ASSESSING EFFECTIVENESS OF FOREST MANAGEMENT APPROAC HES ON LIVELIHOODS AND WOODY SPECIES DIVERSITY AROUND SHEKA FOREST, MASHA DISTRICT, SOUTHWEST ETHIOPIA

MSC THESIS

BY: GETNET REGASSA

FEBURARY, 2017

JIMMA, ETHIOPIA

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Submitted to the School of Graduate Studies Jimma University College of Agriculture and Veterinary Medicine in Partial Fulfillment of the Requirements for Degree of Master of Science in Natural Resource Management (Forest and Nature conservation)

February, 2017

Jimma, Ethiopia

APPROVAL SHEET

SCHOOL OF GRADUATE STUDIES

JIMMA UNIVERSITY COLEGE OF AGRICULTURE AND VETERNARI MEDICINE

Thesis Submission for external Defence Request Form (F-07)

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Program of study: MSc. Natural resource management

Title: **Assessing Effectiveness of Forest Management Approaches on Livelihoods and Woody Species Diversity around Sheka Forest; Masha District, Southwest Ethiopia.**

I have incorporated the suggestion and modifications given during the internal thesis defence and got the approval of my advisers. Hence, I hereby kindly request the Department to allow me to submit my thesis for external thesis defence.

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We, the thesis advisers have verified that the student has incorporated the suggestions and modifications given during the internal thesis defence and the thesis is ready to be submitted.

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Decision/suggestion of Department Graduate Council (DGC) _____

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Chairperson, DGC Signature Date

DEDICATION

To my brother Yohannis Temesgen and father Regassa Firissa for their all-rounded and unconditional support in my life.

STATEMENTOF AUTHOR

First, I declare that this thesis is my own work and that all sources of materials used for thesis have been duly acknowledged. This thesis has been submitted in partial fulfillment of the requirements for M.Sc. degree at Jimma University, College of Agriculture and Veterinary Medicine and is deposited at the University library to be made available to users under rules of the library. I solemnly declare that this thesis is not submitted to any other institution anywhere for the award of any academic degree, diploma, or certificate. Brief quotations from this thesis are allowable without special permission provided that accurate Acknowledgment of sources is made. Requests for permission for extended quotation from or reproduction of this manuscript in whole or in part may be granted by the Department of Natural Resource Management or the Dean of the School of Graduate Studies when in his or her judgment the proposed use of the material is in the interests of scholarship. In all other instances, however, permission must be obtained from the author.

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BIOGRAPHICALSKETCH

The Author, Getnet Regassa, was born on 25th of August 1983 in Masha District of Sheka Zone, Southern Ethiopia. He attained his junior elementary school at Masha Junior and Secondary School (From 1989 to 1996) and his secondary school at Masha comprehensive Secondary school from 1997 to 2000. He then joined Wondo Genet College of Forestry in 2000 and awarded Diploma in forestry in 2002. After graduation, he was employed in Bureau of Agriculture and Rural Development as a forest conservation Expert in Masha District of Sheka Zone. He completed his BSc in natural resource in 2010 from Jimma University. After his BSc completion he employed in Bureau of natural resource office as biodiversity expert in Sheka zone until he joined the School of Graduate Studies at Jimma University, College of Agriculture and Veterinary Medicine in September 2015 to pursue his M.Sc. degree in Natural Resource Management specialization in Forest and Nature Conservation

ACKNOWLEDGEMENTS

First I want to express my deeply thank to my Advisors Mr. Zerihun Kebebew and Dr. Kaba Urgessa for their persistent help in all steps of the thesis from title selection to writing the final report. Their way of teaching, continuous guidance, feedbacks, advices and encouragement have been truly exceptional and learnable. Besides, their support, constructive criticisms, flexibility and kindness have inspired me greatly and helped me to successfully complete my paper work.

My thanks go to Sheka zone Environment and Forest Development and Protection Office for the sponsorship study leave and technical support during data collection. I am grateful to the residents of the study sites for giving me their time to discuss about forest management approaches. Local authorities are so highly deserved due to provision of information and facilitation during data collection. I would like to thank heart fully my families particularly my brother Yohannis Temesgen who is not only my brother but also my father throughout all of my life.

I am very grateful to my best friends who contributed to support the accomplishment of the study in one way or the other. I would like to express my appreciation and special thanks to all persons who contributed for the comment.

Last but not least, I would also like to extend my thanks to Jimma University College of Agriculture and Veterinary Medicine for financial support of the study and computer and internet access and services with polite hospitality.

ACRONYMS/ABBREVIATIONS

ANOVA	Analysis of Variance
BR	Biosphere Reserve
CBNRM	Community Based Natural Resource Management
DBH	Diameter at Breast Height
FDRE	Federal Democratic Republic of Ethiopia
GPS	Geographical positioning system
HH	Household
IVI	Importance Value Index
MAB	Man and Biosphere
MELCA	Movement for Ecological Learning and Community Action
NFPAS	National Forest Priority Areas
NGOs	Non-Governmental Organizations
NTFP PFM	Non Timber Forest Products and Participatory Forest Management
NTFPs	Non Timber Forest Products
OFLP	Oromia Forested Landscape Program
PAs	Peasant Associations
PFM	Participatory Forest Management
SFBRNF	Sheka Forest Biosphere Reserve Nomination Form
SPSS	Statistical Package for Social Sciences
SZFEDO	Sheka Zone Finance and Economic Development Office
UNESCO	United Nations Educational Scientific and Cultural Organization

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ABSTRACT

The forests located in southwest Ethiopia have been under traditional and participatory forest management approach at different periods. Still there is an effort to look for effective forest management approach that helps to maintain the remaining natural forest of southwest Ethiopia. Biosphere reserve forest management is the other approach that has been recently introduced in the area. The main objective of this study was to assess the effectiveness of PFM and Biosphere reserve forest management approaches in relation to traditional approach in addressing the local community's livelihoods and conserving tree diversity of Sheka forest. Socioeconomic and vegetation data were collected through household survey, focus group discussion and forest inventory. Total of 100samples for household survey and 67 plots for forest were inventoried. The result shows that forest as a source of livelihood contribution is higher in traditional approach and lower in biosphere reserve (particularly at buffer and core area) and PFM was perceived to be moderate contribution. Twelve percent respondents perceived use right as being extremely restricted, 53% moderately restricted and 35% no restriction toward PFM forestry approach. Majority of the respondents (58%) perceived the absence of restriction on use right and 35% perceived to be medium restriction whereas few of the respondents (7%) perceived to be extremely restricted in traditional approach. In biosphere larger proportion of respondents (73%) reacted to be use right extremely restricted. The forest vegetation assessment revealed a total of 38 woody species, representing 23 families were identified in three of forest management blocks. Of the total woody species recorded, 36, 35 and 33 species were found in biosphere reserve, PFM and traditional forest site respectively. The density of woody species were 344 trees/ha, 352 trees/ha, 398 trees/ha were encountered at PFM, traditional and biosphere reserve respectively. For sapling 5781,5100 and 8666 individuals per hectare were encountered at PFM, traditional and biosphere reserve forest blocks respectively, whereas 10555, 8937 and 14708 seedling population were counted per hectare at PFM, traditional and biosphere respectively. The Shannon (H) of each forest blocks vegetation was 3.55 in PFM, 3.49 in traditional and 3.58 in biosphere. The study concluded traditional forest management has active role in contributing the livelihood with doubt in biodiversity conservation, PFM also provide livelihood contribution without the early improvement, but discourage forest destruction. Biosphere reserve confirmed biodiversity conservation with less contribution for livelihood. Recommendations, that various strategies must be combined including the use of local knowledge and institutions in the conservation of forest.

Key words: Livelihoods, Forest Management, Forest Products, Woody Tree Species

1. INTRODUCTION

1.1 Background and Justification of the Study

Forest is an important source for the rural poor to meet their basic needs, such as food, fuel, health and cash (Vedeld*et al*, 2007).According to Shackleton*et al (*2007)the rural, and to some extent urban, households extensively use the forest resources to meet their daily livelihood. Without forest resources their ability to satisfy their basic needs would have been jeopardized. The quantity and quality of these forest resources for goods and services are influenced by forest characteristics such as stand structure and tree species composition (Daniel and Peter, 2006). Forest management strategies to some extent influence forest capacities to meet public demands for certain goods and services. Many developing countries continue to face the challenge of how best to manage and conserve their forests. Management approaches of forests, whether they are protectionist oriented or livelihoods based are important in determining outcomes of conservation and sustainable use (Kant & Berry, 2005).

The southwest (SW) highlands of Ethiopia are one of the most forested areas in Ethiopia. These forests form an important source of several non-timber forest products (NTFPs), such as wild coffee (*Coffea arabica*), different spices and honey. Recently, concern has been voiced over the degradation of the remaining forests in this region, as a result of an increasing pressure due to immigration and expanding commercial cultivation, which causes a conversion of forests into agricultural land. Beside this, changed governmental strategies to develop the region led to agricultural investments and selective timber felling also contributes for the decline of the forest (Van Beijnen*et al,* 2004). Tadesse (2002) has stated about 60% loss of the forest cover of the highland plateau of SW Ethiopia. Ruesing (1999) has also stated that 9000 square km destruction of high forests between 1973 and 1990. Another report indicates about 50% of high forests have been slightly or heavily disturbed from 1971 to 1997 (Daba, 2000).

From the foregoing it is important to understand forest management approaches within the study area in which they are implemented. In Sheka forest, under the former imperial ‘Haile Sellassie’ regime the forest areas were owned by landlords. Each landlord divided the land under his ownership to different ‘Gashas’. Under each ‘Gasha’ leader, there were tenants who made use of the forest resources. The Gasha leaders defined the size and the boundary of the land for the

tenant, and such an area is called a 'Kobbo' which is often 40 ha's (Van Beijnen et al, 2004).*Kobo* refers to customary ownership of a block of forest land bounded and demarcated by big trees or other physical features – like rivers and small streams and exclusively used for traditional beekeeping and hunting (Dereje and Tadesse, 2007).During the 'Derge' regime landlordism was abolished, and the 'Kobbo' system started to breakdown in the villages. In some kebeles, the access to the forest resources started to open towards all the people, but the trees (especially for beekeeping purposes) are still individually owned with exclusive use rights.

In Sheka forest within this already existing local practice, the NTFP Research and Development Project Southwest Ethiopia has started Participatory Forest Management (PFM) operations in 2003.Most countries in Africa have promoted PFM since the 1990's for sustainable forest conservation (Rasul*et al*, 2011). Many believes that sustainable forest management can be possible through clear and recognized access rights to these resources as well as multi stakeholder agreements on the objectives of forest management. PFM assumes that the local communities' right to use forest resources is recognized (Tacconi, 2007). The hypothesis is that the benefits which local communities perceive from the forest motivate the wise use and conservation of forest resources (Tacconi, 2007).

Other forest resource management approach that has been practiced in Sheka is Biosphere reserve. The United Nations Educational Scientific and Cultural Organization (UNESCO) has registered the Sheka forest to its global list of 599 Biosphere Reserves in 117 countries in 2011 (Melca, 2013).Biosphere reserve is designed with the objective of achieving a sustainable balance between the sometimes-conflicting goals of conserving biological diversity, promoting economic development, and maintaining associated cultural values (UNESCO, 1996).

The Sheka Forest Biosphere reserve is designated as core zone, buffer zone and transitional zone (SFBRNF, 2011).Core zone is an area devoted to long-term protection of the natural forest. It is an area to be protected from human interference except for traditional non-timber uses such as traditional beekeeping, wild spices and medicinal plants collection, ritual ceremonies as well as controlled eco-tourism using some routes, research, monitoring, and trainings. The buffer zone on the other hand is an area devoted for both conservation and use functions. All use functions except logging, new permanent settlements, and high impact investments like monoculture

plantation, intensive agriculture and hunting are allowed in this area. And lastly the transitional area is a development zone where all activities for livelihood of the local community take place (SFBRNF, 2011).

The centuries-old uses of the forest commons comprise a significant part of what remains of the traditional forest knowledge and management practices in Sheka forest. However, while common forest lands make important contributions to local communities and their cultural heritage, their effective and sustainable management presents many challenges. Despite these measures and programs and institution was wished to preventing open access and use of forest resources with sustainable livelihood, still in Sheka community has widely been used to day forest common right in the same ways as they were in the centuries. The actual exercise of traditional common rights (beyond the institutional level) has, for several decades, been very controversial. On one hand, traditional common land management practices are quite often unsustainable (Betru*et al*, 2005). On the other hand, common lands represent a remarkable heritage of environmental wealth, economic relations and socio-cultural values (Mastewal, 2010).

Similarly in PFM, certain literatures stated that there are gaps and challenges while implementing PFM. For instance, the study report by Gobeze *et al. (*2009) stated that PFM improves forest condition well and contributes better income and livelihood for local community. In contrary, the study by Tekalign *et al* (2015) who reported that largest proportion of the respondents indicated that being a member of PFM made no difference to their wellbeing and in terms of conservation plays major role in protecting from destruction rather improving forest condition.

In respect to BR, it is supposed to be an approach to sustainable development that integrates conservation, social and economic issues (UNESCO, 2002).On the other hand Stryamets (2013) states in his study the nature conservation orientation of BR's management which is supported by many countries' legislation might create also economic constraints for implementation of BRs as initiatives aims at sustainable development. And studies that explore local communities' perceptions of forest management approaches in terms of livelihoods and conservation are not widespread in south west Ethiopia. Therefore, this research has attempted to examine and assess

the contribution of the current forest management approaches with respect to livelihood benefit for community and forest natural status particularly answering the following questions.

1) Can the three forest management approaches empower the local community in terms of use and access right and benefit from the forest by respecting cultural and social value?
2) To what extent can the three forest management approaches play a role in improving forest condition in terms of woody trees diversity contributing for livelihood in contemporary times?

1.2. Objectives of the Study

1.2.1 General objective

To investigate the effect of different forest management approaches on the local livelihood support and woody species diversity in Sheka forest.

1.2.2 Specific Objective

- To assess the perception of local communities in terms of access right, use right, benefit & participation on the principle of existing forest management approaches with social and cultural perspectives.
- To identify the major forest products and evaluate the income and benefit gained from the three existing forest management approaches.
- Assessing the impact of the current forest management approach on woody species diversity and regeneration capacity

2. LITERATURE REVIEW

2.1 Overview of Forest Conservation and Rural Livelihood in Ethiopia

In Ethiopia, the most important forest areas were grouped into 58 National Forest Priority Areas (NFPAS) for management purposes in the 1980s (OFLP,2015). In 1993, there was a total area of about 4.8 million ha delineated under NFPAs. However, these didn't help to stop the destruction and extinction of forest areas. Hundreds of millions of people, mostly in developing countries, derive a significant part of their subsistence needs and income out of plant and animal products from natural forest. The livelihoods of many people in Ethiopia also depend directly or indirectly on forests (Aseffa, 2007).

Livelihoods are the access that individuals or households have different types of capital (natural, physical, human, financial and social), opportunities and services (Ellis, 2000). The study of Tamene and Legesse (2004) revealed that the livelihoods of the local people were highly dependent in one way or another on natural forest. Particularly, NTFPs like honey, forest coffee, spices and bamboo were identified as most important means of livelihoods. Moreover, the study identified that level of extraction of forest product is related to socio-economic characteristics of household and resource embodied in a patch of forest. Existences of NTFPs certification potentials were also identified as an important mechanism to enhance their contribution to the livelihood of local people as well as means to achieve sustainable conservation (Taye, 2003).

2.2 The Forest Vegetation of Southwest Ethiopia

The flora of southwest Ethiopia has been among the least known in tropical Africa until recent years, mainly due to lack of access. Until the mid-20th century, surveys and descriptions of the forest vegetation were based on the observations of a few foreign travelers. Neumann and Bieber, a German and an Austrian traveler, respectively, reported the existence of rain forests in the region for the first time in 1906 (Friis*et al*, 1982). The plant specimens collected by Bieber in 1906 were not identified until Cufodontis performed this task in 1948 (Friis*et al*. 1982). Some Italian foresters also visited the forests of SW Ethiopia around the late 1930s and early 1940s .The opening up of access roads in the 1960s facilitated botanical collection from the forests of the area. Sheka forested landscape is one of the area in the region that comprises an extraordinary natural and cultural landscape mosaic of dense natural forest, sacred/cultural

forest, managed forests for coffee and beekeeping, bamboo thicket, wetlands, agricultural land, historical sites, natural landmarks like waterfalls, caves, interspersed with settlements. According to Tadesse and Masresh(2007), Sheka forest possesses a high biodiversity, with unique and endemic flora and fauna, being part of the eastern afromontane biodiversity hotspot. The forest is also important for the role it plays in protection of watersheds that have local and international significance. It is highly regarded for flood and erosion control, and carbon-sequestration to mitigate the effects of climate change.

Moreover, Sheka forest is a crucial asset for local communities because it represents the main source of livelihood for many indigenous people. In addition, it provides a connection with the spiritual realm through the preservation of sacred natural sites, and contributes to the maintenance of a balanced ecological system. Despite these facts the forest is currently being threatened by a variety of negative pressures, including: expansion of monoculture and private investments (e.g. tea plantation), deforestation and forest degradation resulting from the expansion of agricultural activities, deforestation from an increasing need for energy (fuel wood and charcoal are being sold from forest resources), and the diminishing strength of the traditional cultural protection system.

2.3 Concept of Traditional Forest Management System

Traditional forest management means management which has been organized by indigenous people in different eras. The opposite of traditional forest and environmental management, which is organized by elders and on which there is no written documentation in Africa, is management organized by professional foresters and officials whose methods and objects are (or should be) regulated by forest, environmental and land policies as well as by written laws. There is a long tradition of human influencing forest in order to increase the benefits they drive from them. For instance, paleobotonical research has shown that in new Guinean even as long ago as the late Pleistocene, some 30,000-40,000 years ago people were manipulating the forest by trimming, thinning and ring-barking in order to increase the natural regenerations(Hladik *et al*,1993).

Knowledge about traditional forest management systems and how they were organized within the social set up of the day are limited. Within the gradual integration of new scientific forest management policies, traditional forest management systems are either ignored or over ruled

(Wangdi *et al*, 2014). A traditional forest management practice throughout the globe has moved in major ways to integrate new values and polices (Parrotta and Trosper, 2012).This change is mostly driven through the progressive accumulation of experiences and adaptive response to internal and external economic, political, social and ecological change (Berkes, 2008). In Sheka despite lack of literatures, the traditional forest management supposed to meet the basic needs of forest resources for communities and contributed in maintaining balance between environmental resources and growing population needs.

The traditional management of large forests (*kobo*) in the area is based on the rights and obligations of the individual who inherited the forestland from his ancestors (Zewdie, 2007). The holder of the forest who is allotted or has inherited a block is responsible for its management through traditionally known use and conservation rights. Other people are not allowed to use resources in *kobo* for hanging beehive and extraction of other NTFPs unless it is beyond the knowledge of the owner of a particular *kobo*. Clan leaders enforce the customary rules of forest management, though to a less extent nowadays (MELCA, 2011).Traditionally, clan leaders control the holder of *kobo* who is responsible for illegal timber extraction and other damages brought within his boundary. The clan leader has the right to impose different forms of punishments on the illegal use of forest resources. Currently, both the government and the owners control forest and NTFPs in *kobo* area. Clan leaders still provide informal advices for promoting conservation of resources in *kobo* area (MELCA, 2011). But the fact behind may be controversy because it is currently evident that in Kobo People are not obligated to obtain permits from any formal or informal bodies like local old client leaders as well as government, they haven't take any responsibilities in monitoring the violation of forest lows from concerned body.

2.4 Participatory Forest Management Concept and Sustainability

Participatory forest management (PFM) has emerged during the last decade as an effective approach to be used by local communities in taking part in decision-making to ensure the sustainable management and use of forest resources that are important to their livelihoods (Potters *et al.,* 2003). Based on the idea of Warner (2003), PFM can be defined as participation of stakeholders in forestry decisions, from policy formulation to field level execution and back

with a full role in decision-making. PFM provides an exclusive property right group of people or community over a patch of forests (Tsegaye *et al.,* 2004). It is regarded as an umbrella concept covering all of the different types of forestry activities that involve local stakeholders, especially villagers, in different degrees of decision-making authority (Potters *et al.,* 2003).Participatory forest management (PFM) can be considered a non-market community based institution for forest management and protection- and sustainable human development (Prasad and Kant, 2002).

Since the late 1970's many PFM systems have been practiced in the tropics because professional foresters noticed that they could not manage the forests sustainably under the principle of conventional and industrial forestry where the local people were considered to be obstacles or constraints to forest management (Inoue & Isozaki, 2003). A PFM system is considered to be an indispensable policy concept in achieving sustainable forest management and currently, PFM is viewed as a potential and increasing feature of forest policy and practice in most of the developing countries (Brown, 1999). Increasingly, policies and programs are crafted with the intent of enlisting local people as partners in forest land management. The involvement of local communities, local government, and other stakeholders (including private sectors, NGOs and international agencies) in forest management is accepted as an ongoing trend (Warner, 2003).In particular, the role of forest-based communities has received increased interest from researchers and policy-makers, and in developing countries, - forestry professionals have focused their attention increasingly on the interaction between communities and forests.

Like many other developing countries, there has been an unprecedented enthusiasm for PFM in Ethiopia. Participatory forestry ensures active participation by the rural people in planning, implementing, and benefit sharing of tree growing programs. It includes a forestation programs in marginal and degraded state and communal forest lands and varied other manifestations of agro forestry .The primary objective of PFM, - in most of the developing countries, - is to reduce the poverty of local communities through livelihood support and empowerment. It helps to secure livelihoods through better access to forest resources (Fisher and Hirsch, 2008).

In the past, the impacts of PFM on poverty reduction were assessed in terms of income or food security. The current approach, however, attempts to go beyond the previous criteria and include

multidimensional characteristics and causes, and that is of sustainable livelihoods (Warner, 2003).But certain literatures stated that there are gaps and challenges while implementing PFM. For instance the study report by Tekalign *et al* (2015) who reported that largest proportion of the respondents indicated that being a member of PFM made no difference to their wellbeing. There was also an assumption that PFM promoted as a solution to problems associated with deforestation and forest degradation. The same research report revealed that there are few numbers of seedlings and saplings of economic and ecologically important tree species under the forest but it plays a major role in protecting from destruction rather improvement of forest condition(Tekalign *et al*, 2015).

2.5 Concept of Biosphere Reserve Forest Management Strategy

According to UNESCO's definition, Biosphere reserves are places recognized by Man and Biosphere (MAB) where local communities are actively involved in governance and management, research, education, training and monitoring at the service of both socio-economic development and biodiversity conservation. Biosphere reserves are sites for experimenting with and learning about sustainable development. By design, there is no single model for running biosphere reserves, but there are two common underlying principles: the management system of a biosphere reserve needs to be open, not closed, to community concerns; and it needs to be adaptable to changes in local circumstances.

Biosphere reserves are meant to be places where communities can work in concert with the area's land-managing agencies, local governments, schools, and other institutions to design responses to external political, economic, and social pressures that affect the ecological and cultural values of the area. Each biosphere reserve has its own system of governance to ensure that it meets its functions and objectives. Often it is found useful to set up a committee or board that coordinates all biosphere reserve's activities. Usually a coordinator is named as the contact person for all matters dealing with the biosphere reserve (Stryamets, 2013).Biosphere reserve (BR) as a concept has multiply functions, among them conservation function, sustainable development, monitoring and scientific functions (UNESCO, 2002).

Biosphere reserve is tool for bringing together ecological, social and economic issues towards sustainable development (UNESCO, 2002). The sustainable development principle integrates

present and long-term needs at local, regional and global scales, embracing ecological, economic and socio-cultural dimensions as interdependent components of societal development progress. Biosphere Reserve is one of several concepts established to create learning sites for sustainable development toward sustainability on the ground, and to reconcile the conflicts between nature conservation and regional sustainable development (Bridgewater, 2002). It as a concept applied on the ground has three main functions: (1) a conservation function, i.e. to conserve genetic resources, species, ecosystems and landscapes; (2) a development function, i.e. to foster sustainable development as a societal and collaborative processes; and (3) a logistic support function, i.e. to support research, monitoring, education, training, establishment of demonstration sites, and to promote environmental awareness related to local, national and global issues of conservation and development (UNESCO, 1995).

Thus, a BR could be used as an approach to sustainable development that integrates ecological, social and economic issues (UNESCO, 2002).There are a number of opportunities with the BR. Among them the economic component includes the rural territories development where green tourism is thought to have a large potential (Elbakidze *et al.*, 2013). New green technologies could in connection to the BR be introduced to the area as example of sustainable resource use. Among other potentially beneficial issues for rural economic development is the transition to organic farming. The BR status might be an opportunity to develop a labeling scheme for organic products, like it was done in some European BR (Amend *et al*., 2008). For the local stakeholders the BR status could lead to new funding opportunities.

Not only opportunities there are also constraints or threats in implementing biosphere reserve. The results from the policy analyses and interviews with stakeholders in the emerging BR showed that the legislative domain of the BR concept had a clear negative impact on the different perceptions of what the BR concept is by different stakeholders. For instance Stryamets (2013) states in his study the nature conservation orientation of BR's management which is supported by many countries' legislation might create also economic constraints for implementation of BRs as initiatives aims at sustainable development. This is likely to make BR implementation challenging and wrought with conflict among stakeholders. This notion is also supported by Bosak (2008) who stated that the promoters of BR initiatives often meet resistance from local

people that recognize the BR as a pure nature conservation tool, which brings limitations in nature resource use and does not provide any economic benefits for local people

2.6 Evolution of the Community Based Forest Management approach

A few centuries ago customary local forest management was the norm around the world, people had local rules and practices that helped ensure that use of the forest was carried out on a wise basis. Customary responsibility went into rapid decline with the superimposition of centralized regulatory forest control especially during the colonial period. Countries not colonized, including Ethiopia and Thailand also adopted centralized regulatory approaches. This period of centralized regulatory control of forests has coincided with the most rapid decline in natural forest resources in human history and utterly changed the relationship between rural people and the forests around them. Regulatory forest policies and programs were often impossible to implement in developing countries because of lack of human and material resources. Fundamentally they promoted an open access mentality among forest dependent people-"why should I protect what does not belong to me and I cannot legally benefit from? The result of the regulatory approach was often the opposite of the intention – uncontrolled forest depletion (Kant and Berry, 2005).In response to the failures of the regulatory approaches, in the late 1970s international donors began to support social forestry as it became increasingly clear that governments on their own could not manage the forest resources without cooperation of local people. However in these early initiatives villagers were often not provided with an opportunity to design the projects or to make decisions about how they would be implemented.

Fundamentally often land and tree tenure issues were not addressed. This led many local people involved in the schemes to not invest time and effort in the maintenance of trees after planting. In the 1980s, approaches evolved further, the social forestry focus moved from plantations to include natural forest. These initiatives were often based on the assumption that both lack of environmental awareness combined with poverty led to deforestation and that environmental awareness campaigns and alleviating poverty through alternative livelihoods approaches would take the pressure off the forest. These initiatives worked only on a small scale with heavy subsidization from projects, so that scaling up continually proved a challenge, as did problems with maintaining the motivation of community members to protect the natural forest after the project support ceased (Kant and Berry, 2005).

Various participatory studies around the late 1980s and early 1990s delved deeper into the perspectives of forest dependent people to identify their perspectives on the root causes of the lack of investment in sustainable forest management. The results included a questioning of poverty as the clear cause of deforestation, as it was highlighted that often the rich were more responsible for deforestation than the poor and that if wealth was increased, demand for forest products increased, rather than decreased. Also research showed that increasing the value of the forest for local people, rather than distracting them from forest use through alternative livelihood approaches was the best way to increase motivation to protect the forest and discourage conversion to agriculture(Kant and Berry, 2005).

2.7. The Concept of Forest Use, Access and Management Rights

Access rights are the rights held by a community and its members to enter a forest area. Having this right to enter or pass through a particular space is the most basic tenure right and is closely linked to its opposite: the right to exclude or deny another party access to a particular resource (Ribot and Nancy. 2003). While access rights may seem self-evident, the reality is often far more complex, particularly if the state has granted the right of exclusion to another party—such as a private landowner, a protected-area manager, or an agency of government. If the rights-holding in this alternative circumstance wishes to exclude a forest community or some members of it, or to give access rights to third parties who might use the forest resources contrary to the customs of said communities, they can do so legally. In fact, much of the insecurity associated with community land in Africa derives from the legal enactment of the right of the private landowner, concessionaire, or park authority.

The right to withdraw forest resources is perhaps the most important right for communities that are dependent on forest resources for their livelihoods. Withdrawal rights—or the right to benefit—may be for subsistence or commercial purposes. In forest areas some nations' legal instruments frequently differentiate between the right to harvest timber and the right to harvest non-timber forests products. Without explicitly protected and defined withdrawal rights, rural livelihoods are highly vulnerable to restrictions, particularly in regimes where the state retains a claim of ownership over land. In these situations, rights are limited to usufruct; access to particular resources may be restricted, either for conservation purposes or because the government is waiting to allocate those resources to larger-scale actors (RRI, 2012).

Defined withdrawal rights therefore legitimize local livelihood systems and decrease the likelihood that communities will face threats to their traditional livelihoods or barriers to markets. Withdrawal rights are often accompanied by limitations. In most cases, these plans fail to recognize the traditional ways of managing natural resources practiced by Indigenous Peoples or other communities, even in the case of subsistence use. This implies, in practice, a restriction on the customary use recognized by statutory instruments. The right to manage a specific geographical area implies a higher degree of both responsibility and freedom. The concept used to define management rights is broad and includes those rights that communities have to regulate and make decisions about the forest resources and territories for which they have recognized access and withdrawal rights.

The right to manage can be defined by the legal limits of other rights, and it can also be used to empower a community to articulate its rights to alienation or the exclusion of particular resources. For example, if a community can only withdraw NTFPs for subsistence purposes, the law may recognize the right to regulate internal access and patterns of use and to transform the NTFP resources for subsistence. This is the case, for example, for the Zones of Historical and Cultural Use and Value in Mozambique, in which communities have the right to manage timber and non-timber resources for subsistence purposes only. Forests are complex ecosystems but can be used or managed with specific outcomes in mind, such as the use of particular species, the storage of carbon, to meet timber production goals, or to produce medicines or other NTFPs. Attaining such outcomes often requires specific management techniques and a balance in the access and withdrawal rights of particular individuals, households, and groups within a community. The right to decide the outcomes, and the practices for achieving them, is therefore highly relevant to communities and households dependent on forest resources (Hall *et al,* 2011)

3. MATERIALS AND METHODS

3.1 Study Area Description

Location

The study was conducted on Sheka forest; Masha district southwest Ethiopia. It is located at about 670 km from Addis Ababa towards Southwest Ethiopia in Sheka Zone of SNNP Regional State. Geographically, the district lies between 7°24'–7°52' N latitude and 35°13'–35°35' E longitude. The altitudinal range of the areas falls between 1600–2700 m.a.s.l. The district is one of the five Woredas in Sheka Zone that shares a boundary with Oromiya Region in the North, Gambella in the West, YekiWoredain the South and AnderachaWoredain the East. In the district, there are 19 rural and 2 urban kebeles.

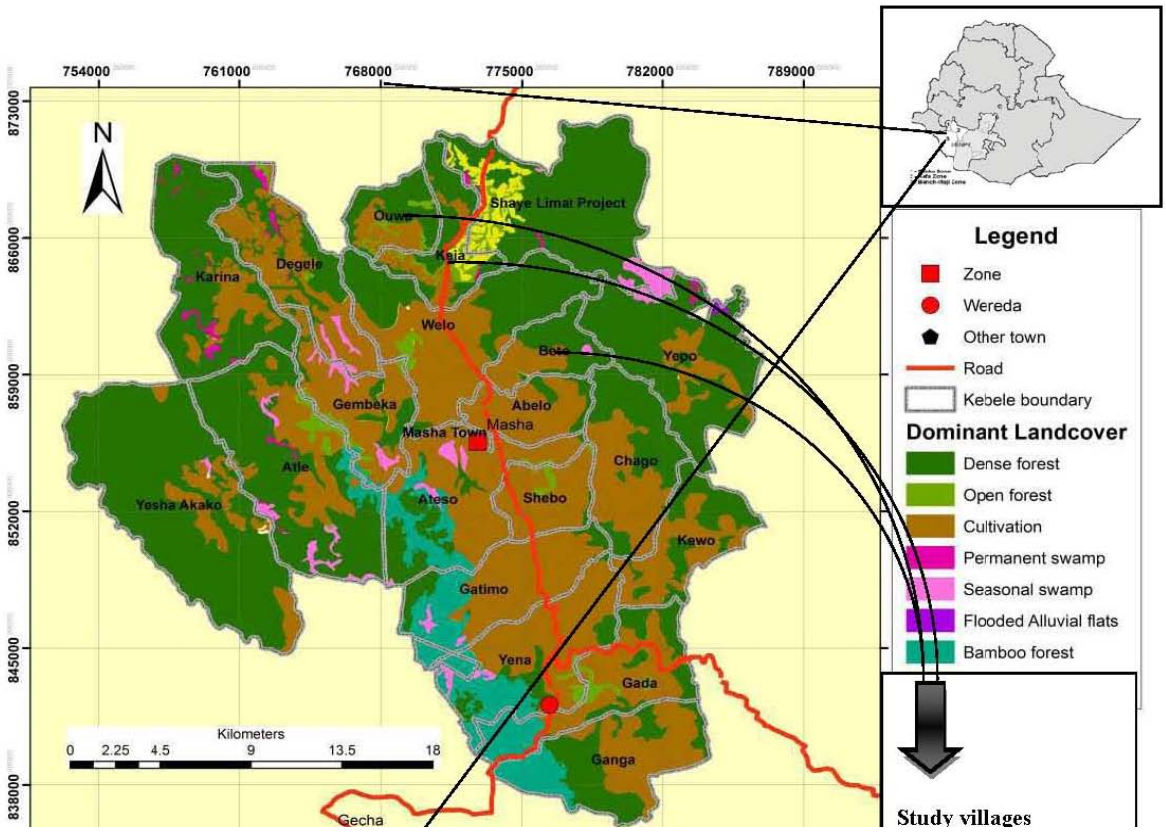


Figure1. Map of the study area

Climate and soil type

The mean annual rainfall is more than 2300 mm mostly falling during the humid season between April and November (monthly means 100–350 mm and higher than potential evapotranspiration), with dry spells between December and March (dry season, monthly means 40–100 mm and lower than potential evapo transpiration). The temperature is moderate throughout the year, with monthly mean range of 16 0 C to 20 0 C. The soil is deep (>1.5 m) and clayey (46% clay, 27% silt and 8% sand) with about10 cm thick organic layer and low pH (4.3–5.2) (Embaye*et al*, 2004).

Farming system

Farming system is characterized by a subsistence mixed farming system, where rain-fed crop farming and livestock production coexist. They cultivate mainly maize (*Zea mays* L.), teff (*Eragrostis*Zucc.), beans (*Viciafaba*L.) and false banana (*Ensetventricosum)* locally called "enset". Cattle, sheep and goats are the main livestock types raised in the area. Harvesting of non-timber forest products such as wild coffee spices and honey occupies an important place in the household economy in the area (NTFP PFM, 2009). Survey conducted in the area revealed that honey, *enset*, livestock, annual crops, sugarcane, liana, chat and gesho, cardamom, wild coffee, palm, banana and '*timiz'* in descending order of importance are the major means of subsistence (NTFP 2004).

Vegetation

Covered with the moist montane forests which are valued for their high species endemism (Tadesse and Arassa, 2004) and have essential hydrological functions, being sometimes referred to as a 'Water Tower' for the Baro and Akobo river system (Bekele and Tesfaye, 2013). In addition they are highly valued by communities living in the area for domestic and economic purposes, are the natural habitat of the wild *Arabica* coffee (Hein and Gatzweiler, 2006) and are remarkable for other economically important plant species including spices and honey bee flora.

Population

The district has a total population of 40,810, of whom 20,116 are men and 20,694 women; 6,787 or 16.63% of its population are urban dwellers. The majority of the inhabitants were Protestants,

with 56.5% of the population reporting that belief, 32.82% practiced Ethiopian Orthodox Christianity, 7.15% practiced traditional beliefs, and 1.56% was Islam (SZFEDO, 2009)

Topography

The study area is mountainous with green vegetation which has attractive scene. The topography of the area comprises different land futures are flat area, rugged topography, plateau and steep sloppy areas are commonly observed in the study area (Alemayhu, 2010).

3.2 Method of Data Collection

In this research both primary and secondary data sources were used. The primary data were obtained from field work. To collect data from household respondents, structured questionnaire was prepared and pre-tested through pilot study before directly applied in order to improve its clarity as well as its accuracy. After the required modification was made on the question, it had been distributed to the selected sample size to respond to the questions. The questionnaires were administered on a face-to-face interview bases to increase the likelihood of the questionnaire paper return. It was translated into the local language and enumerators were recruited from the study area.

Key informant interview was also conducted as people discuss the way they perceive things with each other, the possibility to reveal their true feeling and understanding about the topic can be increased. This is particularly important to have information people would otherwise like to conceal. In addition, this method is used to have collective view of the respondents. A focus group discussion "…is invariably interested in the ways in which individuals discuses certain issues as a group, rather than simply as individuals."(Bryman, 2008).For such reasons, key informants were purposely sampled and conducted with specialized knowledge of the characteristics at each survey site. The size of each group was six people. Focus group discussion was used to triangulate data collected from community via questionnaire.

Forest vegetation inventory was undertaken to measure and identify the woody species diversity and natural regeneration under the selected forest patches. To support the other sources of data field observations were conducted and various sites of the forest had been observed along

transect line walk. The secondary information was obtained from Published, journals, official records and project reports.

3.3 Study Site Selection

To identify the major issues pertaining to and effectiveness of current forest management approaches Uwa, Beto and Keja kebeles were purposely selected from the study district. Partly because they are the first intervention sites of the study district to be selected for implementation of the three forest management approaches. PFM is the oldest intervention site found in Uwa village, Keja village (Uto) in which forest land is extensively demarcated intervention for the biosphere reserves and Beto village which is still strong indigenous traditional common is being practiced were selected. In addition the study kebeles are adjacent to each other and they are approximately similar in terms of landscape (altitude, slope, aspect, soil). Therefore the three sites that have been seen as model samples for the study area were identified.

3.4 Sample Size and Sampling Determination

3.4.1 Household survey sampling

To fulfill the objective and to get answers for the listed research questions it was needed to collect the information from the local people. With this, there were three target groups for collecting the required information for the study. One was the local people who are formally member of the PFM, but also may utilize or access informally from other forest blocks (traditional and biosphere reserve) and the next group was village members who were relevant to the Biosphere reserve and for whom forest land is extensively demarcated for the reserve and directly involved with the BR planning and promotion.

The third were peoples who are in strong relation with indigenous traditional forest management approach. But it should be clear that three of the forest management approaches are practiced in three of the villages where considered as sample sites for the study and the sample households were selected from each of the villages (Table 1).Therefore, for this study total of 3community groups were included from each approaches found in the study area. Notice that all of the respondents from the three villages were asked about three of the management approaches in order to get clear perception particularly, on access and use right of the forest resource.

The sample size of the households was determined based on the formula below. The formula helped to determine the required sample size. This simplified formula assumes a 95% confidence level and the maximum variance (p = 0.5). The formula is:

$$n = \frac{N}{1 + N(e)^2}$$ ..... (Kasunic, 2005).

Where

n -is the sample size

N -is the population size

e -specifies the desired level of precision, where e = 1– precision (0.05 limit of tolerable error) level of precision= 9% (0.09).

1 = a theoretical or statistical constant. Based on the formula, 100 households were selected from the total sample size of villages.

Table1.Total number of HH and forest cover with sampled size

No	Forest village	Forest block	Total HH of the forest village	forest cover in ha	Sample size	
					HH.Sample size	Forest sample plots
1	Uwa	Yigo-1	180	760	33	27
2	Beto	Shato	110	450	21	16
3	Keja	Uto	250	680	46	24

Then, in three of forest management blocks (Table 1), total of 100 households were selected by using systematic sampling method. Systematic sampling involves drawing a sample by taking every *K*th case from a list of the population (Ary *et al*., 2002) .The lottery method was used to have random start (the first household).

Mathematically,

K = N/n Where, K= sampling interval

N= total households of the Kebele

n= sample size

In addition, we used purposive sampling to select six key informants (based on their experience and knowledge that they acquired) concerning their perception on importance on livelihoods and access and use right of each forest management blocks (approaches)

3.4.2 Forest vegetation sampling

An inventory was carried out in the identified sample site using systematic line transect sampling design. Square plot of 20 m*20 m($400m^2$)was laid along the transect line that were laid at an interval of 400 meters (Hall and Bawa, 1993). Square plots were laid out along transect line by starting with a corner point located by survey. The second corner was then located and at both corners, right angles were established to locate corners three and four. The first plot and the starting transect lines were located randomly from all forest patches. All sample plots were located at least 40 m from forest edges to avoid edge effect on the species diversity and regeneration rate. A total of 67 plots (27 in the PFM forest, 24 in the biosphere and 16 in the traditional forest blocks) were sampled that had a space every 300 meter along linear and parallel separated by 400 meter from one another, because the required sample plot need to be representative of the whole forest population. The species accumulation curve shows that the sample plots are enough to represent each forest stands.

The big plot size of 20m*20m (400 m^2) was used as the main plot for inventorying mature trees (DBH > 10cm) in which species type identified and basal area per plot were calculated over. For saplings and seedlings, an inner 10m*10m sub-plots were used. The seedlings recorded were defined as woody plants with height $\leq$ 1.5 m, and sapling as those with height >1.5 m, and DBH <10 cm (Kelbessa and Soromessa, 2004). Seedling and sapling designations were thus not based on pure biological criteria, but were categorizations separating relatively small trees from larger, better established individual. All seedlings within 1.5 m and saplings within 2 m tall were counted.

In each plot, all of the tree species and number of all plant individuals were identified and counted. Tree species names were identified in the field with the help of knowledgeable local individuals for vernacular name in the field and published field guides on the Flora of Ethiopia and Eritrea (The National Herbarium Addis Ababa University, 1997), and honey bee flora of Ethiopia (Fichtl and Admasu, 1994).Caliper and diameter tape were used to measure tree DBH,

GPS to measure longitude and latitude of the plots, and compass for direction were used during the forest inventory.

3.5Data Analysis

3.5.1 Socioeconomic data analysis

Answers recorded during the interviews were edited, coded and entered for computer analysis by using Microsoft Excel and Statistical package for social sciences (SPSS) version 20 by preparing variable description files. Descriptive statistics was computed and some frequency distribution data was cross tabulated and presented in table and graphs. Respondents' perceptions with regard to importance of management approaches were aggregated in to four components such as source of livelihoods,forest income,social value and cultural value.The levels of the rate of importance of forest from the approaches were determined by dividing in to different categories namely low,moderate and high .

Determination of the perception level of importance of individual respondents on the forestfor the management approaches was made by adding the total number of respondents for each category and then calculating its percentage.Thus, the perception level of respondents on the importance of forest management types was determined using percentage of respondents. Before the generalization of perception of importance of forest for each management approaches from total respondents of the three forest villages, the proportion of respondents from each forest villages were analyzed for each level of category.

Inorder to identify the relation between each forest management approaches of the selected variables,pearson correlation which is a statistical measure of the strength of a linear relationship between each data of the villages and the approaches was used.In a sample it isdescribed by the strength of the correlation using the guide that Evans (1996) suggests for the absolute value of *r*and is designed by $-1 \leq r \leq 1$,

3.5.2 Forest vegetation data analysis

All individuals of species registered in all the 67 sample quadrants were used in the analysis of vegetation structure. The Diameter at Breast Height (DBH), basal area, tree density, frequency and important value index were used for description of vegetation structure. Diameter at Breast Height (DBH**)** was measured for those woody plants having diameter greater than 10 cm at breast height (1.3 m) from the ground, using caliper and for those trees being larger than the caliper diameter, common tape was used to measure the circumference and then diameter was calculated from circumference (c); d= c/π, where d is diameter at breast height. Basal area that defines the area of a given section of land that is occupied by the cross-section of tree (Suratman, 2012) was also used to calculate the dominance of species.

$$BA = = (DBH/2)^2 * \pi$$

Where; BA- Basal Area (M^2); D (DBH) -is diameter at breast height (cm), Π= 3.14

The Importance Value Index (IVI), which is a sum of relative density, relative frequency and relative dominance, was calculated for each species. The vegetation data of the tree species were calculated on Excel spread sheet using the following formulas;

$$\text{Relative density} = \frac{\text{Density of one species}}{\text{Total density}} * 100$$

$$\text{Relative frequency} = \frac{\text{Frequency of one species}}{\text{Total frequency}} * 100$$

$$\text{Relative dominance} = \frac{\text{basal area of species}}{\text{Total basal area}} * 100$$

Species diversity, richness and evenness indices, which provide important information about rarity and commonness of species in a community, were used. The indices can be used to compare diversity between habitat types (Suratman, 2012). Species richness is simply the number of species present in an area. Species evenness refers to the proportion that each species comprises of the whole (Nolan and Callahan, 2006). Thus, different diversity, species richness, species evenness indices were calculated for each transect as well as pooled data from each transects for three forest patch categories.

The Shannon-Weiner Species Diversity Index which is commonly used to characterize species diversity in a community was calculated by taking the number of each species, the proportion of each species of the total number of individuals, and sums the proportion times the natural log of the proportion for each species. Since this was a negative number, then the negative of the negative of this sum was taken. The higher the number, the higher is the species diversity (Nolan and Callahan, 2006).

Diversity Index (H') = $-\sum_{1=i}^{s} pi \ln (pi)$

Where; H' = Shannon's diversity index

S = total number of species in the quadrate

Pi = ni/N, the number of individuals found in the i^{th} species as a proportion of the total number of individuals found in all species.

In = natural logarithm to base e (Nolan and Callahan, 2006).

Evenness (E) was calculated using the Shannon evenness index following the equation:

$$\text{Evenness (E)} = \frac{H'}{H'max}$$

Where:

H'- is the Shannon- diversity index and,

H′max = ln S

S- The total number of species at a site (Alatalo, 1981 cited by Rocky and Mligo, 2012).

To know Statistical difference of species indices between the forest management approaches, ANOVA test was used.

4. RESULTS AND DISCUSSION

4.1 Socioeconomic survey

4.1.1 Community Perceptions on Importance of Forest Management Approaches

Perception with regard to livelihoods and income

In table 2 proportion of respondents from Uwa site (n=33), Beto forest sites (n=21) and Keja site (n=46)towards the importance of forest changes with forest management approaches shows that majority (51%, 47.6% and 47.7%) from Uwa, Beto and Keja respectvely felt thatforest as source of livelihoods is being mediumduring PFM approach, the figure lowered to 18% , 24% and 28% during traditional, whilst lowered to 24% , 24% ,and 15% during BRA from Uwa , Beto and Keja respectively.

During traditional forest management, 70%, 62% and 57% from Uwa, Beto and Keja respectively perceived that forest as source of livelihoods is high, the proportion decreased to 22%, 28.6% and 24% from Uwa, Beto and Keja respectively during PFM, while decreased to 12%, 19% and 26% from Uwa, Beto and Keja respectively during BRA. Majority of the respondents (64%, 57%, and 41%) from Uwa, Beto and Keja respectively reacted to be low during BRM, but the figure lowered during PFM and traditional management approaches (Table 2).

Perception on income from PFM showed that majority of the household respondents from three of the forest villages stated that they raise moderate income (43%, 43%, and 54% from Uwa, Beto and Keja sites respectively). Incase of traditional, 72.7%, 68% and 78% of the respondents from Uwa, Beto and Keja sites respectively stated to be high. But only few people perceived to be low (table 2). In Biosphere reserve 61%,71% and 69% of respondents reacted to be low from Uwa, Beto and Keja forest sites respectively,but inconsiderable proportion of respondents perceived to be high(Table 2).

Table 2:Proprtion of respondents' Perception on livilihood and income contribution

PFM site	**proportion on livelihoods dependency**			**proportion on income**		
	Low	**Medium**	**High**	**Low**	**Medium**	**High**
Uwa	n=9(27%)	n=17(51%)	n=7(22%)	n=7(21%)	n=14(43%)	n=12(36%)
Beto	n=5(23.8%)	n=10(47.6)	n=6(28.6%)	n=6(28.6)	n=9(43%)	n=6(28.4%)
Keja	n=13(28.3%)	n=22(47.7)	n=11(24%)	n=12(26%)	n=25(54%)	n=9(20%)
Proportion total	n=27(27%)	n=49(49%)	n=24(24%)	n=25(25%)	n=48(48%)	n=27(27%)
Traditional site	**Low**	**Medium**	**High**	**Low**	**Medium**	**High**
Uwa	n=4(12%)	n=6(18%)	n=23(70%)	n=5(15.3%)	n=4(12%)	n=24(72.7%)
Beto	n= 3(14%)	n=5(24%)	n=13(62%)	n=3(14%)	n=4(18%)	n=14(68%)
Keja	n=7(15%)	n=13(28%)	n=26(57%)	n=4(9%)	n=6(13%)	n=36(78%)
proportion total	n=14(14%)	n=24(24%)	n=62(62%)	n=12(12%)	n=14(14%)	n=74(74%)
BR site	**Low**	**Medium**	**High**	**Low**	**Medium**	**High**
Uwa	n=21(64%)	n=8(24%)	n=4(12%)	n=20(61%)	n=10(30%)	n=3(9%)
Beto	n=12(57%)	n=5(24%)	n=4(19%)	n=15(71%	n=5(24%)	n=1(5%)
Keja	n=19(41%)	n=15(33%)	n=12(26%)	n=32(69%)	n=9(20)	n=5(11%)
Proportion total	n=52(52%)	n=28(28%)	n=20(20%)	n=67(67%)	n=24(24%)	n=9(9%)

In terms of livelihoods contribution for the local community, the respondents' Pearson correlation coefficient value of 0.107 between PFM and traditional forest management approach showed that there appeared to be very weak positive correlation but between PFM and biosphere reserve there is negative correlation (r= -0.089).Similarly there is negative correlation between traditional and biosphere reserve (r=-0.021) (Table 3).

Table 3: Correlation output with regard to source of livelihood within the three approaches

		PFMcFSOL	TRAcFSOL	BIORcFSOL
PFMcFSOL	Pearson correlation	1	0.107	-0.089
	N	100	100	100
TRAcFSOL	Pearson correlation		1	-0.021
	N		100	100
BIORcFSOL	Pearson correlation			1
	N			100

PFMcFSOL=PFM contribution for source of livelihood,
TRAcFSOL=Traditional contribution for source of livelihood
BIORcFSOL= Biosphere reserve contribution for source of livelihood

The result in the statistical analysis indicated that there was negative correlation between the income of PFM and traditional forest practices (r = -0.370), whereas there is very weak correlation between PFM and biosphere reserve forest management (r= 0.117), though there is positive relation among the two approaches (Table 4). With regard to traditional and biosphere reserve forest management approaches, there was negative correlation (r=0.032).The perception result indicated that there is decrement of income from biosphere reserve while income from traditional forestry boosts.

Table 4 Correlation output with regard to income within the management approaches

		PFMcFCOM	TRAcFCOM	BIORcFCOM
PFMcFCOM	Pearson correlation	1	-.370	.117
	N	100	100	100
TRAcFCOM	Pearson correlation		1	
	N		100	
BIORcFCOM	Pearson correlation		-.032	1
	N		100	100

PFMcFCOM = PFM contribution for source of income
TRAcFCOM = Traditional contribution for source of income
BIORcFCOM = Biosphere reserve contribution for source of income

Over all, the result indicates that a considerable difference was found in the perception of local community with respect to income and livelihood contribution with the three forest management approaches. The perception of local community towards the importance of forest changes with forest management approaches shows that 62% of the respondents felt that forest as source of livelihoods is high during traditional forest management approaches, the figure lowered to 24% and 20% during PFM and BRA, respectively. This result is in line with the previous study(Young, 2007) which was stated as; traditional resource management can serve to enhance the livelihood of rural people who are dependent on forest resource. The finding is also in agreement with the report by Berhanu et al (2003); Kayambazinthu et al (2004) who stated that traditional forest resource management has the capacity in enhancing livelihood improvements of rural community.

Based on all valid survey response, level of dependency on forest with regard to traditional approach were high. In the same manner the findings indicated the level of dependency on forest

from PFM is medium proportion from all respondents. In case of the biosphere respondents interviewed stated that they were with low level of dependency in terms of income and livelihood. The study indicated that PFM has less value rate in terms of dependency and income with compared to traditional approach but more than that of biosphere reserve, which the present study finding agree with the previous study report by (Tekalign *et al,*2015), peoples out of PFM have high level of forest dependence. But when observed in terms of biosphere, this finding is also supported by studies in other countries, where BR as a pure nature conservation tool (Bosak, 2008), which brings limitation in nature resource use and doesn't provide considerable income for local people.

Perception with regard to social and cultural value

In terms of social value when the interviews were carried out respondents were engaged to consider gender equity, religion inclusion and exclusion and ethnic minority and majority on the involvement of forest use and access right. Regarding cultural value the respondents and key informants for focus group discussion were engaged on the taboos, norms, customs and local rules value while forest management practice is implemented. In addition particularly focus group discussion was engaged to describe about social and cultural value of the approaches. As illustrated in Table 5, regarding social value toward PFM, among all respondents from the three villages most of them perceived to be low, where as in terms of cultural value most of respondents felt to be medium. In respect to traditional forest management approach, most of the respondents perceived to be medium and high for social and cultural value respectively. And none of the respondents reacted low for the cultural value of the approach (Table 5).

In terms of biosphere reserve forest management approach it was perceived to be low with respondents' proportion of 49%,45% and 48% from Uwa, Keja and Beto respectively with regard to social value, whereas in terms of cultural value most of the respondents perceived to be high which accounts 76%, 74%, and 76% from Uwa, Keja and Beto respectively. Majority of respondents perceived to be low with regard to social value may be due to the exclusion of minority groups and it's mostly those dominant ethnic groups who mainly participate on the management of biosphere reserve even though the principle of the biosphere reserve theory doesn't support the idea. The result from the respondent community shows social value of biosphere reserve has minor contribution for the community. But with regard to cultural value

the high perception may be due to respecting of the local taboos and rules and customs of approach.

Table 5 Proportional Perception of respondants on the social and cultural value of the approaches

PFM site	**social value**			**Cultural value**		
	Low	Medium	High	Low	Medium	High
Uwa	14(42%)	18(55%)	1(3%)	5(15%)	17(52%)	11(33%)
Keja	20(43%)	15(33%)	11(24%)	10(22%)	25(54%)	11(24%)
Beto	9(43%)	6(28%)	6(29%)	4(19%)	13(62%)	4(19%)
proportion total	43(43)	39(39%	18(18%)	19(19%)	55(55%)	26(26%)
Traditional site	Low	Medium	High	Low	Medium	High
Uwa	7(21%)	11(34%)	15(45%)	0(0%)	5(16%)	28(84%)
Keja	5(11%)	27(59%)	14(30%)	0(0%)	11(24%)	35(76%)
Beto	4(19%)	16(76%)	1(5%)	0(0%)	5(24%)	16(76%)
proportion total	16(16%)	54(54%)	30(30%)	0(0%)	21(21%)	79(79%)
BR site	Low	Medium	High	Low	Medium	High
Uwa	16(49%)	12(36%)	5(15%)	1(3%)	7(21%)	25(76%)
Keja	21(45%)	16(35%)	9(20%)	2(4%)	10(22%)	34(74%)
Beto	10(48%)	7(33%)	4(19%)	0(0%)	5(24%)	16(76%)
proportion total	47(47%)	35(35%)	18(18%)	3(3%)	22(22%)	75(75%)

Overall the perception of local community towards social value with forest management approaches indicates that 16% of the respondents felt that forest has low social value during traditional forest management approaches, the figure increased to 43% and 47% during PFM and BRA respectively. This could be due to less involvement and not being a membership by ethnic minority groups in PFM and absence of community institutional organization in biosphere reserve. From the finding we understand that more number of respondents for the positive perception balanced toward traditional forest management approach. Results on this count corroborate with the report by Yeraswork (2001) that states the very nature of the rules that govern the traditional resource management in being evolving from traditional practice and the attribute of the local communities such as homogeneity in terms of social interaction on resource use and management. Also Zelealem and Williams (2005), described in social perspective local traditional natural resource institutions indicates pride in informal values and institutions, and their value as a tool for conserving and utilizing natural resource.

In addition, the perception of local community towards cultural value with forest management approaches indicates that 79% and 75% of the respondents felt that forest has high cultural value during traditional forest management approaches and BRM respectively, the figures lowered to 26% during PFM. Particularly the focus group discussion also described that traditional forest management (Kobo) and biosphere reserve have been respecting and practicing the local culture in the community. But in the PFM more number of respondents falls on the medium rate. This finding show that biosphere and traditional forest management approaches highly inter connect the local community culturally, but only a few people felt to be high toward PFM showing that PFM has less cultural implication as compared to the two approaches. This finding is related with the finding by (Zewdie, 2007) which states that traditional resource management practice appreciate local people's customs, believes and rules. In contrary, PFM is supported by rule and regulations prepared by government body and the association members with the regional and national legislative guide line. During implementation there is more respecting government's rule rather respecting of the customs and taboos on traditional way.

4.1.2 Perception on access and use right of forest managemnt approches

In this study, access right and use right as a variable may represent and include many forms of collective right that do not necessarily corresponded to modern classification as either private or public right, traditionally exercised by a community in its use of land or particular natural resource for defined purpose. More documents extended this meaning to cover a much wider range of tangible and intangible goods (Bollier, 2002). In Sheka forest users have age-old traditional rules and rights that are well recognized by the entire forest users. Such rules, although not formally written ,are in force for long, and are respected by communities and there are customary rights and forest users with such rights leading to disproportionate extraction of certain forest products from over a relatively large forest area than other members who did not possess customary rights. The attitudes of local people were evaluated in such away in order to get a general impression of local people's reactions toward the informal right as well access in terms to their social conventions on what is acceptable or normal behavior commonly adhered to in a society.

Access right

In this study communities were engaged to describe the right to enter or pass through forest sites as well as the right or situation of the forest management approaches to exclude or deny accessing to a particular forest product. As to the level of perceived access right, the survey and percentage analysis (Figure 2) has showed that most respondents (59%, 55% and 67%) felt that there was limited access) from Uwa, Beto and Keja on PFM respectively. The result of perception of access right on traditional forest management approach has showed (Figure 3) majority of respondents (70%, 76% and 59%) said that there was an open access whilst a very few percentage (6% from Uwa kebele) and none of the respondents from both Keja and Beto kebeles perceived to be no access right on the forest resource (figure 2). The total proportional survey result from respondents' analysis has showed 2%, 3%, 29% and 66% ` perceived to be none, extremely limited, limited and open access respectively (n=100) from traditional natural forest management. With regard to BR management approach, 67%, 62% and 63% of the respondents considered that extreme limitation on access right from Uwa, Beto and Keja sites respectively. High proportion of respondents in the study area indicated that, they did not go and harvest forest resources from BR natural forest, but very small proportion of respondents said that limited and open access on the resource.

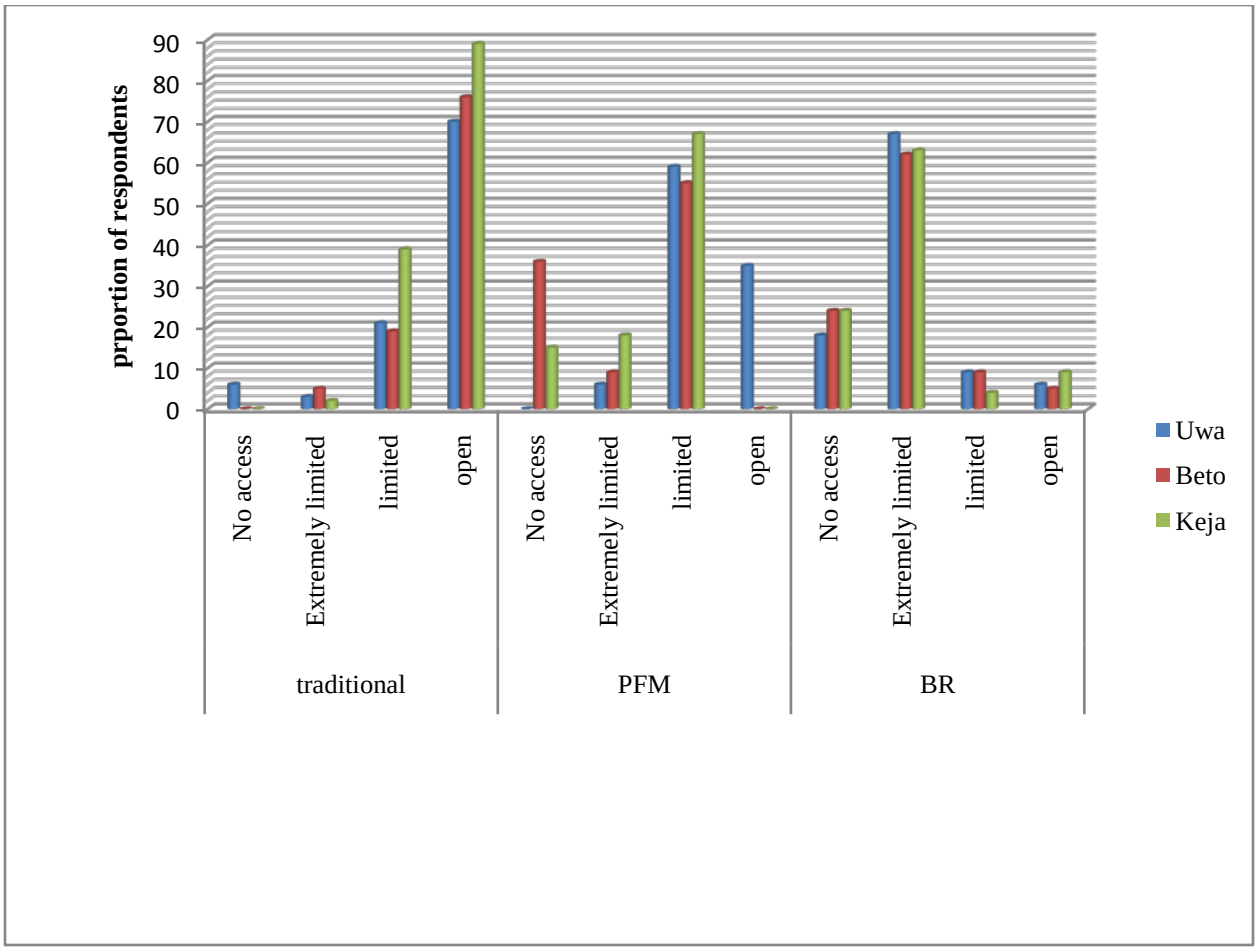


Figure 2. Proportion of respondents' perception on access right on the approaches

The perception of local community towards access right of forest changes with forest management approaches shows that 64 % of the respondents felt that access right is extremely limited during biosphere reserve management approaches, the figure lowered to 3 % and 11% during traditional and PFM, respectively, while majority of the respondents (66%) felt open access right during traditional forest management approach, but the figure lowered to 7% and 12% during BRM and PFM respectively. In addition 60% respondents felt that access right is limited toward PFM approach.

With regard to access right, there is negative correlation to each other in three of forest management approaches (Table 6)

Table 6. Pearson correlation with regard to access right within tthe approches

		PFMaccess	TRAaccess	BIORaccess
PFMaccess	Pearson correlation	1	-.111	-.100
	N	100	100	100
TRAaccess	Pearson correlation		1	-.070
	N		100	100
BIORaccess	Pearson correlation			1
	N			100

Use right

In this study communities were engaged to describe withdrawal right or the right to benefit from forest products may be timber or non-timber forest products for subsistence or commercial purposes. Figure 3, indicates that proportion of respondents perceived use right on PFM approach were 9%, 70% and 21% to be extremely restricted, moderately restricted and no restriction (from Uwa village). In addition 13%, 59% and 28% to be extremely restricted, moderately restricted and no restriction (from Beto village) where as 14%, 29% and 57% perceived to be extremely restricted, moderately restricted and no restriction (from Keja village) respectively. Majority of respondents reacted on absence of restriction to traditional forest management approach. From Uwa village, 42%, 52% and 6% perceived to be no, moderate and extreme restriction respectively, whereas from Beto village, 71%, 24% and 5%, and from Keja village, 63%, 28% and 9% reacted to be no, moderate and extreme restriction respectively (Figure 3).The result has also showed most respondents were stated that biosphere forest management approach extremely restrict them to withdraw or extract forest resource reacting that 12%,16% and 72% from Uwa site, where as 9%,5% and 86% from Beto forest site whilst 7%,26% and 67% from Keja forest site to be no, moderate and extreme restriction respectively.

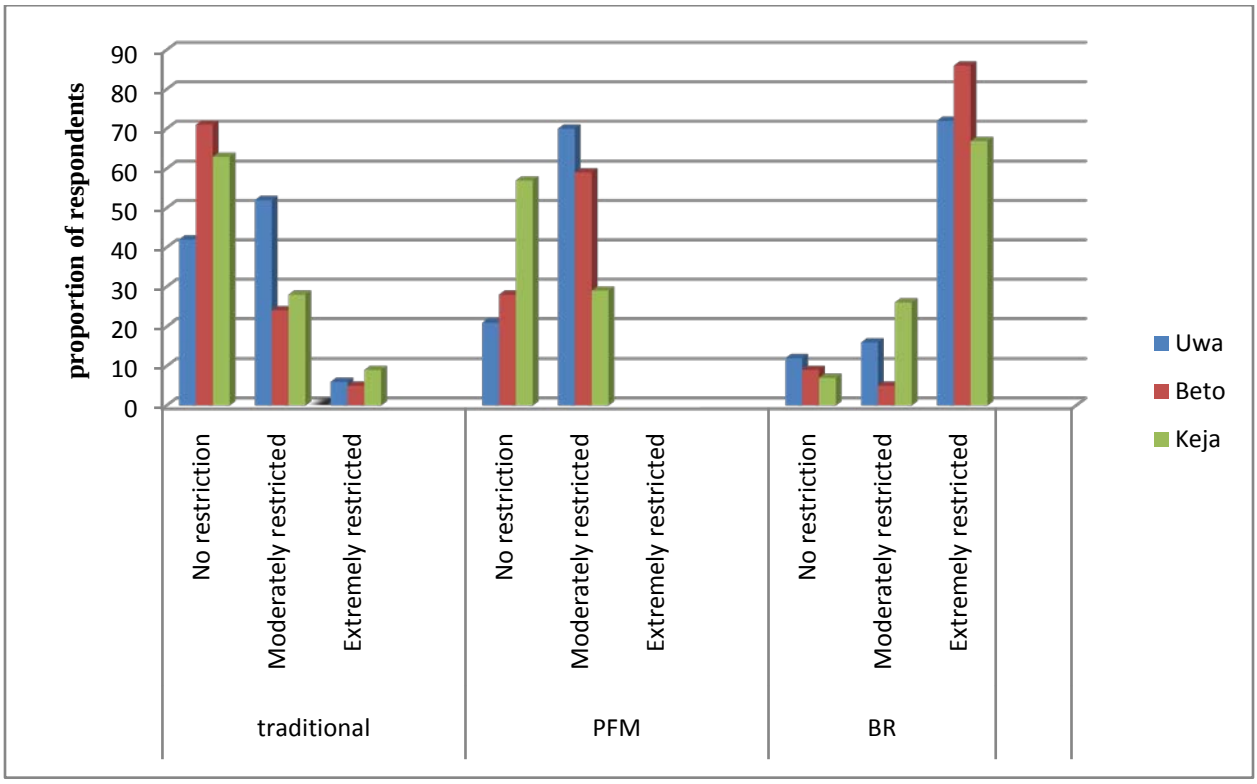


Figure 3 Proportion of respondents perception on use right toward the approaches

The summery perception of local community towards use right of forest changes with forest management approaches shows that 58% of the respondents felt that absence of restriction during traditional forest management approaches, the figure lowered to 35% and 9% during PFM and BRA, respectively. To the case of extreme restriction majority of the respondents (73%) reacted to ward BR and the figure lowered to 12% and 7% during PFM and traditional approaches respectively.

Overall, the findings of access and use right of the study show that forest resources from both traditional (informal institution) and PFM forest management approach can be accessed by community members and outsiders despite there is certain limitation on the PFM. They also show that, there is restricted access to forest resource from biosphere reserve forest management approach. What differed traditional approach from the two approaches from the result is that traditional approach seems like that free access and use right approach leading to maximum

extraction of forest products. Because there is no common rule for individual owner to prevent over exploitation despite it is de facto individual property. The implication is that most households in the study area depend on accessing forest resources from traditional forest blocks for their day to day use by allowing excessive harvest and overexploitation of forest products. (Hardin, 1968) stressed in his article that people are selfish by nature and natural resources would be overexploited due to the maximization of benefits by individual users over several years.

4.1.3 Perception With Regard to Responsibility, Participation and Feeling of Ownership

Under this, the observed variations in respondents' perception were also categorized in to three aspects such as, local communities' responsibility of forest conservation, participation on conservation of forest, and feeling of ownership. Table 7 has indicated more number of respondents perceived to be high from Uwa and Keja site where as medium from Beto site that they are responsible for conservation of forest on the PFM approach. Participation on PFM is perceived to be high only from Uwa site but from Beto and Keja sites more respondents perceived that their participation is none and low on PFM.

Table 7. Perceptions with regard to responsibility, participation and feeling of ownership toward PFM

	From Uwa site				from Beto site				from Keja site			
	None	Low	Med	High	None	Low	Med	High	None	Low	Med	High
Responsibility	8	8	16	68	14	10	43	33	9	26	32	33
participation	0	6	9	85	57	5	38	0	11	54	28	7
feeling ownership	3	24	6	67	5	19	9	67	7	17	13	63

On traditional forest management approach, it is showed that (Table 8) more number of the respondents perceived to be medium for the responsibility of forest conservation from Uwa and Beto site, whereas low perception from Keja site. But more respondents stated that participation on forest conservation is none and low. In case of ownership feeling more frequency of respondents perceived to be high.

Table 8.Responsibility, participation and feeling of ownership towards traditional managemnt approch

	From Uwa site				from Beto site				from Keja site			
	None	Low	Med	High	None	Low	Med	High	None	Low	Med	High
Responsibility	0	41	52	7	3	33	51	13	3	50	34	13
participation	34	27	12	27	62	19	9	10	26	52	9	13
feeling ownership	6	9	46	39	0	5	24	71	11	20	28	41

In respect to biosphere forest reserve approach more of the respondents' considered that they are highly responsible for protection and conservation of the reserve. In terms of participation 55% and 57% perceived to be medium from Uwa and Beto site respectively where as 65 % considered to be high from Keja site. More of the respondents' feel of ownership is encountered to be high at three of the sites (Table 9)

Table 9 Responsibility, participation and feeling of ownership towardsbiosphere managemnt approch

	From Uwa site				from Beto site				from Keja site			
	None	Low	Med	High	None	Low	Med	High	None	Low	Med	High
Responsibility	3	9	21	67	5	14	5	76	4	0	13	83
participation	18	21	55	6	19	10	57	14	0	2	33	65
feeling ownership	15	24	24	37	5	9	10	76	4	7	17	72

Overall, summery of percentage analysis indicated that more percentage of respondents, 47% and 76% being responsible to conservation is perceived to be high in PFM and biosphere respectively where as in traditional more percentage of respondents, 46% felt to be medium. Similarly, on participation more respondents 31% ,35% who perceived to be high were observed on PFM and biosphere respectively, but in contrary the result showed that more respondents 35% and 36% perceived to be no and low participation on conservation of traditional forest management respectively. In terms of feeling of ownership more respondents felt to be high which accounts 45%, 47% and 61% for PFM, traditional and biosphere respectively. The result implies that traditional forestry in the area lack well specified duties for the resource user in terms of responsibility and participation as duties impose costs of resource use upon users. The lack of duties for resources means that users have no rights over them. Consequently, they cannot compel the coercive power of the state to defend their interests. This idea coincides with

(Sjaastad and Bromley, 2000) who stated that, resource users who do not have ruled duties have privileges and causes them to partition resources without consideration for the interests of other parties.

4.1.4 Main Forest Products and Annual Income from the Three Forest Management Approaches

Table 10, 11, and 12 shows, the various main forest products commonly harvested and the proportion of respondents who collect different products from PFM, traditional and biosphere reserve respectively within three of the villages. All reported incomes are sums of annual cash and subsistence activities. Cost of own labor is not included in the income calculations, partly due to difficulties in identifying relevant labor shadow prices (Campbell and Luckert,2002).Using value added may create some bias when comparing income across sectors, as different economic activities have different labor needs. Income of the forest products is the value of forest products collected from the three forest management approaches differently. The average value of all forest products were reflected by the existing price of the past three years. To know the total income of each products of the sampled household respondents from each of the forest management approaches in the study sites, the average annual total amount of each forest products were evaluated and determined, by asking the respondents that they had got in the past three years and calculating the annual average income. Accordingly, from PFM forest blocks as indicated **(**Table 10**)** the more income earn was from honey which has a total average annual income of 130,875 birr accounting 68.4% cover, and the least incomes were from climber, construction pole ,wild vegetables, farm tool handle which accounts 0.7%,1%,0.1% and 0.5% cover respectively.

Table 10 :The amount of forest products and average annual income (Birr) of the sample HH from PFM approch

Forest Products	No of HH collect	Total mount/yr	Total income/yrs	Amount/ person. Yr	Income/ person,yr	cover %
Honey.kg	74	5235	130875	70.7	1768	68.4
Coffee.kg	29	1180	23600	40.7	813	12.3
Spice.kg	69	764	22930	11	332	12
Beehive.pcs	70	1192	5961	17	85	3
Fire wood.load	39	1267	3800	32	97	2
Climber pcs	37	269	1348	7	36	0.7
construction pole.p	39	318	1910	8	49	1
Wild vegetables.kg	38	104	209	2	5	0.1
Farmtoolhandle.p	59	54	810	1	14	0.5

The use of forest products in the traditional forest management has showed widespread for all of the products, but the majority of the respondents collect honey, beehive, coffee, climbers and fire wood. (Table 11) shows, from the traditional forest blocks, honey is the largest proportion (81.3%) earning average annual value of 350,583 birr. coffee, spice and beehives contributes next to honey with proportional share of 4.6%, 8.3% and 2.6% respectively. This implies that traditional forest contribute more income for the local community.

Table 11: The amount of forest products and averageannual income of the sample HH from traditional forest blocks

Forest Products	No of HH collect	Total amount/yr	Total income/yrs	Amount person /yr	Income /person,yr	cover %
Honey.kg	96	14023	350583	146	3651	81.3
Coffee.kg	76	988	19773	13	260	4.6
Spice.kg	63	1190	35700	19	566	8.3
Beehive.pcs	92	2171	10858	23	118	2.6
Fire wood.load	74	1595	4785	21	64	1
Climber.pcs	81	1096	5483	13	67	1.3
constructionpole.p	70	373	2240	5	32	0.5
Wild vegetables.kg	48	94	188	2	4	0.04
Farm toolhandle.p	70	95	1430	1	20	0.36

In case of biosphere reserve forestry the finding in table 12 has showed that the proportion of respondents who collect forest products were less, but the majority of respondents collected spice and wild vegetables which account 41%, 37% respectively which implies that nondestructive forest products are allowed to collect from the forest. With regard to forest products more share also observed on honey and spice which earn 46.2% and 40.6% respectively, coffee contributes 11.4% , whereas the woody products such as beehives, firewood, climber, construction pole share very few income, with 0.2%, 0.03%, 0.18%, 0.16% respectively (Table 12). This implies that biosphere reserve forestry doesn't provide considerable products and income for local community.

Table 12:The amount of forest products and annual average income of the sample HH from biosphere reserve forest blocks

Forest products	No of HH collect	Total amount/Kg.yr	Total income/yrs	Amount /person,yr	Income /person/yr	Cover %
Honey.kg	22	568	14208	26	645	46.2
Coffee.kg	14	175	3513	12	250	11.4
Spice.kg	41	415	12450	10	303	40.6
Beehive.pcs	3	12	58	4	19	0.2
Fire wood.load	1	3	10	3	10	0.03
Climber.pcs	3	11	55	4	18	0.18
construction pole.p	3	8	50	2	16	0.16
Wild vegetable.kg	37	61	123	2	3	0.4
Farmtoolhandle.p	29	17	260	1	9	0.83

Generally the finding indicated that majority of the respondents collect forest products from traditional forest blocks. The respondents also collect from PFM forest blocks. In contrary the respondents that harvest forest products from biosphere forest blocks were very few especially woody products such as beehives, firewood, climber and construction pole which accounts 3%,1%,3% and 3% respectively. But the result shows that three of the management approaches consists common characteristics in type of forest products to be collected.

4.2 Forest Vegetation Survey

4.2.1 Species composition

A total of 38 woody species, representing 23 families were identified and recorded commonly in the three of the existing forest management approaches (Appendix 1). Of the total woody species recorded, 35 and 33 species were found in PFM and traditional forest site respectively, on the other hand 36 species were encountered in the biosphere reserve forest block, whereas 28 species were common for three of the forest sites belonging to 23, 22 and 21 family respectively. There were three species not found in traditional forest blocks, but found in both PFM and biosphere forest sites. There were also two species identified in both biosphere and traditional forest blocks but absent in PFM site. Similarly there was one species not found in the biosphere forest block, but common for both PFM and traditional forest site. In contrary there was one species identified in biosphere but absent in both PFM and traditional and similarly there was one species identified in only PFM but absent in both biosphere and traditional forest blocks. Generally the number of tree species in biosphere reserve forest block is higher than PFM and traditional forest blocks and also PFM is more number of species than traditional forest block. Of identified tree and shrubs in the three forest blocks 89% forest composition was dominated by the trees and the remaining 11% were covered by shrubs(Appendix 1).

4.2.2 Density of trees and natural regeneration

Tree density and regeneration of seedlings and saplings were computed per hectare in the three forest blocks. As the result showed (Figure 4), 344 trees/ha, 352 trees/ha, 398 trees/ha were encountered at PFM, traditional and biosphere reserve respectively. The result indicated more number of trees was found in biosphere forest stand which were 54 more trees found than that of PFM forest block and 46 more than that of traditional forest which means that, PFM forest block is with less number of trees than that of traditional and biosphere reserve forest site. Statistical analysis of variance shows these differences were statistically significant (P=0.002). As it was observed by transect wake for triangulation, there could be more trees cutting in PFM unlike that of BRM with high wood demand in the area consequently harvesting heavy products within a short time. But the higher number of trees in traditional forest block as compared to PFM may be due to the presence of more number of trees that are important for beehive hanging suitable for hold.

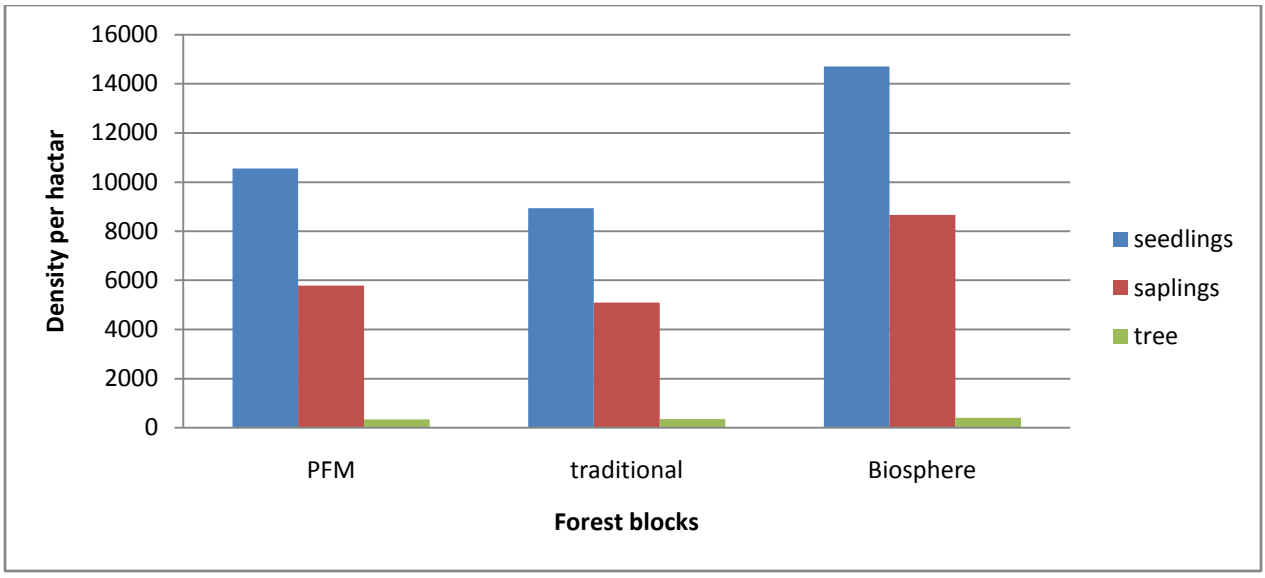


Figure 4. **Seedlings,saplings and trees density per hectar across the forest blocks**

For sapling 5781, 5100 and 8666 individuals per hectare were encountered at PFM, traditional and biosphere reserve forest blocks respectively. The analysis of variance (ANOVA) indicated that, these differences were statistically significant among the villages with P-value equal to 0.027. Concerning the seedling population, 10555, 8937 and 14708 were counted per hectare at PFM, traditional and biosphere reserve respectively. The difference in seedling density per hectare was statistically significant with P-value is equal to 0.022 ($P<0.05$). These assessment result showed that there were better seedlings and saplings within the forest blocks, indicating more regeneration capacity in the biosphere reserve forest block and less regeneration at the traditional forest site, whereas medium regeneration at PFM with compare to the forest blocks. The stand density of all species per hectare has indicated (Table 13).

Seedling and sapling assessment of the three forest stand has showed that good natural regeneration in three of the forest site despite there was great gap in the number of regeneration in which more amount of seedling and sapling are observed and recorded in biosphere forest site. For example we can see that seedling density per hectare in biosphere is 28% greater than that of PFM and in turn the traditional forest block is much less by 39% from biosphere reserve (Table 13). This implies that biosphere reserve forest management approach is more concerned with protection and conservation of biodiversity approach which encourage rehabilitation and natural regeneration of the forest stand, and also PFM is in better situation than traditional forest block,

this could be because of taking care for natural regeneration while harvesting and felling of trees due to rule and regulation, whereas in the traditional forest block they did not care for natural regeneration, as there is no formulated rule while harvesting product to care for natural regeneration except some species which are fast growing and suitable for hanging of beehives.

4.2.3 Structure and regeneration of the forest blocks

The majority of individuals at PFM measured have diameter class less than 10 cm(seedlings and saplings) were 97% from the total including all growing stage of the individuals., whereas when we consider tree stage DBH greater than 10 cm, the majority of individuals measured have DBH less than 30.1 cm were 66.5%,size class of 30.1-50 cm were 15.7%,50.1-70 cm were 6.7%,size class of 70.1-90 cm were 5% and the size class >90.1 were 6.1%.The overall population structure implies that there is health regeneration as depicted by the inverted J-curve (figure5).

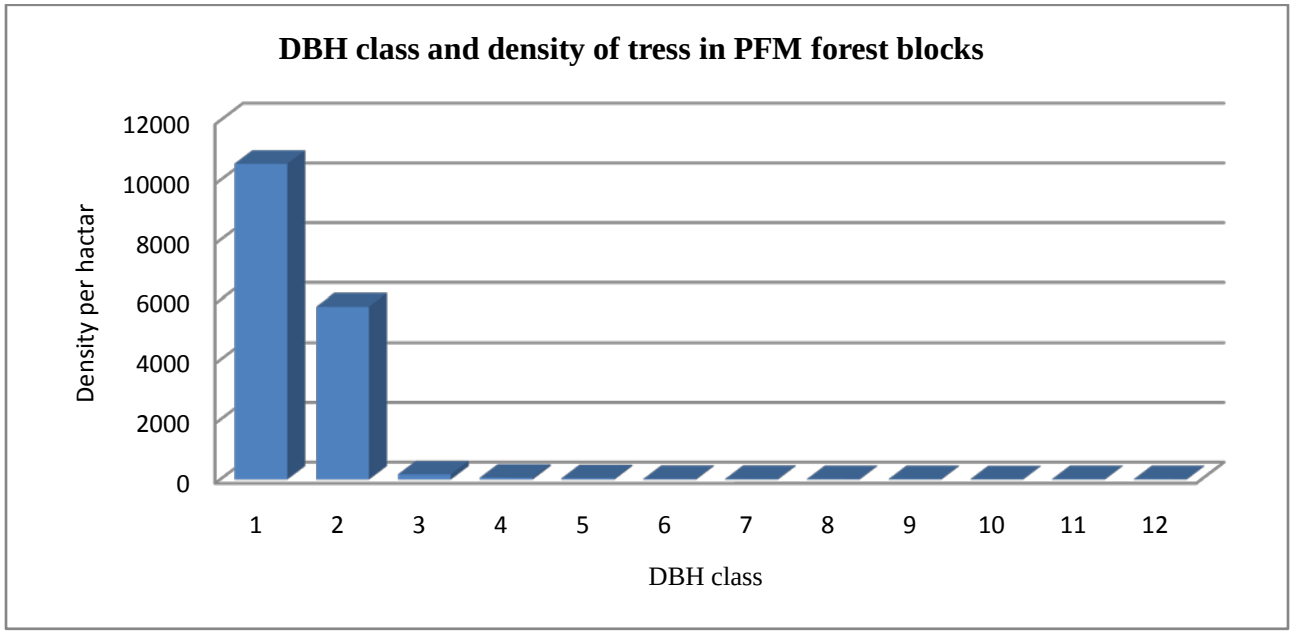


Figure 5. The distribution of tree species at PFM forest block in different DBH class (Diameter class: 1=seedlings, 2=saplings, 3=10.0-20cm, 4=20.1-30cm, 5=30.1-40cm, 6=40.1-50cm, 7=50.1-60cm, 8= 60.1-70cm, 9=70.1-80cm, 10=80.1-90cm, 11=90.1-100cm, 12=>100cm

Similarly, in the traditional forest block majority of individuals have diameter class of less than 10 cm were 96% from the total, including all growing stage of the individuals., whereas when we consider tree stage DBH greater than 10 cm, large number of individuals counted were DBH less than 30.1 cm were 56%, 30.1-50 cm were 23.3%, 50.1-70 cm were 8%, size class of 70.1-90 cm were 6.7% and the size class >90.1 were 6%. Despite the overall population structure indicates the presence of healthy regeneration as depicted by the inverted J-shape (Figure 6), the number of individuals especially at the seedling and sapling stage is less than that of PFM and biosphere reserve, which implies that more disturbance and interference of the forest stand as compared to the two approaches. This may be due to free access of the forest resource

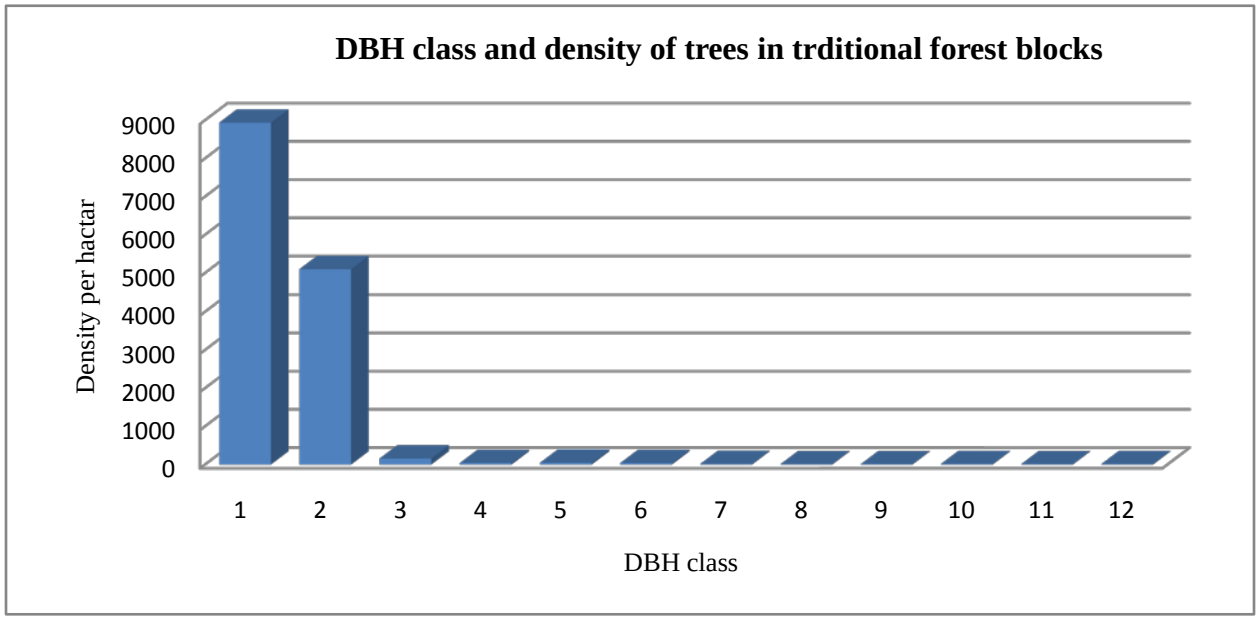


Figure 6. The distribution of tree species at traditional forest block in different DBH class (Diameter class: 1=seedlings,class 2=saplings, 3=10.0-20cm, 4=20.1-30cm, 5=30.1-40cm, 6=40.1-50cm, 7=50.1-60cm, 8= 60.1-70cm, 9=70.1-80cm, 10=80.1-90cm, 11=90.1-100cm, 12=>100cm

The biosphere forest block (Figure 7) has showed that the majority of individuals were counted within the diameter class less than 10 cm which accounted 98% from all individuals. Whereas from the individuals with diameter greater than 10 cm, 57.8% were encountered for diameter less than 30.1 cm, 20.3% for diameter class 30.1-50 cm, 11.3% for diameter class 50.1-70 and 5.3% and 5.3% for diameter class 70.1-90 cm and >90.1cm respectively. In BR the overall population structure also indicated that there is more healthy regeneration than that of PFM and traditional forest site as depicted by the inverted J-curve. The implication is there is less interference or

disturbance within the forest stand. This could be due to restriction to enter in to the forest for use of the resource.

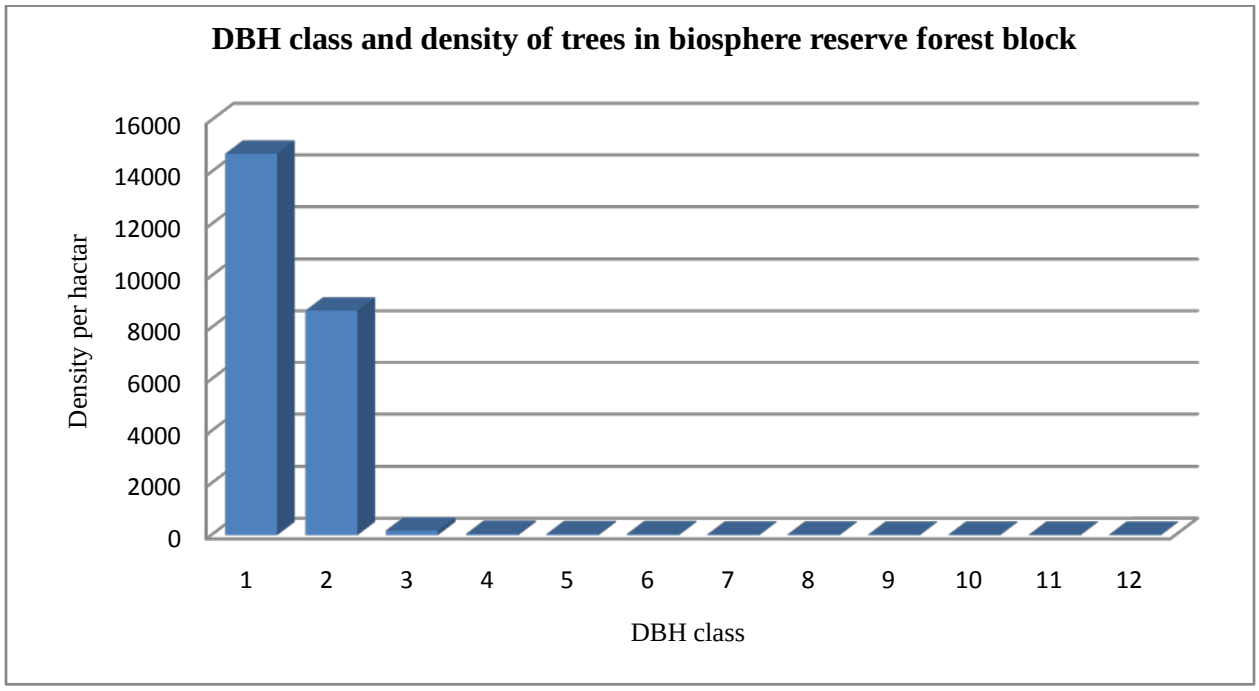
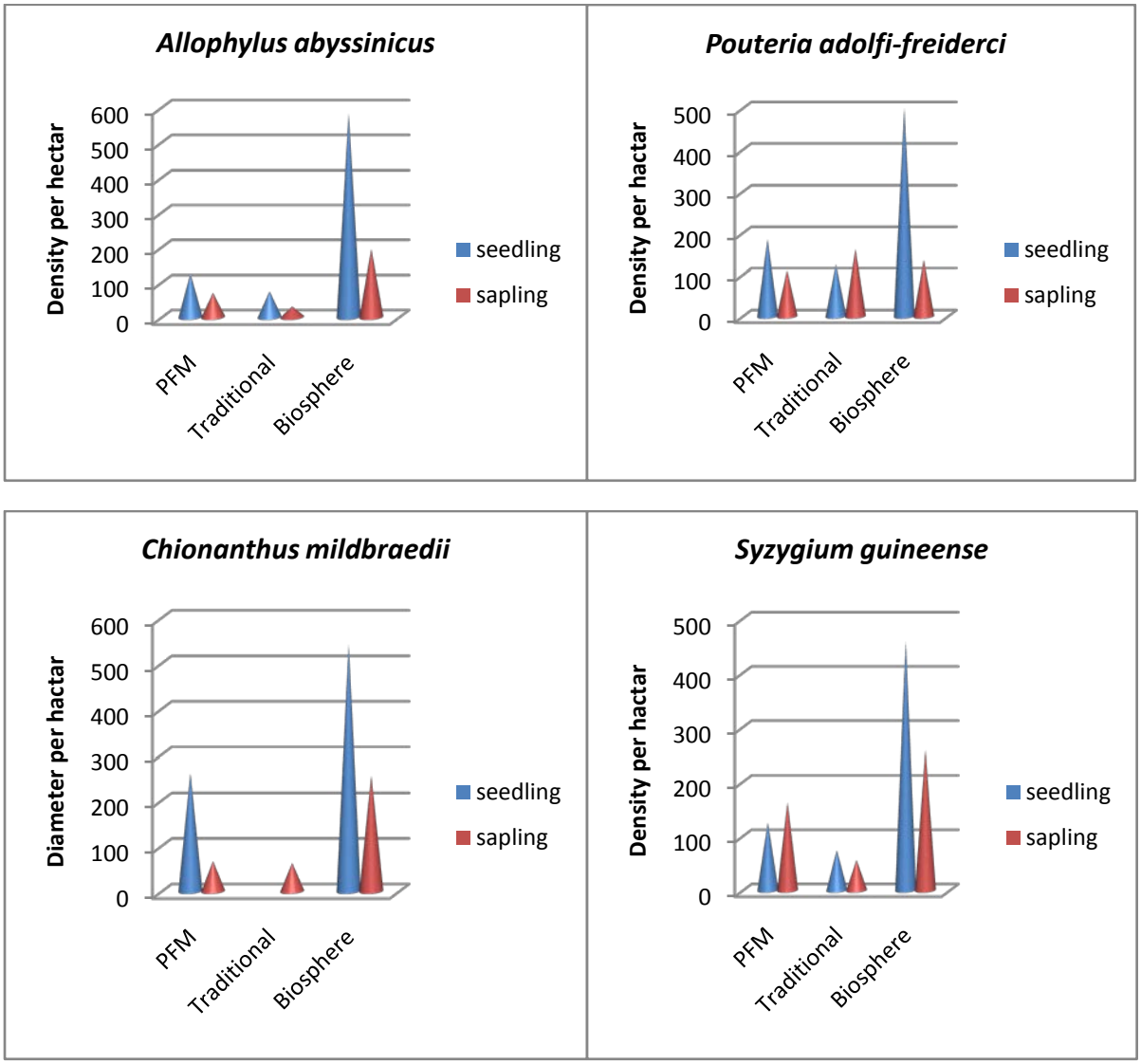


Figure 7: **The distribution of tree species at BR forest block in different DBH class (Diameter class: 1=seedlings,class 2=saplings, 3=10.0-20cm, 4=20.1-30cm, 5=30.1-40cm, 6=40.1-50cm, 7=50.1-60cm, 8= 60.1-70cm, 9=70.1-80cm, 10=80.1-90cm, 11=90.1-100cm, 12=>100cm**

The result showed (Figure 8) that there are some species that regenerate well in biosphere forest block, but less regeneration in PFM and traditional despite there was also difference in the number of regeneration between PFM and traditional in which better regeneration at PFM forest block than that of traditional site of those specific species. For instance from the result, species like *Allophylus abyssinicus*, *Bersama abyssinica*, *Dombeya torrida*, *Syzygium guineense*, *Pouteria adolfi-freiderici* and *Turraea holstii* were observed with widespread regeneration within biosphere reserve forest block, which were less observed and counted in traditional and PFM. But *Cordia africana* was species which was not observed at traditional forest block, but commonly present at PFM and biosphere. In addition *Croton macrostachyus* was absent at biosphere reserve forest block at seedling stage. This might be due the reason that most of the time Croton growth in the disturbed environment showing that less disturbance of biosphere

reserve forest block. Similarly species *Chionanthus mildbraedii* was not observed at seedling stage in the traditional forest block but with more regeneration at biosphere and less regeneration at PFM was encountered.



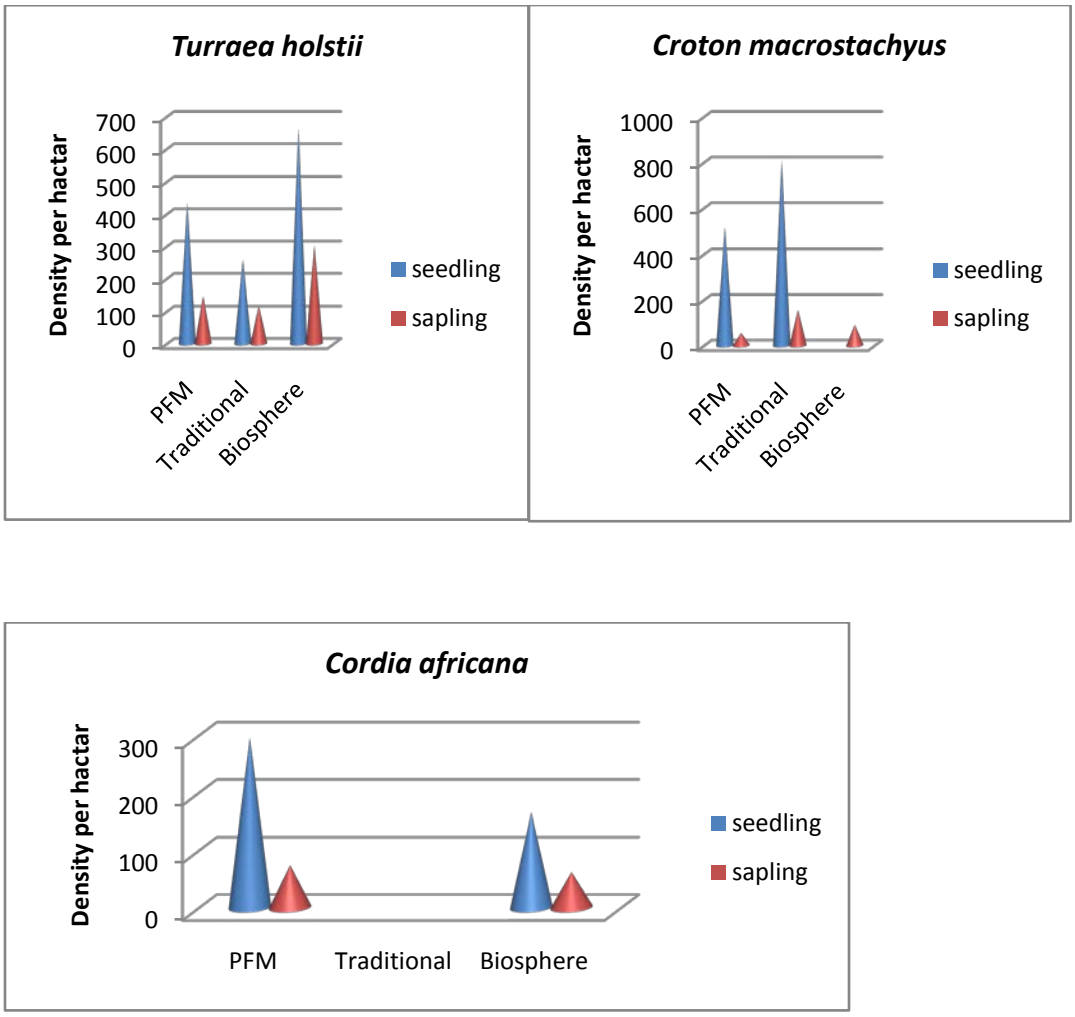


Figure 8:Seedling and sapling regeneration of selected species under the three forest sites

Table 13.Seedlings, saplings and tree density per hectare in three of forest sites

No	Botonical	Family	Density/ha								
			PFM			Traditional			Biosphere		
			se	sa	Te	se	sa	Te	Se	sa	Te
1	*Albizia gummifera*	Fabaceae	444	640	34	437	593	15	1041	475	29
2	*Allophylus abyssinicus*	Sapindaceae	125	70	10	74	31	18	583	195	13
3	*Pouteria adolfi-friederiai*	Sapotaceae	185	111	12	125	162	21	500	135	19
4	*Apodytes dimidiata*	Icacinaceae	333	55	7	187	37	10	458	108	20
5	*Bersama abyssinica*	*Melianthaceae*	111	56	11	0	44	25	458	204	6
6	*Cassipourea malosana*	Rhizophoraceae	444	144	2	125	87	3	375	358	2
7	*Chionanthus mildbraedii*	Oleaceae	259	66	15	0	62	11	541	254	10
8	*Clausena anisata*	Rutaceae	614	314	1	312	331	2	1125	420	4
9	*Cordia africana*	Boraginaceae	296	74	14	0	0	0	166	62	2
10	*Croton macrostachyus*	Euphorbiaceae	518	55	15	812	263	17	0	91	20
11	*Dombeya torrida*	Sterculiaceae	125	137	7	111	52	8	416	241	9
12	*Dracaena afromontana*	Sapotaceae	666	333	0	434	212	11	1041	512	3
13	*Ehretia cymosa*	Boraginaceae	222	11	2	0	56	2	41	104	3
14	*Ekebergia capensis*	Meliaceae	0	14	13	0	0	11	219	50	13
15	*Galinierasa xifraga*	Rubiaceae	607	329	5	437	275	2	333	433	15
16	*Ilex mitis*	Meliaceae	333	77	14	312	0	20	583	262	20
17	*Macaranga capensis*	Euphorbiaceae	407	166	5	562	156	17	333	162	8
18	*Millettia ferruginea*	Fabaceae	629	285	23	1375	431	17	1125	408	32
19	*Ocotea kenyensis*	Lauraceae	222	125	11	125	75	0	83	295	9
20	*Olea capensis*	Oleaceae	185	222	15	437	250	10	583	341	13
21	*Oxyanthus speciosus*	Rubiaceae	481	377	1	500	475	5	750	487	14
22	*Phoenix reclinata*	Arecaceae	148	100	2	187	218	8	291	229	9
23	*Pittosporum viridiflorum*	Pittosporaceae	0	40	2	0	0	6	0	91	2
24	*Polyscias fulva*	Araliaceae	592	484	23	375	356	15	375	366	19
25	*Prunus africana*	Rosaceae	170	29	11	0	43	9	333	261	12
26	*Rothmannia urcelliformis*	Rubiaceae	407	244	0	625	206	3	291	400	3
27	*Syzygium guineense*	Myrtaceae	125	162	11	74	56	21	458	258	22
28	*Trichilia dregeana*	Meliaceae	370	107	3	250	37	0	250	229	2
29	*Turraea holstii*	Meliaceae	437	148	1	437	118	4	666	304	2
30	*Vepris dainellii*	Rutaceae	656	451	7	312	187	3	958	487	18
31	*Vernonia auriculifera*	Asteraceae	111	355	25	125	287	25	250	200	8
32	*Schreberia alata*	Oleaceae	185	0	5	187	0	4	43	45	10
33	*Dracaena steudneri*	Dracaenaceae	148	0	5	0	0	0	39	0	0
34	*Ficus sur*	Moraceae	0	0	11	0	0	11	0	70	12
35	*Sapium ellipticum*	Euphorbiaceae	0	0	0	0	0	0	0	129	2
36	*Vernonia amygdalina*	Asteraceae	0	0	5	0	0	4	0	0	0
37	*Maesa lanceolata*	Myrsinaceae	0	0	6	0	0	2	0	0	4
38	*Schefflera abyssinica*	Araliaceae	0	0	10	0	0	12	0	0	9
	Total		10555	5781	344	8937	5100	352	14708	8666	398

Se=Seedlings, Sa=Saplings, Te=Trees

Seedling species dominant in PFM are *Dracaena afromontana, Vepris dainellii, Millettia ferruginea, Clausena anisata* and *Galinieras axifraga*. Similarly at traditional forest block, the abundant seedling species were *Millettia ferruginea, Croton macrostachyus, Rothmannia urcelliformis, Macaranga capensis and Oxyanthus speciosus.* At biosphere forest site the abundant seedlings were *Albizia gummifera, Clausena anisata, Millettia ferruginea,Vepris dainellii* and *Dracaena afromontana*(Table 13).

4.2.4 Species richness, Shannon-diversity and IVI

In terms of Shannon-Wiener Diversity (H) index as the result has showed (Table 14), 3.55, 3.49 and 3.58 were calculated in PFM, traditional and biosphere respectively. Diversity greater than 2 indicates medium to high species diversity (Giliba et al. 2011 cited by Tekalign et al, 2015). Therefore this finding implies that the three forest blocks are rich in species diversity. However, biosphere reserve has higher Shannon-Wiener Diversity than PFM and traditional forest block, but comparatively PFM has more diversity index than that of traditional forest site. This difference were not statistically significant (P=0.152).This finding was comparable with the reports Gobze *et al*. (2009) who reported a Shannon-Wiener Diversity index of 3.46 and 3.367 with PFM and non-PFM forest at Bonga southwest Ethiopia. Concerning on the species evenness (E), PFM has higher evenness value of 0.91 than biosphere reserve and traditional forest blocks which has 0.89 and 0.88 evenness respectively. The result has showed biosphere reserve has relatively higher evenness than traditional forest block. These difference were not statistically significant (P=0.198).Generally the result implies that though statistically there is no significant difference between the forest blocks, we can see the diversity indices somewhat more in BR indicating more undisturbed forest stand.

Table 14.Species richness,evenness,and Shannon-diversity across forest blocks

Index	PFM	Traditional	Biosphere	P-value
species richness(S)	35	33	36	0.001
Shannon Diversity(H')	3.25	3.22	3.32	0.152
Species evenness(E)	0.91	0.88	0.89	0.198
H' max	3.55	3.49	3.58	0.114

With respect to relative importance measured by IVI of the woody species at tree stage, *Schefflera abyssinica, Ilex mitis, Millettia ferruginea, Ficus sur, Ekebergia capensis, Albizia gummifera, Croton macrostachyus, Syzygium guineense*and *Chionanthus mildbraedii* were the top nine most important woody species among those common to the three forest sites. Table 15 shows the top nine species ranked based on their important value index, accordingly the result has showed that 53.8% (IVI=161.4), 47.22% (IVI=141.61) and 49.47% (IVI=148.42) of the forest composition at PFM, traditional and biosphere were dominated by these nine species respectively. The species *Schefflera abyssinica* has the highest important value index at both PFM and traditional forest blocks among all species identified, whereas it was second highest in terms of IVI at biosphere forest site (table 15). This was because of its large biomass (high relative dominancy). As indicated, the relative density and relative frequency of *Schefflera abyssinica* were encountered among the least species. In terms of relative frequency and relative density we can see from the result that *Albizia gummifera* and *Millettia ferruginea* were the dominant species.

Table 15 Top nine specieses ranked based on Important Value Index at PFM,traditional and biosphere reserve forest sites respectively

Botonical name	RD	RF	RO	IVI
Schefflera abyssinica	2.956	3.97	27.996	34.922
Albizia gummifera	9.94	5.77	12.79	28.5
Millettia ferruginea	6.72	6.859	5.261	18.84
Chionanthus mildbraedii	4.569	5.4	6.2	16.169
Ekebergia capensis	3.76	4.69	7.14	15.59
Croton macrostachyus	4.569	5.415	4.245	14.229
Ficus sur	3.225	3.61	4.988	11.823
Ilex mitis	4.03	4.33	3.294	11.654
Syzygium guineense	3.225	4.332	2.1452	9.7022
Total IVI				**161.4**

Botonical name	RD	RF	RO	IVI
Schefflera abyssinica	3.55	4.597	30.307	38.454
Syzygium guineense	6.222	6.321	9.365	21.908
Ilex mitis	5.77	5.747	5.26	16.777
Millettia ferruginea	4.88	5.172	3.938	13.99
Croton macrostachyus	4.9	4.597	1.65	11.147
Ekebergia capensis	3.1	4.022	3.433	10.555
Albizia gummifera	4.44	4.597	1.358	10.395
Ficus sur	3.1	3.448	3.522	10.07
Chionanthus mildbraedii	3.1	2.873	2.341	8.314
Total IVI				**141.61**

Botonical name	RD	RF	RO	IVI
Millettia ferruginea	8.11	5.902	10.9	24.912
Schefflera abyssinica	2.356	3.125	18.725	24.206
Syzygium guineense	5.497	6.25	10.337	22.084
Albizia gummifera	7.329	4.86	6.708	18.897
Ilex mitis	5.235	4.86	7.145	17.24
Croton macrostachyus	4.973	4.16	2.6	11.733
Ekebergia capensis	3.403	3.819	4.394	11.616
Ficus sur	3.403	3.819	2.35	9.572
Chionanthus mildbraedii	2.617	3.47	2.073	8.16
Total IVI				148.42

RD=Relative Density;RF=Relative frequency;RO=Relative dominance;IVI=Important Value Index

5. CONCLUSION AND RECOMMENDATION

This study examined the performance of the three management approaches such as traditional, PFM and biosphere reserve when PFM was introduced nearly one and half decades ago, but BR was introduced half decades ago (6 years).Though BR implementation has been very recent and challenging in determination and comparison in terms of forest vegetation status, the study attempted to observe natural regeneration capacity of the forest block at seedling and sapling stage and their effect in terms of forest products and income.

Returning to the research questions presented at the start of this paper, the findings of this study suggest that traditional forest management practice (locally called Kobo) are rooted in the customary life of local communities, it appear to have widespread social acceptance, is adapted to local conditions with attractive contribution for livelihoods of the local community with free access and use right, but in terms of sustainability it may not have the potential to solve the current problem facing forest loss due to lack of clear and sound forest management strategy. Such kind of practice may not be advisable with the current high rate of population growth and question of resource carrying capacity with high demand of land for agricultural investment which the challenging issue currently for the remaining forests in which the tenure security is clearly unknown. Because of these limitations and risks traditional forest management needs to be modified to ensure long term sustainability under the control of an effective conflict resolution system to ensure traditional management's high degree of social acceptance. This may be accomplished through the development of collaborative forest management plans that involves local communities at the level of decision making.

With regard to PFM, it does not provide a new source of revenue for local people by allowing them to collect forest products in specialized mannerwith better forest condition securing regulated access rights. This power of regulation for PFM could be due to the presence of buy laws and agreement between government and villagers to protect the forest and afraid of the government not to hand over the forest land for agricultural investors. In respect to biosphere management strategy, the results confirm the importance of biosphere reserve for biodiversity conservation in terms of tree species composition and natural regeneration capacity, but its contribution for the livelihood of the local community is not considerable showing that the continuity of the management may be at risk even though the result of the community perception

on the approach is positively observed which may be due to registration of the reserve internationally under UNESCO in which the local communities are proud of it for the identity.

The study concluded that local traditional forest management practice has active roles in contributing the livelihood of the local community with doubt in conserving the forests in sustainable manner. And PFM also provide livelihood contribution owning capacity in playing a major role in preventing from forest destruction. Biosphere reserve is important for biodiversity conservation in greater extent with constraint in contributing for local livelihood.

Recommendations, that various strategies must be combined including the use of local knowledge and institutions in the conservation of forest. Local institutions give knowledge on how they are and how they can be combined in with other strategies like those in the government, NGO's and even private sector in conservation of the forests with clear forest management plan.

Finally the findings in this study are based on a small sample of communities and forest blocks in the large forest area and should be confirmed or refuted by a more widespread study.

REFERENCES

Almayhu, M. 2010.Contribution of Forest Products Extraction to Livelihood Support and Forest Conservation in Masha and AndrachaWoredas in South Western Ethiopia. Addis Ababa University.

Amend, T., Brown, J., Kothari, A., Phillips, A. &Stolton, S.2008. Protected Landscapes and Agro biodiversity Values.Volume 1 in the series, Protected Landscapes and Seascapes, IUCN & GTZ.

Ary, D., Jacobs, L.C., and Razavieh, A. 2002.Introduction to research in education. Belmont, CA: Wadsworth/Thomson Learning.

Aseffa, S. 2007. Economic value of afromontane natural forest in Sheka Zone, southwest Ethiopia.In Forests of Sheka: Multidisciplinary case studies on impacts of land use/ land cover changes, southwest Ethiopia.

Aseffa,.S. 2005). Conservation Costs of Wild Population of Coffeaarabica in the Montane Rainforest of Ethiopia. MSc. Thesis Submitted to Alemaya University

Bekele, M. and Tesfaye, Y. 2013.NTFP-PFM South-West Ethiopia, Forested landscapes andlivelihood project. Project Impact Assessment, Final Report. Submitted SLA and its partners by Conscientia training, consultancy and research PLC.

Berkes,F.2008.Sacred ecology: traditional ecological knowledge and resource management.New York

Betru, N., J. Ali, andNyborg, I. 2005.Exploring ecological and socio-economic issues for the improvement of area enclosure management: A case study from Ethiopia.Drylands Coordination Group Report No. 38.63 p.

Bollier,D., 2002.SilentTheft: The private plunder of our common wealth .Routledge,New York.

Bosak, K. 2008. Nature, conflict and biodiversity conservation in the Nanda Devi biosphere reserve. Conservation Society

Bridgewater, P. 2002. Biosphere reserves: special places for people and nature. Environmental Science and Policy.

Brown, D. 1999. Principles and Practice of Forest Co-Management: Evidence from West-Central Africa European Union Tropical Forestry. London: ODI, and Brussels: European Commission.

Bryman, A. 2008. Social Research Methods, 3rd edition, Oxford University Press

Campbell,.B, Luckert,.M. 2002. Uncovering the Hidden Harvest: Valuation Methods for Woodland and Forest Resources. Earth scan Publications, London.

Daba, U. 2000. Perception of forest cover and tree planting and ownership in Jimma Zone, Ethiopia.

Daniel, A., Peter, B.2005.Stimulating effect of forest management on selected public forest goods and services: Case study. Swiss Federal Institute of Forest. Switzerland

Dereje, T. and Tadesse, W. 2007.Customary Forest Tenure in Southwest Ethiopia.

Edwards,S.,Sebsebe,.D &Hedberg, I. 1997.Flora of Ethiopia and Eritrea volume 6: Addis Abeba, Ethiopia.Upsala,Sweden

Elbakidze M., Angelstam P., Sandström, C., Stryamets N., Axelsson R., Crow S., Stryamets G., Yamelynets T. 2013. Biosphere reserves for conservation and development in Ukraine; Policy analysis and a case study of establishment. Environmental Conservation

Ellis, F. 2000. The determinants of rural livelihood diversification in developing Countries.Journal of Agricultural Economics.

Embaye, K., Weih, M., Ledin, L. 2004. Biomass and nutrient distribution in a highland bamboo forest in southwest Ethiopia: implications for management

FDRE, 2011.Devolution of Forest Rights and Sustainable Forest Management: A Review of Policies and Programs
Fisher, R., Hirsch, P. 2008 .Poverty and agrarian-forest interactions in Thailand Geogr

Flictl,R. and Admasu,A. (1994). Honey bee flora of Ethiopia. Publisher MargrafVerlag, Weikersheim, Germany

Friis, I., Rasmussen, F.N. and Vollesen, K. 1982. Studies in the flora and vegetation of SW Ethiopia

Gobeze, T., Bekele, M., Lemenih, M. and Kassa, H. 2009. Participatory forest management and its impacts on livelihoods and forest status: the case of Bonga forest in Ethiopia. International Forestry Review

Hall, D., Philip, H, and Tania M. 2011. Powers of Exclusion: Land dilemmas in Southeast Asia. Singapore: National University of Singapore

Hall, P.,Bawa, K.1993.Method to assess the impact of extraction of non-timber tropical forest products on plant population. Economic Botany

Hardin, G. 1968. The Tragedy of the Commons. Science 162: 1243-1248.

Hein L, Gatzweiler, F. 2006. The economic value of coffee (Coffeaarabica) genetic resources. Ecol. Econ. 60 (1).

Hladik, C. M., Hladik, A., Linares, O. F., Pagezy, H., Semple, A., and Hadley, M..1993. Tropical Forests, People and Food.Biocultural Interactions and Applications to Development.UNESCO and the Parthenon Publishing Group, New York and Paris.

Inoue, M and H .Isozaki,2003 People and Forest Policy and Local Reality in Southeast Asia,the Russian far east,and Japan

Jonah ,V., Ivo M, Greetje R, Jenneke V. 2004 .Base line study of participatory forest management andNon timber forest products in case of Southwest Ethiopia

Kant S Berry, R., 2005.Institution, Sustainability and Natural Resources.Institution for Sustainable Forest Management. Netherlands: Springer.

Kelbessa, E. And Soromessa, T. 2004. Biodiversity, ecology and regeneration studies in Bonga, Borana and Chilimo. Technical Report for FARM Africa/SOS Sahel, Addis Ababa, Ethiopia

Mastewal.Y, 2010.How Informal Institutions Strengthen Sustainable Management of Common Pool Resources in Tigray, Ethiopia.

Nolan, K..and Callahan, J. 2006. Beachcomber biology: The Shannon-Weiner Species Diversity Index. In Tested Studies for Laboratory Teaching, Volume 27 (M.A. O'Donnell, Editor).Proceedings of the 27th Workshop/Conferenc**e** of the Association for Biology Laboratory Education (ABLE).

NTFP PFM project 2009. Non-Timber Forest Products Research and Development Project South-West Ethiopia; Forest landscape sustainability and improved livelihoods through non-timber forest - product development and payment for environmental servicesGrant ENV/2006/114-229,Year Two Annual Report 1st July-30thJune 2009,Mizan Teferi and Huddersfield.

NTFP R&D Project. 2004. Livelihoods and Non Timber Forest Products in Southwest Ethiopia Mizan Teferi; Non-Timber Forest Products Research and Development Project in Southwest Ethiopia.

OFLP, 2015 Strategic Environmental and Social Assessment for the Implementation of REDD+ In Ethiopia. Addis Ababa.

Parrotta, J.A. and Ronald L. Trosper, eds. 2012. Traditional Forest-Related Knowledge: Sustaining Communities, Ecosystems and Biocultural Diversity. New York: Springer

Potters, J, Reeb, D &Crollius, MR 2003, 'The Process of Participatory Forestry in Africa', paper presented to Second International Workshop on Participatory Forestry in Africa

Prasad. R and Kant .S 2002 Sustainable Human Development – Experiences From India. Indian Institute of Forest Management

R. Fisher, P. Hirsch, 2008 .Poverty and agrarian-forest interactions in Thailand.

Rasul, G, Thapa, G.B. and Karki, M.B. 2011.Comparative Analysis of Evolution of Participatory Forest Management Institutions in South Asia.Society and Natural Resources

Reusing M. (1998).Monitoring of natural high forests in Ethiopia.MinistryofAgriculture and GTZ, Addis Ababa.

Ribot, J and Nancy L,. 2003. "A Theory of Access". RuralSociology.The Journal of development studies, Volume 68, Issue 2.

Rocky, J. and Mligo, C. 2012.Regeneration pattern and size-class distribution of indigenous woody species in exotic plantation in Pugu Forest Reserve, Tanzania, International Journal of Biodiversity and Conservation

RRI. 2012. What Rights? A Comparative Analysis of Developing Countries' National Legislation on Community and Indigenous Peoples' Forest Tenure Rights. Washington DC: Rights and Resources Initiative

Shackleton, E.,Buiten, E. and Bird,B. 2007. The importance of dry woodlands and forests in rural livelihoods and poverty alleviation in South Africa.

Sjaastad, E. and Bromley, D. 2000. The prejudices of property rights: on individualism, specificity, and security in property regimes. Development Policy Review.

Stryamets, .N. 2013. Sustainable forest management within Biosphere reserves territories - challenges and opportunities: Roztochya biosphere reserve as a case study.

Suratman, M. 2012. Tree Species Diversity and Forest Stand Structure of Pahang National Park, Malaysia: Faculty of Applied Sciences, University of Technology MARA, Shah Alam, Malaysia

SZFEDO, 2009. Sheka zone finance and economic development office, annual report.

Tacconi, L. 2007. Decentralization, forests and livelihoods: Theory and narrative. Global Environmental Change

Tadesse W. 2011 Sheka forest biosphere reserve nomination form. Addis Ababa

Tadesse, W. 2002. The impact of land use/land cover changes on biodiversity in Masha and AnderachaWoredas of Sheka Zone, SNNP Regional

Tadesse,W. and Ararsa R 2004 Forest Biodiversity, Management Practices and NTFP production. Non-timber Forest Products Research and Development Project, MizanTeferi

Tadesse,.W and Masresha,. F. 2007. Forests of Sheka: ecological, social, legal and economic dimensions of recent land use/ land cover changes-overview and synthesis. In Forests of Sheka: Multidisciplinary case studies on impacts of land use/ land cover changes, southwest Ethiopia. MELCA Ethiopia, Addis Ababa.

Tamene,.T and Legesse,.T. 2004. Livelihood and non-timber forest products in South-west Ethiopia. Non-timber Forest Products Research and Development Project Southwest Ethiopia

Taye ,B .2003. The Potential of Banga Forest for Certification. Paper prepared for national stockholders workshop on forest certification. Addis Ababa,Ethiopia.

Tekalign.T, Kaba, U and. Zerihun, K.2015 Challenges for Improving Forest Conditions and Forest Based Livelihoods Through Participatory Forest Management Around Bonga, Southwestern Ethiopia. International Forestry Review.

Thompson,.J. 2000. Tragically difficult: the obstacles to governing the commons. Program in Law and Economics.

UNESCO, 1996. Biosphere reserves: The Seville Strategy and the Statutory Framework of the World Network, UNESCO, Paris.

UNESCO. 1995. Biosphere Reserves. The Seville Strategy and the Statutory Framework of the World Network, UNESCO, Paris, France

UNESCO.2002. Biosphere Reserves: Special places for people and nature. Technical report for Paris conference. France

Van , J., Mostertman, I., Renkema, G. and Van vliet, J. 2004. Baseline description of project area: summary of participatory appraisal data at Kebele and Got level. Non-timber Forest Products Research and Development Project in SW Ethiopia, Wageningen, Student Research Series No. 1

Vedeld, P., Angelsen, A., Bojo, J., Sjaastad, E. and Berg,G.. 2007. Forest environmental incomes and the rural poor. Forest Policy and Economics 9**.**

Wangdi, S., Nawang.N,SangayWangchuk and Kinga T.2014.Social restriction in traditional forest management systems, and its implications for biodiversity conservation in Bhutan.

Wells, A. 2007. Study of illegal timber extraction practices in Honduras and Nicaragua found that excessive barriers imposed on local producers for legal compliance of their extractive livelihoods drove them into the illegal realm.Lessons for REDD+ from measures to control illegal logging in Indonesia.

Yemiru, T., Roos, A., Campbell, B.M. And Bohlin, F. 2010. Forest Incomes and Poverty Alleviation under Participatory Forest Management in the Bale Highlands, Southern Ethiopia.

Yeraswork, A. 2001.Overview of Natural Resource Management in Ethiopia and Policy Implications. In: Natural Resource Management in Ethiopia. Addis Ababa University, Ethiopia.

Young, O. 2007. Rights, rules, and common pools: Solving problems arising in human/environment relations. Natural Resources Journal 47

Zelealem, T. and N. Leader-Williams. 2005. Indigenous Common Property Resource Management in the Central Highlands of Ethiopia.

Zewdie, J. 2007. The impact of cultural changes on the people of Sheka and their traditional resource management practices: the case of four kebeles in Masha Woreda: Multidisciplinary case studies on impacts of land use/ land cover changes, southwest Ethiopia

APPENDICES

Appendix 1: List of woody plant species in study area

No	Vernacular name	Botanical name	Family	Life form
1	Chato	*Albizia gummifera*	Fabaceae	Tree
2	Sheo	*Allophylu sabyssinicus*	Sapindaceae	Tree
3	Shao	*Pouteria adolfi-freiderici*	Sapotaceae	Tree
4	Wondabo	*Apodytes dimidiata*	Icacinaceae	Tree
5	Boko	*Bersama abyssinica*	Melianthaceae	Tree
6	Woralo	*Cassipaurea malosana*	Rhizophoraceae	Tree
7	Shigawo	*Chionanthus mildbraedii*	Oleaceae	Tree
8	Ermicho	*Clausena anisata*	Rutaceae	Small tree
9	Dio	*Cordia africana*	Boraginaceae	Tree
10	Shomo	*Croton macrostachyus*	Euphorbiaceae	Tree
11	Boaro	*Dombeya torrida*	Sterculiaceae	Tree
12	youdo	*Dracaena steudneri*	Dracaenaceae	Small tree
13	Yogamo	*Ehretia cymosa*	Boraginaceae	Small tree
14	Ororo	*Ekebergia capensis*	Meliaceae	Tree
15	Eto	*Ficus sur*	Moraceae	Tree
16	Dido	*Galiniera saxifraga*	Rubiaceae	Small tree
17	Keto	*Ilex mitis*	Meliaceae	Tree
18	Worango	*Macaranga capensis*	Euphorbiaceae	Tree
19	Chego	*Maesa lanceolata*	Myrsinaceae	Shrub
20	Yago	*Millettia ferruginea*	Fabaceae	Tree
21	Washo	*Ocotea kenyensis*	Lauraceae	Tree
22	Yeho	*Olea capensis*	Oleaceae	Tree
23	Eyimato	*Oxyanthus speciosus*	Rubiaceae	Small tree
24	Yebo	*Phoenix reclinata*	Arecaceae	Tree
25	Shollo	*Pittosporum viridiflorum*	Pittosporaceae	Tree
26	Karasho	*Polyscias fulva*	Araliaceae	Tree
27	Omo	*Prunus africana*	Rosaceae	Tree
28	Manjo	*Schefflera abyssinica*	Araliaceae	Tree
29	Opo	*Schreberia alata*	Oleaceae	Tree
30	Yino	*Syzygium guineense*	Myrtaceae	Tree
31	Mulawo	*Trichilia dregeana*	Meliaceae	Tree
32	Shawo	*Turraea holstii*	Meliaceae	Shrub
33	Mergato	*Vepris dainellii*	Rutaceae	Small tree
34	Girawo	*Vernonia amygdalina*	Asteraceae	Shrub
35	Dengirato	*Vernonia auriculifera*	Asteraceae	Shrub
36	Shedo	*Sapium ellipticum*	Euphorbiacea	Tree
37	Fishino	*Dracaena afromontana*	Dracaenaceae	Small tree
38	Dibo	*Rothmannia urcelliformis*	Rubiaceae	Tree

Appendix 2: HH survey questionnaire

I. Basic information of the forest

1.1 Sheka Masha forest

Total area of the forest (ha)_____

Year PFM started_____

Total area of forest under PFM (ha)_____

Year Biosphere Reserve Approach started_____

Total area of forest under BRA (ha)_____(Core_____

Total area of forest under Traditional (Kobo) (ha)_____

1.2 Yigo-1 PFM and Uto Biosphere reserved forest

Total area (ha)		
Year when forest managed under PFM		
Area of forest under PFM (ha)		
Number of forest user groups/PFM		
Total number of forest user members		
Year when forest managed under Biosphere		
Area of forest under PFM designated in core Zone(ha)		

Part II. Questionnaire for interview

Site from the forest blocks_____

1.3 Household characteristics

Name		Major sources of livelihoods	Rank
Sex			
Age			
Education			
Wealth category			
Year of PFM membership			
Forest dependence (subsistence/commercial)			

1.4How do you rate the importance of forest?	Low	Medium	high	

Source of livelihoods				
Level of dependence on forest				
Forest income				
Social value				
Cultural value				

1.4.1 When do you think forest is more protected? During /PFM/biosphere reserve/Kobo

1.4.2 How do you rate your knowledge or information of PFM? (Little/medium/high)

1.4.3 How do you rate your knowledge or information of BRA? (Little/medium/high)

1.4.3 How do you rate your knowledge or information of traditional (kobo) system? (Little/medium/high)

1.5 Rights and responsibility to use and conserve forest resources during traditional

1.5.1 Access rights (None, Extremely limited, limited, and open)

1.5.2 Use rights (Extremely restricted, moderately restricted, No restriction)

1.5.3 Responsibility of forest conservation (None, low, medium, high)

1.5.4 Feeling of responsibility of forest conservation (None, low, medium, high)

1.5.5 Participation of local people in forest conservation activities (None, low, medium, high)

1.6 How do you rank the importance of forest in kobo trend	Low	Medium	high
Source of livelihoods			
Level of dependence on forest			
Forest income			
Social value			
Cultural value			

1.7 Rights and responsibility to use and conserve forest resources after PFM

1.7.1 Access rights (None, Extremely limited, limited, No limitation/open)

1.7.2 Use rights (Extremely restricted, restricted, No restriction)

1.7.3 Responsibility of forest conservation (None, low, medium, high)

1.7.4 Feeling of responsibility of ownership (None, low, medium, high)

1.7.5 Participation of local people in forest conservation activities (None, low, medium, high)

1.8 How do you rate the importance of forest after PFM	Low	Medium	high
Source of livelihoods			
Level of dependence on forest			
Forest income			
Social value			
Cultural value			

1.9 Rights and responsibility to use and conserve forest resources after BR Approach

1.9.1 Access rights (None, Extremely limited, limited, No limitation/open)

1.9.2 Use rights (Extremely restricted, restricted, No restriction)

1.9.3 Responsibility of forest conservation (None, low, medium, high)

1.9.4 Feeling of responsibility of forest conservation (None, low, medium, high)

1.9.5 Participation of local people in forest conservation activities (None, low, medium, high)

1.9.7 What are forest products extracted from core Zone in the past?	From buffer and core zone where do you get more in past?

1.9.8 How do you rate the importance of forest after Biosphere Reserve Approach?

	Low	Medium	high
Source of livelihoods			
Level of dependence on forest			

Forest income			
Social value			
Cultural value			

1.9.9 Actual forest products protected not to use from core zone

Forest products types	Uses (subsistence/commercial)	If commercial estimated annual income in ETB	

2. Which forest products do you collect and for what purpose (market/consumption)? From last year's experiences, fill the following table from different forest management strategy

3.3.1 PFM

Forest products	Annual collection of the forest products per household			
	Market	consumption	Unit price	Total income
3.1 Firewood for household consumption (load)				
3.2 Firewood for sale (load)				
3.3 Construction posts/poles for household consumption (pcs)				
3.4 Construction posts/poles for sale (pcs)				
3.5 Timber (pcs)				

3.6 Honey (kg/yr)				
3.7 Forest coffee (kg/yr)				
3.8 Spice (korerima) (kg/yr)				
3.9 Spice (timiz) (kg/yr)				
3.10 Spice (wild pepper) (kg/yr)				
3.11 Hareg for household consumption (climber) (pcs)				
3.12 Hareg for sale (climber) (pcs)				
3.13 Bamboo for household consumption (pcs)				
3.14 Bamboo for sale (pcs)				
3.15 Charcoal for sale (sack)				
3.16 Meat from wild animals (no.)				
3.17 Wild food (mushroom, bamboo shoots, *Acho*, *kechi*)				
3.18 Household furniture (tables, chair, etc) pcs				
3.19 Bee hives (Bejo and/ or Yegilo) for sale (pcs)				
3.20 Bee hives (Bejo and/ or Yegilo) for household consumption (pcs)				
3.21 Others, specify				

3.3.2 Biosphere

Forest products	Annual collection of the forest products per household			
	Market	consumption	Unit price	Total income
Firewood for household consumption (load)				
Firewood for sale (load)				
Construction posts/poles for household consumption (pcs)				

Construction posts/poles for sale (pcs)				
Timber (pcs)				
Honey (kg/yr)				
Forest coffee (kg/yr)				
Spice (korerima) (kg/yr)				
Spice (timiz) (kg/yr)				
Spice (wild pepper) (kg/yr)				
3.1 Hareg for household consumption (climber) (pcs)				
3.2 Hareg for sale (climber) (pcs)				
3.3 Bamboo for household consumption (pcs)				
3.4 Bamboo for sale (pcs)				
3.5 Charcoal for sale (sack)				
3.6 Meat from wild animals (no.)				
3.7 Wild food (mushroom, bamboo shoots, *Acho-kechi*)				
3.8 Household furniture (tables, chair, etc) pcs				
3.9 Bee hives (Bejo and/ or Yegilo) for sale (pcs)				
3.10 Bee hives (Bejo and/ or Yegilo) for household consumption (pcs)				
3.11 Others, specify				

3.3.3 Traditional (Kobo)

Forest products	Annual collection of the forest products per household			
	Market	consumption	Unit price	Total income
3.12 Firewood for household consumption (load)				
3.13 Firewood for sale (load)				
3.14 Construction posts/poles for household consumption (pcs)				
3.15 Construction posts/poles for sale (pcs)				
3.16 Timber (pcs)				
3.17 Honey (kg/yr)				
3.18 Forest coffee (kg/yr)				
3.19 Spice (korerima) (kg/yr)				
3.20 Spice (timiz) (kg/yr)				
3.21 Spice (wild pepper) (kg/yr)				
3.22 Hareg for household consumption (climber) (pcs)				
3.23 Hareg for sale (climber) (pcs)				
3.24 Bamboo for household consumption (pcs)				
3.25 Bamboo for sale (pcs)				
3.26 Charcoal for sale (sack)				
3.27 Meat from wild animals (no.)				
3.28 Wild food (mushroom, bamboo shoots, *Acho*፡*kechi*)				
3.29 Household furniture (tables, chair, etc) pcs				
3.30 Bee hives (Bejo and/ or Yegilo) for sale (pcs)				
3.31 Bee hives (Bejo and/ or Yegilo) for household consumption (pcs)				
3.32 Others, specify				

Appendix 3: pictures

Local community transporting harvested honey from Kobo

local beehives (Yegilo) from Kobo

Identification of tree species with local knowledgeable individuals in traditional forest site

Interview with respondent households

Forest vegetation survey measuring DBH

Counting natural regeneration (seedlings and saplings)