is that local communities who have been alienated should rightfully own, control, manage, and benefit from biodiversity (wildlife) (Songorwa *et al.,* 2000). In CBC, communities are perceived not as mere beneficiaries, but as active participants capable of carrying out wildlife management activities.

Countries in the southern part of Africa such as Namibia, Botswana, Zambia, and South Africa have had a good experience in community-based conservation. However, in the rest of Africa, for example in East Africa, participatory biodiversity conservation has been confronting some challenges such as poverty and rapid population growth. This has led to a considerable concern over community-based conservation (Paulo, 2010). Community oriented approaches to biodiversity conservation take many different forms and many kinds of projects and programmes can be found. In late 1970s and early 1980s conservationists came up with two main participatory approaches which are passive and active community approaches. The passive participatory approach is commonly known as 'Community Conservation', whereas the active participatory approach is known as 'Community Based Conservation' (Songorwa *et al.,* 2000).

2.1.2.2 WMA as Strategy of Implementing Community based Conservation

WMAs represent a new approach to biodiversity conservation (wildlife management) in Tanzania that has its roots in the late 1980s. This new approach emerged from the perceived failure of past, traditionally centralized wildlife management policies and practices in Tanzania. The crisis facing biodiversity (wildlife) in Tanzania at that time included loss of half of its elephant population and almost its entire black rhino population through poaching and spawned actions on the part of the Government of Tanzania to critically examine the current state of wildlife policy (WWF, 2014). This paved the way for USAID to initiate

what became more than 20 years of support to the wildlife sector. Consequently government officials in Tanzania promoted the new community-based approaches, and WMAs emerged during the reform process in the 1990s as new framework for communities to manage and benefit from wildlife.

This strategic shift towards community-based conservation framework was enshrined in the 1998 Wildlife Policy of Tanzania. This policy promoted wildlife management at the village level by allowing "rural communities and private land holders to manage wildlife on their land for their own benefit" and "devolving management responsibility of the settled and areas outside unsettled PAs (protected areas) to rural people and the private sector (MNRT, 1998).

WMA conservation approach began to be formally implemented in 2003, following WMA Regulations first issued in 2002, and the first WMAs were gazette in 2006. In 2009, the Parliament of Tanzania approved a new Wildlife Conservation Act which enshrined WMAs in the overarching sectorial legislative framework. New WMA Regulations under the 2009 Act were issued in 2012 and contain a number of key changes e.g. strengthening the communities involvement and influence over trophy hunting concession allocations in WMA, as well as providing greater clarity around benefit-sharing.

Wildlife numbers along with biodiversity and wildlife dynamics, should be the key indicator of success in WMAs in terms of wildlife conservation. However, with few exceptions, WMAs have not systematically gathered sufficient, standardized wildlife census data. Some attempts have been made with support from the United States Government funding to conduct annual or biannual counts for biological assessments. However, for the most part the reported population increases of key species such as elephants, lions and

leopards are anecdotal. Because potential revenue is closely linked to the quality of wildlife populations and habitat in the WMA, this information is necessary for Authorized Association (AA) to protect and improve opportunities for revenue generation.

Involving communities in decision making related to natural resource management has been praised as a potentially fruitful endeavour that can enhance local well-being while protecting biodiversity and ecosystem functions (UNEP, 2007). WMA were established to promote biodiversity conservation while meeting human needs supports.

2.1.2.3 Success and Challenges of Community based Conservation

Community based Conservation aimed at providing an incentive for the sustainable management of biodiversity resources, by linking their maintenance with poverty alleviation or livelihoods benefits for the people living in their vicinity (Salafsky and Wollenberg, 2000). This has typically been achieved through wildlife linked enterprises, such as tourism or wild harvesting of resources (Hughes and Flintan, 2001).

There are wide ranges of critical socio-economic issues affecting the large majority of populations within the CBC initiatives and their presence or absence affects significantly their quality of life. Most of the local communities are lacking important social services and infrastructure, and in many instances, in areas such as in the Selous, Selous Conservation Region Service (SCRS), Ngorongoro Conservation Area Authority (NCAA) and MBOMIPA Project, these services and other important infrastructure like improved roads, village offices, schools and health facilities were provided.

A study conducted in Northern Kenya on effectiveness' of CBC by Glew *et al.* (2010) shows that benefits of CBC are occurring at both the household and community level.

Increasing physical security and access to affordable transport were the most important impacts for households. Some direct financial impacts have occurred through the provision of educational and medical scholarships and to a lesser extent through paid employment especially in tourism. Income in conservancy communities were significantly more likely to be described as 'stable or increasing' than in non-conservancy areas, and small-scale changes in the activities used to generate income are apparent. A study at Burunge WMA showed that communities were benefiting from revenue collected from investors, which also funded numerous community development projects including health services and the construction of three schools (Igoe *et al.,* 2007). In addition, residents have found work in these conservation-based businesses.

Despite the benefits of Community Based Conservation, some studies report on many CBC challenges. For example, Lewis and Phiri (1998) found that in Lupande, Zambia the biodiversity decreased an indication that the Luangwa Integrated Resources Development Project (LIRDP) had failed to control wire snare incidences resulting to massive killings of animals. It was later established that the project failed because communities perceived it as it had no tangible benefits to them (Wainwright and Wehrmeyer, 1998). Similarly, Wells (1998) points out that few community-based conservation programs have enhanced conservation of biodiversity in Indonesia. Also the study conducted by Songorwa (1999) revealed that the interests of communities are largely their own survival rather than biodiversity conservation. It is therefore difficult to meaningfully engage them in conservation. Other literature indicates that community institutions have been eroded and compromised, to the extent that they cannot manage to take on conservation responsibilities (Barrett *et al.*, 2001). Other weaknesses of involving local communities include failure of national governments to give the communities full responsibility to manage as well as lack of capacity on the part of the communities (Songorwa *et al.,* 2000).

Furthermore, in Tanzania, WMA challenges are not unique to those mentioned above (WWF, 2014). They take different approaches, from the increased poaching as a result of human wildlife conflict, inadequate Anti-poaching capacity of VGS, and increase in prices of ivory and rhino horns in international markets (Southeast Asia and the Middle East). Improvements in technology have exacerbated the situation by making it much easier to communicate and move goods from the fields to markets. The increased availability of military weapons, small arms and ammunition coming from war-torn neighboring countries has resulted in indiscriminate killing.

Concomitantly, lack of regular and clear financial support, working gears such as uniforms and transport has seriously demoralised the management effectiveness (John, 2010). VGSs are not well paid with no insurance or compensation once they got injuries, hence do not participate fully in patrol; thus turning to other activities like agriculture and some of them are engaged in pouching. A study by Songorwa (1999b) indicated that in Selous Conservation Programme (SCP), a VGS was once injured while on patrol and his injury became a burden only to his family. This situation can influence the VGSs into engaging themselves in illegal activities. The illegal activities contribute in decimating the number of animals thus reducing biodiversity especially number of animals.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Description of the Study Area

3.1.1 Location

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

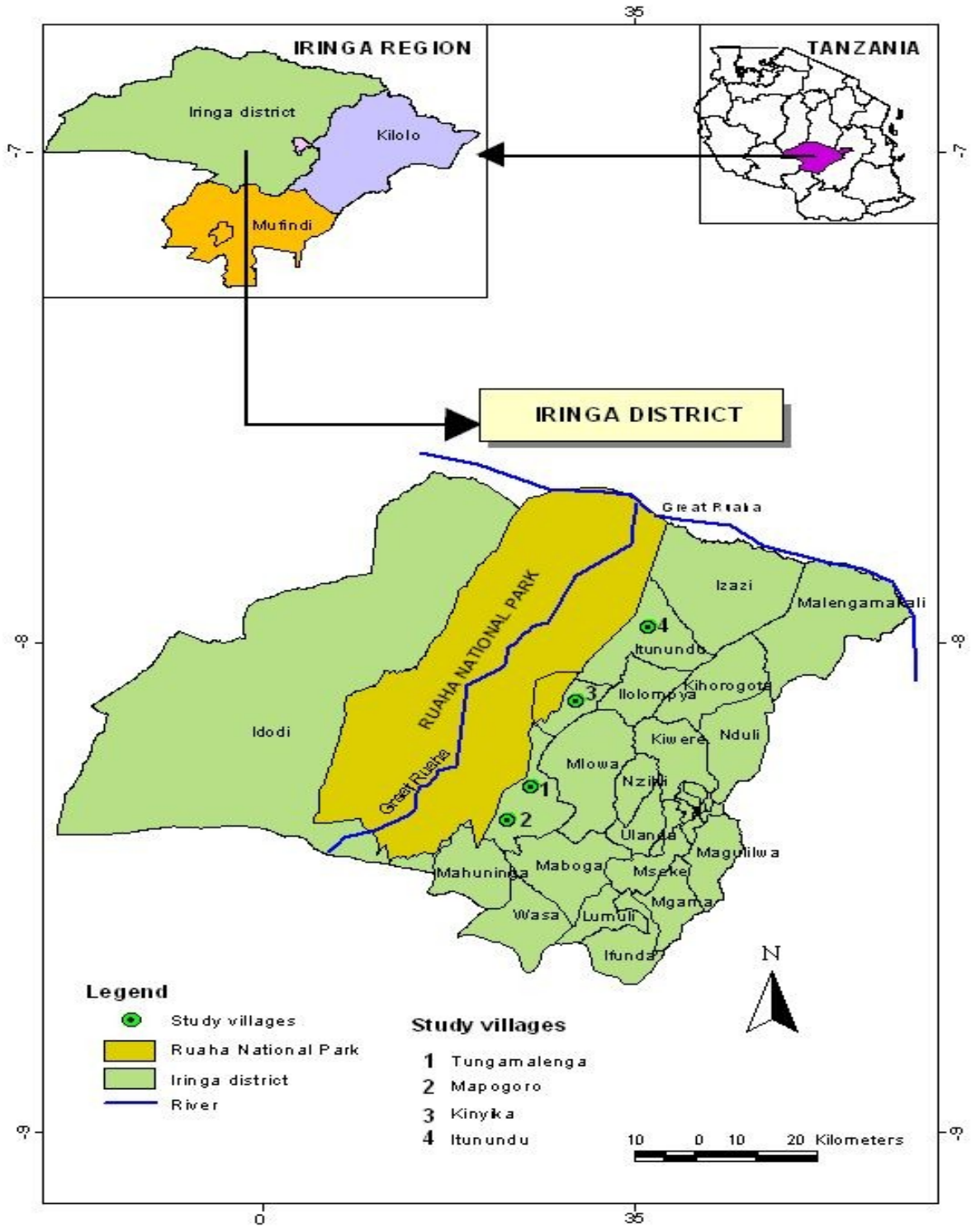

Figure 2: Map of Iringa District showing locations of the study villages

3.1.2 Physical Features

The main physiographic feature to the north of the MBOMIPA WMA is the Great Ruaha River, which flows from the south-west to the north –east. Several rivers originating from

the south of MBOMIPA WMA flow northwards. The Little Ruaha is the only permanent north river, flowing into the Great Ruaha River all times. Idodi, Kitanewa, Tungamalenga and Mahuninga rivers pass through wetlands and flow permanently through the villages bearing their names. Further downstream these rivers converge to form the Ilusi River, which historically flowed through most dry seasons, but now does not flow due to diversions for irrigation in the villages. The ecological significance of the Ilusi River and other tributaries has grown since the drying of the Great Ruaha, as it flows sooner and provides an alternative source of water in areas that have now become water stressed. Kitengeneza and Chambalasi rocky hills on the north-eastern part of the MBOMIPA WMA are scenic and are good tourist's attractions and observation points (WMA, 2006).

3.1.3 Geology

The basement rocks in MBOMIPA WMA are composed of gneiss and granite (Nahonyo, Mwasumbi and Bayona, 1998). The central and southern portions are composed of Precambrian gneiss of Dodoman and Usagaran types. Granite is scattered in clusters from north to south (WMA, 2006).

3.1.4 Vegetation

The vegetation of MBOMIPAWMA is formed by the physiognomic communities of tourism, and wildlife including *Acacia*woodland/bush land, *Acacia – Commiphora*bushland, *Brachystegia*woodland, *Commiphora-Combretum*bushland, *Acacia tortilis* thorn scrub, and Acacia induced woodland modified by human activities, Hyphaene plus *Acaciatortilisriparian* vegetation and Combretum woodland (Sosovele & Ngwale, 2002).

3.1.5 Wildlife

The diverse plant communities described above provide excellent habitats for a wide range of invertebrates (particularly insects and spiders), amphibians, reptiles, birds and mammals. The mammal list includes flagship species such as elephants (*Loxodonta africana*), hippopotamus (*Hippopotamus amphibius*), giraffe (*Giraffa camelopardalis*), buffalo*(Bison bonasus),* zebra (*Equus burchelli*), Lichtenstein's hartebeest (*Alcelaphus lichtensteinii*), roan and sable antelopes (*Hippotragus niger*), greater and lesser kudus (*Tragelaphus strepsiceros*), bushbuck (*Tragelaphus scriptus*), eland (*Tragelaphus taurotragus*), impala (*Aepyceros melampus*), duiker, lion (*Panthera leo*), leopard (*panthera padus*), cheetah (*Acinoyx jubatus*), and wild dog (*Lycaon pictus*), The WMA also represents the southern limits of Grant's gazelle's and lesser kudu's ranges (Sosovele, 2004).

The WMA also boasts for a diverse bird community, which approximate to 500, given the 529 bird species count from Ruaha National Park. Important reptiles include Nile crocodile *(Crocodylus niloticus),* monitor lizard (*Varanus niloticus)*, python *(python regis),* spitting cobra (*Naja nigricollis)* and puff adder *(Bitis arietans)*. In terms of bio-geographic significance, the presence of the East African Sand boa (*Eryxcolubrinussp)* in the WMA is the southernmost record for the species and the recording of the Turner's fat-toed gecko (*Pachydactylusturneri*) is a significant range extension for the species. In addition to providing critical dry season water for terrestrial wildlife, the rivers within the WMA are also home to 38 fish species, freshwater mussels, and charismatic riverine species like the African clawless otter (*Aonyx capensis*). According to the Wildlife Conservation Society (WCS) (2005), the river's dense woodland and riverine forests are of significant tourism potential and are critical resources for some species.

3.1.6 Climate

MBOMIPA WMA is a narrow southeast/northwest strip in the rift valley between the highlands to the south and the plateau to the north. Generally, the northern part is drier than the south and gets an average rainfall of >500mm per annum (TANAPA brochure) while the southern part gets an average of 750mm-1000mm of rain per annum (Nahonyo et al., 1998). The western part of the WMA near Mtera dam gets 450mm of rain (SWECO, 1985). Rainfall data collected at Msembe to the north of the WMA gives an average rainfall of 500mm per annum (TANAPA GMP, 1997).

Throughout the WMA and the surrounding area, rain falls during the period of November-April/May. Rainfall variance is very high (SWECO, 1985, TANAPA GMP, 1997; Nahonyo *et al.,* 1998,). Temperatures are high during most of the year (SWECO 1985; Nahonyo *et al.,* 1998) and can reach 44ºC during the day time (TANAPAGMP, 1997). According to Sustainable Management of the Usangu wetlands and the Catchment (SMUWC 2002), humidity is low and potential evapotranspiration is very high, 3260 mm per annum.

3.2 Research Design

A cross-sectional study design was used for data collection. Such research design allows data to be collected at a single point in time without repetition. The design uses minimum time and resources and provides quick results (Bailey, 1994).

3.2.1 Sampling procedures

Simple random sampling was used to select villages. Four villages were selected, two from Idodi Division and two from Pawaga Division. World Bank (1995) defines household as a unit consisting of one or more persons who are related and live together in one or more houses and have common catering arrangement. Since the sampling unit was household,

simple random sampling technique was used to identify those households. Representative households were randomly selected from the lists that were provided by the respective village government offices. A sample size ranging from 30 to 50 is sufficient for exploratory and in-depth work (Bernard, 1995). A total of 30 households were selected from each village, making a total of 120 households selected for the questionnaire survey. The father or mother of the household was the key respondent. However, other members on the basis of age (18 and above) and gender were encouraged to supplement information and/or to respond on behalf of the key respondent.

3.3 Data Collection

Both primary and secondary data were collected for statistical analysis and the following methods were used.

3.3.1 Household Questionnaire-based Interviews

The survey was conducted using a structured questionnaire containing both open and close-ended questions (Appendix 4). The method was used to obtain information on contribution of wildlife management areas in biodiversity conservation and to community livelihood. Also, the technique was used to obtain villagers' views on the remarkable contribution of MBOMIPA WMA to biodiversity conservation and their livelihood associated with this MBOMIPA WMA. The survey was conducted in Kiswahili and translated into English for better analysis.

3.3.2 Interviews with key informants

A key informant is an individual who has wide knowledge about the issue in question (Bernard, 1995). In this study key informants included Village Game Scouts (VGS), one VGS from each village (n = 4 VGS), MBOMIPA WMA Officials (Chairman and his

Administrative secretary), Village Natural Resource Committee (VNRC) (Chairman and director) from each village making a total of 8 respondents and one famous elder from each village (n=4). So a total of 18 key informants were involved. The VGS, MBOMIPA WMA officials, VNRC and famous elders were identified through village government leaders. The discussion was guided by a checklist (Appendix 5) and aimed at obtaining more 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 were used to supplement those collected through household questionnaire survey.

3.3.3 Focus group discussion

Two representatives one woman and one man from the groups were involved, this was for the groups with both women and men. Representatives were from special groups which were environmentalist, women, pastoralists, and farmers, so making a total of 8 people in each village. A total of four FGDs were conducted. The technique 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 to their livelihood. WMA activities and their contribution to biodiversity conservation, were also collected. Focus group discussions were guided by a checklist.

3.3.4 Documentation method

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 as well as the wildlife policy. Other documents were obtained through literature

search using Internet and from MBOMIPA WMA office. This information was important in broadening perspectives and also in providing in-depth understanding of the research topic.

3.4 Data Analysis

3.4.1 Qualitative data

Qualitative data and information from the discussion with key informants and FGD was analysed through content analysis. Content analysis is a set of methods for analysing the symbolic content of any communication with an intention to reduce the total content of communication to some set 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 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 analysis under quantitative data falls under the domain of "descriptive statistics". Descriptive statistics was applied to determine frequencies, percentages. Chi square test was used to test if there was significant difference in response about community awareness on biodiversity and WMA activities and their contribution to biodiversity conservation.

CHAPTER FOUR

4.0 RESULTS

4.1 Economic Activities

During this study, majority of the surveyed households seemed to be farmers and few of them were conducting other economic activities as livestock keeping, small business, agro-pastoralist, formal employment, and casual labour (Table 1).

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
Other	2	1.7
Total	**120**	**100**

4.2 Community Awareness on Biodiversity Conservation

4.2.1 Awareness of the phrase "biodiversity conservation"

In this category it was revealed after interview in the four villages that majority of the respondents had good understanding of the biodiversity conservation and only few of them knew nothing about the term biodiversity conservation (Table 2), where by Kinyika and Itunundu village were more aware of biodiversity conservation whilst Tungamalenga and mapogoro were least aware. (Chi-square; $p< 0.05$).

Table 2: Awareness of term biodiversity conservation

Village	Response				χ^2	p
	Very good	Good	Fair	Poor		
Tungamalenga	7(23.33)	7(23.33)	5(16.7)	11(36.67)	2.533	0.469
Mapogoro	2(6.67)	8(26.67)	10(33.33)	10(33.33)	5.733	0.125
Kinyika	3(10.00)	15(50.00)	6(20.00)	6(20.00)	10.8	0.013**
Itunundu	1(3.33)	12(40.00)	11(36.67)	6(20.00)	10.27	0.016**
Total	**13(10.8)**	**42(35.00)**	**32(26.67)**	**33(27.5)**		

Note: Numbers in brackets are percentage of respondents and outside the bracket are frequencies of the respondents and ** indicates statistical significance at $p<0.05$.

4.2.2 Awareness of the Importance of Biodiversity Conservation

In view of awareness about the importance of biodiversity conservation, results show that majority of the respondents were familiar on why we conserve biodiversity. Statistically there were significant differences between three villages (Mapogoro, Kinyika and Itunundu) (Table 3). Mapogoro Kinyika and Itunundu were more aware and Tungamalenga was least aware.

Table 3: Awareness of the importance of biodiversity conservation

Village	Response				χ^2	p
	Very good	Good	Fair	Poor		
Tungamalenga	5(4.2)	11(9.2)	9(7.6)	5(4.2)	3.600	0.308
Mapogoro	1(0.8)	15(12.5)	12(10.0)	2(1.7)	19.867	0.000**
Kinyika	1(0.8)	19(15.8)	4(3.3)	6(5.0)	25.200	0.000**
Itunundu	1(0.8)	16(13.3)	5(4.2)	8(6.7)	16.133	0.001**
Total	**8(6.6)**	**61(50.8)**	**30(25.1)**	**21(17.6)**		

** indicates statistical significance at $p<0.05$.

4.2.3 Knowledge about human activities contributing to biodiversity conservation

According to table 4, the results indicate that majority of respondents understood it well while few of them have poorly knowledgeable about those activities. Statistical test shows

significant differences between three villages (Mapogoro, Kinyika and Itunundu) at (Table 4). Tungamalenga, Kinyika and Itunundu were more aware while Mapogoro was least aware.

Table 4: Knowledge about human activities contributing to biodiversity conservation

	Response					
Village	**Very good**	**Good**	**Fair**	**Poor**	χ^2	**p**
Tungamalenga	1(0.8)	10(8.3)	11(9.2)	8(6.7)	8.133	0.043**
Mapogoro	0(0)	9(7.5)	13(10.8)	8(6.7)	1.400	0.497
Kinyika	0	6(5.0)	17(14.2)	7(5.8)	7.400	0.025**
Itunundu	0	7(5.8)	17(14.2)	6(5.0)	7.400	0.025**
Total	**1(0.8)**	**32(26.6)**	**58(48.4)**	**29(24.2)**		

** indicates statistical significance at $p<0.05$.

4.2.4 Knowledge about Negative Human Activities that Threaten Biodiversity

During this study it was revealed that majority of the respondents were familiar with negative human activities that threaten biodiversity conservation. Statistically there was no significant difference.

Table 5: Knowledge about negative human activities threatening biodiversity

			Response			
Village	**Very good**	**Good**	**Fair**	**Poor**	χ^2	**p**
Tungamalenga	7(5.8)	10(8.3)	5(4.2)	8(6.7)	1.733	0.630
Mapogoro	0(0)	16(13.3)	8(6.7)	6(5.0)	5.600	0.061
Kinyika	0	8(6.7)	15(12.5)	7(5.8)	3.800	0.150
Itunundu	0	10(8.3)	14(11.7)	6(5.0)	3.200	0.202
Total	**7(5.8)**	**35(36.6)**	**42(35.1)**	**27(22.5)**		

** indicates statistical significance at $p<0.05$.

4.2.5 Knowledge about non-human drivers with positive/negative influence on the biodiversity

In this category after interview with respondents from the four villages it was revealed that the majority of respondents did not know non-human drivers that contribute positively/ negatively to biodiversity conservation but few of them knew it.

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

	Response					
Village	**Very good**	**Good**	**Fair**	**Poor**	χ^2	**p**
Tungamalenga	1(0.8)	4(3.3)	9(7.5)	16(13.3)	17.200	0.001**
Mapogoro	4(3.3)	3(2.5)	5(4.2)	18(15.0)	19.867	0.000**
Kinyika	1(0.8)	6(5.0)	8(6.7)	15(12.5)	13.467	0.004**
Itunundu	2(1.7)	7(5.8)	4(3.3)	17(14.2)	17.733	0.000**
Total	**8(6.6)**	**20(16.6)**	**26(21.7)**	**66(55)**		

** indicates statistical significance at $p<0.05$.

4.3 WMA Activities and Their Contributions to Biodiversity Conservation

Four villages were interviewed during this exercise whereby WMA activities mentioned were controlling poaching, controlling illegal harvesting of woody products and controlling fire (Table 7).

Table 7: WMA activities

Wma Activities	**Frequency (n=120)**	**Percentage**
Controlling poaching	115	95.8
Controlling wildfire	9	7.5
Controlling illegal harvest of woody products and encroachment	26	21.6
Total	**150**	**124.9**

4.3.1 Response on the participation of community members in biodiversity conservation activities

The results showed that the majority of the respondents were participating in biodiversity conservation activities. Statistically there was significant difference on response between three villages (Table 8). Where by Tungamalenga, Mapogoro and Kinyika were more participating than Itunundu.

Table 8: Response on the participation in biodiversity conservation activities

	Response			
Village	**Yes**	**No**	χ^2	**P value**
Tungamalenga	23(19.17)	7(5.83)	8.533	0.003**
Mapogoro	26(21.67)	4(3.33)	16.133	0.000**
Kinyika	21(17.50)	9(7.5)	4.800	0.028**
Itunundu	17(14.17)	13(10.83)	0.533	0.465
Total	**87(72.5)**	**33(27.5)**		

** indicates statistical significance at $p<0.05$.

4.3.2 How community members participate in biodiversity conservation activities

It was found that majority of respondents were participating by reporting illegal activities as illegal hunting, fire, encroachment, illegal harvesting of forestry resources. While few of them participating through rescuing animals, tree planting, ant-poaching patrols and scaring animals (Table 9).

Table 9: How community members participate in biodiversity conservation activities

Activities	**Frequency(n=87)**	**Percentage**
Reporting illegal activities	60	65.2
Rescuing animals	14	15.2
Scaring wild animals	5	5.4
Tree planting	7	7.6
Ant-poaching control	6	6.6
Total	**92**	**105.5**

4.3.3 Contribution of WMA activities to biodiversity conservation

4.3.3.1 Poaching before WMA Implementation

It was revealed that before WMA implementation, poaching was at high rate (Table 10).

Table 10: 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

The majority of respondents said that poaching was low after the establishment of the WMA in comparison to the situation before the establishment (Table 11).

Table 11: 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

In view of illegal off-take of woody products, fire events and encroachment before the WMA establishment was reported that the illegal off-take of wood products was done at high rate. Statistically there was no significant difference on response on illegal off-take of woody products, encroachment, and fire events as all activities were at high rate (Table 12).

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

T	Responses						
Activity	**High**	**Low**	**Nochange**	**Idon't know**	**Eradicated**	χ^2	**p**
Illegalofftakeofwoody product	99(82.5	3(2.5)	1(0.8)	15(12.5	2(1.7)	0.042	0.238
Encroachment	59(49.2)	10(8.3)	1(0.8)	31(25.8)	19(15.8)	0.000	0.144
Fire events	98(81.7)	4(3.3)	2(1.7)	12(10)	4(3.3)	0.222	1.000

** indicates statistical significance at p<0.05.

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

In view of Illegal off take of woody products, fire events and encroachment after WMA establishment results showed that about that Illegal off take of wood products encroachment and fire event was low. Statistical there was significant difference on response toward fire events where by Fire events was reported to be low than other activities (Table 13).

Table 13: Illegal off take of woody products, fire events and encroachment after wma

Activity	**Responses increasing**	**Decreasing**	**No Change**	**I don't Know**	**Eradicated**	χ^2	**p**
Illegal off take of woody product	2(1.7)	84(70)	7(5.8)	13(10.8)	14(11.7)	0.150	0.126
encroachment	1(0.80	49(40.8)	9(7.5)	21(17.5)	40(33.3)	0.000	0.360
Fire events	1(0.8)	80(66.7)	5(4.2)	6(5)	28(23.3)	0.054	0.002

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

The results showed that only a small proportion of the villagers participated in socio-economic activities related to MBOMIPA WMA while the majority did not (Table 14).

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

Response	Frequency	Percentage
Yes	8	6.7
No	112	93.3
Total	**120**	**100**

CHAPTER FIVE

5.0 DISCUSSION

5.1 Economic Activities in the Study Area

Agriculture is the main source of income in Tanzania. In Iringa region 88% of inhabitants depend on agricultural activities for their living (National Bureau of Statistics (NBS, 2008). Maize is the dominant annual crop grown in Iringa region (NBS, 2008). The results of this particular study also revealed that agriculture was the main economic activities in surveyed villages whereby the communities in the areas are engaged mostly in crop farming as their main livelihood activity. The most crops produced were rice, maize, beans, and sunflower. Other crops such as Irish potatoes, wheat, groundnuts, field peas, paddy, cowpeas, finger millet, tomatoes, sorghum, and simsim were produced in small quantities. Furthermore, it was observed that a small number of people, mainly pastoralists (Maasai) kept cattle, goats, and sheep. However, almost all villages were engaged in indigenous poultry rearing/keeping.

5.2 Community Awareness of Biodiversity Conservation

5.2.1 Awareness of the phrase "biodiversity conservation"

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. They reported that biodiversity conservation includes the protection of natural resources that surround their environment including wild animals, plants, insects, and water sources. Likewise, some community members were of the view that biodiversity conservation means protection of wildlife for future generations. Jones (2001) observed similar results at Etosha National Park in Kunene region in Namibia where residents enjoyed the existence of Community -based Wildlife Management and wished

their children and grandchildren to be able to enjoy the same. Provisions of education on biodiversity conservation have high success. Participation in various seminars during the establishment of MBOMIPA WMA was the reason for them to have a good understanding of the phrase biodiversity conservation. Communities' awareness has been reported to be the prime importance in promoting conservation of wildlife and in changing their attitudes towards effective use of wildlife resources (MNRT, 2007).

5.2.2 Knowledge about the importance of biodiversity conservation

It was revealed that majority were well knowledgeable about why we conserve. They reported that conservation enables wildlife to flourish and this will enable the future generation to see the wealth of the country such as animals and forests. Also, this may attract tourists to visit the WMA and lead to generation of foreign currency which will help to improve the national income. Similar findings are reported by Bauer (2003) that a local community living close to Waza National Park in Cameroon appreciated the natural intrinsic value and agreed with the necessity to protect forests and their wildlife for their future generations. They added that conservation provide them with fresh air, firewood, shade, recreational environment, enough rainfall which would in turn bring good crop harvests and construction materials. On the same line, it helps to maintain hospitable habitat for animals and this helps them to get their needs around the area and so reduce the risks of being killed by poachers.

Community members also reported that through conservation they are able to get traditional medicine from both animals and plant and also the area for sacred. A study by Nitasha (2005) observed the same results that community enjoy conservation since it provides human with all their daily needs- 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 through cultural and religious sentiments.

Key Informants reported that conserving biodiversity enables the community to enjoy the beauty of the scenery, provide employment opportunities as local guides and village game scouts. They added that conservation seminars provided and the presence of most respondents during MBOMIPA implementation was the reasons for good understanding of why we conserve biodiversity. The results were not different from those of other studies conducted before the study by 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 about human activities favouring biodiversity conservation

Human activities promoting biodiversity conservation mentioned were tree planting in general land, attending meeting concerning WMA, and controlling illegal poaching. Perhaps this was well known due to their long stay in areas as well as their level of participation. In order to attain biodiversity conservation, tree planting and retention should be done in general land and this is essential so as 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 natural forests thereby doing away with biodiversity degradation (Mbwambo, 2000; Winfred, 2004).

5.2.4 Knowledge about negative human activities threatening biodiversity

Threats to biodiversity come from many sources, but mostly human (Nitasha, 2005). It was found in this particular study that communities in the surveyed villages were well

knowledgeable about the negative human activities that threaten biodiversity. They reported those activities 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 from its plant and animal species with no regard as to whether the resources being consumed were finite or not (Groombridge and Jenkins, 2002).

Results from respondents, key informants and during 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 establishment in their areas. However, poaching especially of elephants was said to have increased, and the reason behind could be the increased demand of ivory products all over the world (WWF, 2014).

Deforestation has left acres of former forests bare and inhospitable to the animals and plants that depended on them for food and sustenance (Gaston and Spicer, 2004). The main cause of deforestation in the study area is due to fuel wood harvesting, since most of respondents had no trees in their general land they were forced to collect it from the wild. This is supported by Woven (2006) that the main source of energy for the people is fuel wood; fuel wood is the energy source of choice, because of its availability, relative cheapness, and ease of use. Most users harvest it from the wild; few of them buy it from the market while other collects it from their farms after burning. Fuel collection is done mostly by women who use these woods to prepare local brew and the preparation of the local brew uses a lot of large logs.

Bushfire is also a negative activity. Respondents exposed that the main source of bushfire is either set by poachers, honey harvesters or farmers clearing vegetation on land for

cultivation. Whereas poachers set fire so that their foot prints are not seen by game scouts, most farmers fail to control fire, and honey harvesters set fire to expel bees.

Communities are also encroaching in conserved areas due to lack of security and shortage of land to cultivate. For example in Mbolimboli village at MBOMIPA, farmers encroached the area and are doing agriculture activities. Also, a study by Lalika (2006) found that farming was the main problem to the biodiversity since people are clearing forests so that they can get areas to cultivate. Similarly, Monela (1995) and Kiwale (2002) report that the loss of biodiversity is attributed by human economic activities, specifically the conversion of forest land for farming purposes.

5.2.5 Knowledge about 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 positive /negative influence on the biodiversity. Heavy rainfall, floods and drought are the non-human activities that can affect biodiversity either positively or negatively. Perhaps poor understanding on those drivers was due to the fact that conservation education which they had was found during the introduction of the MBOMIPA and since human activities were the main source of degradation of natural resources, seminars were aimed to teach them the effects of these activities. Poaching, deforestation, burning of forests and agricultural activities close to water sources were taught as the main factors that damage natural resources. Basing, on results it was suggested that more seminars be organized so that people could be taught those activities that are not environmentally friendly, and which not only cause extinction of animals, forests or drying of water sources but also can lead to climate change that can also be harmful to animals, forests and them as well.

5.3 WMA Activities and Their Contributions to the Biodiversity Conservation

It was revealed that controlling poaching was the main activity of the WMA, due to the fact that an effective and sustainable wildlife management system under Community authority and responsibility in the MBOMIPA WMA was the main objective .Although controlling poaching is the main activity, the WMA was also dealing with other illegal activities inside and around the WMA.

5.3.1 Response on participation of community members in biodiversity conservation activities

Education and sensitisation about responsibilities, rights and expected return assure full participation in conservation. It was found that the majority of respondents are participating in biodiversity conservation activities as the results of knowing that the responsibility of conservation is for all and not only village game scouts and WMA leaders.

The study conducted by John (2010) at Wami-Mbiki WMA shows that majority of community members were not participating in conservation activities and the reasons was lack of awareness of WMA, belief that the area belonged to foreigners', communication gap among villagers, village leaders and WMS leaders, and belief that it is the responsibility of VNRCs, VGS, and WMA leaders.

5.3.2 How community members participate in biodiversity conservation activities

Reporting illegal activities to the Village Game Scout (VGS), Village Natural Resource Committee (VNRC), and WMA leaders is the most way that communities use to participate in biodiversity conservation in the study villages. Key Informants reported that although people were participating through providing information on illegal activities, the number of people reporting such cases was decreasing with time. They added that people then were not

ready to reveal the poachers for fear of losing their lives as no one could show interest to protect 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 some people could die just because of lack of confidentiality.

Another way of participation is through rescuing animals by revealing their presence in villages or out of the conservation areas before citizens killed these animals and before they harmed the citizens. Communities also participate through scaring animals by making noises (shouting), or climbing on the house roofs and beating iron sheet, 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 the animals away and the methods used included making 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.

Tree planting is also done especially in their particular fields to obtain firewood requirements without going to the forest because it involves a long process to get a permit for wood collection.

Again, it was discovered that following the wood in the forest is not only disruptive and damaging the environment, it is also dangerous for the community members' lives because they can be attacked by dangerous animals like lions, buffalo and elephant. Therefore, by planting their own trees, they believe that soon they will be able to generate 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 the increased of illegal activities before the MBOMIPA WMA implementation. According to George (2002), lack of conservation awareness and legal access to natural resources result into low community participation and negative attitude towards wildlife. Communities were also getting nothing from the resources available mainly animals, so they did not see a reason to conserve. In addition, park rangers were few and they would not move around all areas of the park, a law existed but there was no enforcement and revenge killing after livestock loss to large carnivores and crop damage as a way to minimise human-wildlife conflicts.

With that regard, people did not feel that natural resources were theirs, but belonged to TANAPA and foreigners, hence no participation in biodiversity conservation. What was in their mind was that they thought that by destroying the available natural resources they were causing loss to TANAPA.

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

Finally, Gandiwa (2011) reported that the need for bush meat as a source of protein to was the main reason that local residents illegally hunted wild animals. Generating money from

the commercial sale of animal products was indicated as another major reason for illegal hunting in Gonarezhou ecosystem.

5.3.3.2 Poaching after WMA establishment

Great effort has been done in Tanzania including involving communities in participation because they discovered that in order to have successful conservation, the community concern needed to be part of the conservation and experience benefit associated with that conservation. The study results show that community participation, conservation education and associated benefits from MBOMIPA project helped a lot to decrease poaching. Making villagers as part of conservation also helped poaching to decrease. Participation makes them feel part of resources they have and they are responsible to protect them. Conservation education provided also helps them to recognise the conservation importance and realise the benefits obtained from the conservation. A study by Gandiwa (2011) revealed the same results that positive impacts of conservation awareness, education under CAMPFIRE programme, and associated benefits such as cash dividends and bush meat help in decrease of illegal activities.

Community members are also no longer dealing with poaching due to fear of the law and penalties that are given for breaking those rules as being whipped by VGS and to go to jail. In connection to that, increase of security now than ever before helps to reduce illegal activities, now there are game scouts in each village who are patrolling, while before the WMA commencement they were only depending on the park rangers who were few in number and they were not able to conduct patrol in all areas surrounding the park. Similar findings are reported by Gandiwa (2011) who reported that the main reasons given for the perceived decline in illegal hunting in the Gonarezhou ecosystem were that poachers were afraid of being arrested or imprisoned due to strengthened law enforcement.

Illegal activities especially poaching is most done during rainfall period whereby the infrastructure especially roads are inaccessible, and due to lack of resources game scouts are not able to conduct patrol in all areas, but poachers do so since they are well equipped.

Another reason to this is that the forest becomes heavy and difficult for the game scouts to see poachers, and due to poor weapons they use they see their lives under threat.

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

Although poaching is high during rainy season it is also common during the dry season as during this time the roads are passable, it is easy to spot animals one wants to hunt. It is this time that the villagers are already done with their agricultural activities so they do not have other work 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 that are used by poachers are guns, bows, arrows, poison, wire, spears, nests and dogs.

This finding is supported 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 continuous decrease in poaching in recent years since 2013 particularly of elephants as shown in appendix 1. The reasons could be increased demand for ivory in the world market, the high price of these products, but also the participation of leaders and influential people in fighting against the ivory business.

Participation of community in conservation is not only benefiting the local community, but also helping in recovery of wildlife population. This is supported by some 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. The general trend for all these species over the past 15 years or more has been upwards according to the Namibia Association of CBNRM Support Organisation (NACSO) (2004). 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 a general 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 poaching, WMA also deals with all illegal activities within the PA. 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 high rate after the establishment of the WMA due to the increase in people's understanding on the importance of preserving the forests and the impacts they would get if they continued destroying them. Key informants reported that people understand the impact of deforestation was not the only reason for not cutting trees, but it was due to the fact that many forests were harvested at the time where there was no proper management of natural resources, so the large trees that could provide wood and logs are no longer available.

Encroachment of PAs is all most over if you compare with what was observed before. However key informants added that this problem was almost over in some villages especially at Idodi, but In Pawaga Division it was still a problem because of conflicts between farmers and herders, and this is caused by the existing land conflicts making people invade the PAs and make their farming activities. Fire incidents especially those caused by poachers were reported to have decreased; most fire incidents alarmingly reported now days are caused by farmers when they fail to control them during farm preparation. Before the WMA, the rate of poaching was high and this was also causing the frequent occurrences of fire incidents whereby poachers were setting fire so that they could lose evidence of footprints. Additionally, there were poachers who were dealing with honey harvesting and they were therefore setting fire to expel bees. This is supported with the study done by Mugisha (2002) who reported that benefits obtained from conservation lead to the reduction of encroachment and also incidences of fire events.

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 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 respondents' reasons as to why they are not doing socio-economic activities linked to the WMA.

The people involved are from only one village of Tungamalenga. This village is situated very close to the park, 15 km from the park gate it is a village that at least has tourist infrastructures like hotels and campsites compared to other villages.

Activities they are carrying out are selling carvings, camping, cultural dance, and local guide services. People who do these activities reported that there was no significant difference in income before the introduction of MBOMIPA and after the introduction because tourism activities at MBOMIPA were not acknowledged, so it was not easy to get customers especially during low season. This situation discouraged people and led many people to seeing that engaging in WMA socio-economic activities was only wastage of time, and that it was better to engage on agricultural activities.

In addition, some traditional dance groups were reported to have died due to the low number of customers. Again, a snake park was also closed due to 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 for their family income as a result of tourists coming to visit this tourist area.

Although the WMA socio-economic activity has no direct impact to the community livelihoods, MBOMIPA helped them through revenue sharing scheme as shown in appendix 2 whereby these revenues help the community in social services development such as building school classrooms, toilets, teachers' houses, clinic and water services and other infrastructures. Other benefits are covering of school fees for orphans as shown appendix 3 as well as dividend of funds that have helped reduce the cost of service sharing. Before MBOMIPA, they were needed to contribute money, labour force and building materials for social development, but now they are contributing less money. Other items MBOMIPA offers and whenever the project does not, they ask for help from other stakeholders such as Tanzania National Parks (TANAPA), World Wide Fund for Nature (WWF) and Wildlife community society and investors.

These results are similar to the results reported by Karidozo (2007) who reported 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 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 his study conducted at Mbarangadu WMA, Songambele village found that the main direct positive impact of the WMA is that local people at the community level relatively benefit through revenue sharing schemes. It is through the shared revenues that the community constructed Korido Secondary School classrooms, an office for teachers, toilets for students and four houses for teachers. Other benefits are in form of the sponsorship from the tourism investor on sending orphans to school and training of village game scouts who are employed in the anti-poaching unit in the WMA in question.

CHAPTER SIX

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

Success of biodiversity (wildlife) conservation largely depends on participation of local communities in conservation activities. This study revealed that participation of local communities living adjacent MBOMIPA WMA contributed to biodiversity conservation. It was revealed that illegal activities have been reduced compare to before the MBOMIPA establishment. Involvement of communities in conservation activities made them to feel as they are part of resources and realise that conservation is their responsibility and makes them participate in different ways as being village game scouts, reporting illegal activities, rescuing animals, scaring animals, tree planting and anti-poaching patrol. Thus, involvement of community from planning, implementation and evaluation phases will reflect the need for genuine participation of the stakeholders in pursuing conservation activities.

The study also establishes that, Communities were benefiting both indirectly and directly from MBOMIPA WMA. They were benefiting through revenue obtained from investors and those revenue have been used for village development activities such as construction of school facilities (e.g. classroom and toilets, health facilities and supporting orphans to study in secondary school. Three local people were recruited from each village as village game scout, which is a direct benefit in terms of employment.

6.2 Recommendations

i. Proper planning and intervention, all activities i.e. agriculture and tourism investment may be a key to livelihood improvement. Interventions in form of

making sure that revenue from Investors are used for agricultural development to counteract poor food security, support by supporting some of non-land-intensive agricultural options like poultry, horticulture or bee keeping.

ii. Since WMA initiatives have shown some good prospects as reduction of illegal activities and contribution to livelihood in communities living adjacent WMAs, there is also a need of scaling up to other areas which are not currently involved in WMA practices.

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APPENDICES

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

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. Guide question for focus group discussion

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/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 incidents before WMA implementation?
15. What can you say about fire incidents after WMA implementation?

C. Household socio-economic activities and their effects 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?