TRENDS IN THE AVAILABILITY OF NON-TIMBER FOREST PRODUCTS IN BARO-AKOBO RIVERINE FOREST: CASE OF ITANG SPECIAL DISTRICT, GAMBELLA-ETHIOPIA

MSC THESIS

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SUBMITTED TO SCHOOL OF FORESTRY, WONDO GENET COLLEGE OF FORESTRY AND NATURAL RESOURCES, GRADUATE STUDIES, HAWASSA UNIVERSITY

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APPROVAL SHEET-I

This thesis entitled as '*Trends in the Availability of Non-Timber Forest Products in Baro-Akobo Riverine Forest: Case of Itang Special District, Gambella-Ethiopia''* submitted in partial fulfillment of the requirement for degree of master of science in Forest Resources Assessment and Monitoring, Hawassa University, Wondo Genet College of Forestry and Natural Resources. It is the record of the original carried out by Gatluak Reath Thoal ID.No: MSc/Fram/R005/2017 under my supervision and no part of the thesis has been submitted to any other degree or diploma. Therefore, I recommended that the student has fulfilled the requirements and hence here by submitted the thesis to the program.

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Name of the post graduate coordinator	Signature	Date

APPROVAL SHEET-II

We the under signed members of the boards of examiners of the final open defense by Gatluak Reath Thoal have read and evaluated this thesis entitled as '*Trends in the Availability of Non-Timber Forest Products in Baro-Akobo Riverine Forest: Case of Itang Special District, Gambella-Ethiopia''* and examine the candidate. This is therefore, to certify that the thesis has been accepted in partial fulfillment of the requirement for degree of Master of Science in Forest Resources Assessment and Monitoring.

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Name of external examiner	Signature	Date
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_____	_____	_____
Name of main advisor	Signature	Date

Final approval and acceptance of the thesis is contingent up on the submission of the final copy of the thesis to the school of the graduate studies (SGS)) through the department of Graduate Committee (DGC/SGC) of the candidate's department.

Declaration

I, Gatluak Reath Thoal, hereby declare that this research thesis entitled*"Trends in theAvailability of NonTimber Forest Products in Baro-Akobo Riverine Forest: Case of Itang Special District, Gambella-Ethiopia"*has not been submitted to any other Universities than University of Hawassa, Ethiopia.

_____	_____	_____
Student's name	Signature	Date

Dedication

This reserch project is dedicated to God and my loving, caring and industrious father, mother whose their effort and sacrifice have made my dream of having this degree a reality. Words cannot adequately express my deep gratitude to you. I pray you willl live long to reap the fruits of your labor.

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ACRONYMS

CRGE	Climate Resilient Green Economic
CSA	Central Statistical Agency
Das	Development Agents
FAO	Food and Agricultural Organization
FGDs	Focus Group Discussions
GBANRD	Gambella Beurea of Agriculture and Natural Resources Development
GDP	Growth Domestic Products
GIS	Geographical Information System
GNP	Gambella National Park
GPS	Global Positioning System
GRS	Gambella Regional State
GTP	Growth Transformation Plan
HoARECN	Horn of Africa Regional Environmental Centre Network
KIs	Key Informants
MFP	Minor Forest Product
MoA	Ministry of Agriculture
MRV	Measuring Reporting and Verification
NTFPs	Non-Timber Forest Products
NWFPs	Non -Woody Forest Products
PA	Participatory Appraisal
REDD+	Reducing Emissions from Deforestation and Forest Degradation, Enhancement of Forest Carbon Stocks, Sustainable Forest Management and Conservation
SFM	Sustainable Forest Management
SNNP	Southern, Nation, Nationalities and People
UNHCR	United Nation Higher Commission for Refugee
WBISPP	Woody Biomass Inventory and Strategies Planning
LULC	Land use land cover

ABSTRACT

The term "Non Timber Forest Products" (NTFPs) encompasses all biological materials other than timber, which are extracted from forests for human use (De Beer, 1989). They constitute an important source of livelihoods for most rural people around the world as the part of subsistence, cash income and a vital livelihood safety net in times of hardship. However, due to depletion of NTFPs resources through indiscriminate exploitation, agricultural investment, demographic factors, deforestation, and forest degradation that rural based livelihoods, economics return and biodiversity are heavily affected. For that reason, the study was attempted to examine the trends in availability of NTFPs in baro-akobo riverine forest, Itang Special District, Gambella, Ethiopia. Generally, the study was carryout to explore the trends of availability of NTFPs and socio-economic status in the past and present. Beside, purposive sampling technique was used to make study easy with 4 sampled riverine forest kebele' sites namely Pulkhot, Puldeng, Baziel and Leer. On contrary, GIS and Remote Sensing application were carryout to detect the changes of LULC that occurred in 1986 to 2016. In achieving this, LANDSAT satellite images were acquired through Google earth navigation (down loaded from website address http://www.earthexplorer.usgs). In addition, socio-economic data were acquired from the social survey by using structured questionnaires for KIs, FGDs, and HH interview with 150 people in four kebeles. Furthermore, the quantitative and qualitative data analysis was accomplished by tools such as Arc-GIS, Erdas imagine, excel and presented in inform of tables, graphs, figures and maps. As the results, the LULC finding indicated that riverine forest cover is decreasing from time to time due to anthropogenic factors. For example, between 1986 to 2016 almost 1499.22 ha of riverine forest land was converted to others land uses. Most respondents also explained that they engaged in extracting more NTFPs fuelwood, honey bee, bushmeat, edible fruits,forage and spice because it were difficult to obtain permit in order to have timbers. The interview result on the driving forces assessment revealed that the LULC in riverine forest are mainly driven by a combination of instutional, demographic, economic, and biophysical factors. In summary, the researcher identified how NTFPs extraction had sustainable helped local community in fulfilling various socio-economic benefits in the last 3 decades. However, a lack of strong capacity of the forestry sector, coupled with lack of awareness about forest resources management in the past years and ineffective forest policies implementation caused forests destruction and dynamics. Therefore, in order to keep the sustainability of the NTFPS from those changes there must be integration of stakeholders' organization, awareness creation of the community, as well as participatory forest management approach in riverine forest of the study area.

Keywords: *availability; Trends; non-timber forest products; riverine forest; baro-akobo*

1. INTRODUCTION

1.1. Background of study

During the last two decades, human interest in non-timber forest products (NTFPs) that appeared relevant to the growing focus on rural development and conservation of natural resources has grown (Arnold, 2001). Indeed, NTFPs seemed to offer hope that their presence in the forest would act as an incentive to conserve the forest (Lawrence, 2003), at the same time contributing to community development. This was based on the perception that these products are more accessible to rural populations and especially to the rural poor (Saxena, 1995), and that their exploitation is more than timber harvesting (Myers, 1988). Moreover, there is an assumption, often implicit, that making forests more valuable to local users can encourage forest conservation (Plotkin, 1992).

In Ethiopia forexample, NTFPs of significant economic importance include: Natural Gums and incenses; Wild coffee; Bamboo; Herbal medicine; Fuel wood; Small-diameter wood used for poles, posts and carvings; Honey/bee wax; Ecotourism; Spices and condiments; Civet musk; Forest food (Plant & Animal); Forest grazing, etc. These NTFPs have both direct and indirect values (Mulugeta, 2010).

Despite the fact that NTFPs contribute to forest management and poverty alleviation was regarded as very promising, recent studies have cleared, lack of accurate information pertaining to NTFPs in Ethiopia; there is no single responsible body for the collection, documentation, and quantification of NTFPs and their multifaceted contributions either. Beside, this paucity of information, the rural people in Ethiopia, which are reservoir of the wild plant lore, have been exploiting the wild plant resources for food, medicine, and other various NTFPs uses since antiquity (Amare, 1974). The exploitation of forest resources has a differentiated effect, depending on the type of species and the parts being harvested (Arnold and Perez, 2001).

In Gambella region for example the land use/land cover pattern of a region is an outcome of natural and socio-economic factors and their utilization by local people. Land is becoming a scarce resource due to immense agricultural and demographic pressure which gained 1499.22 ha of riverine forest area. Hence, information on land use / land cover and possibilities for their optimal use is essential for the selection, planning and implementation of land use schemes to meet the increasing demands for basic human needs and welfare (Onoja et al., 2015).

A special case also constitutes refugees from neighboring country mainly South Sudan, who fled their home country under chaotic circumstances due to civil war. These people have lived in camps, but the refugees still need NTFPs for their livelihoods, these cause large clearings around those refugees' camps (WBISPP, 2005).

In Pulkhot kebele for example, the refugees had not been in organized official camps, but they try to survive by themselves as landless people. This situation contributed rather heavily to the harvest of NTFPs in the kebele in order to secure a living for themselves (Abraham, 2016). As destruction is increasing, it reduces the quality of the local population livelihoods that depend on NTFPs like honey, edible fruit, bush meat, forage, and shea buter nut, specially the poor, who are living close to the forest land (Gebremarkos and Woldieselassie, 1999). Based on these contexts, this particular research was designed to assess the trend in the availability of non-timber forest products with respect to demographic and vegetation cover changes.

1.2. Statement of the problem

In the study area there are dramatic reductions in availability of NTFPs base from time to time and their price is also increasing. This change is negatively impacted biodiversity, socio-economic values. It had has been the same for long time as a growing number of people trying to use a decreasing amount of NTFPs (WBISPP, 2005).

Unfortunately, the riverine forests that constituted huge amount of NTFPs in the district before is now being removed indiscriminately in order to satisfy the guest for commercial agricultural investment and acquisition of land for refugees' settlement. However, the land is home to thriving populations like the Nuer, Anuak and Opo who are pastoralists moving with the cattle, fishing, grow crops and collecting wild food as the flood waters in the river recede. Their survival and their identity are totally tied to the NTFPs available and the rivers that run through it (Abraham, 2016).

Various NTFPs such as forage, honey, bushmea, edible fruit, are collected from the forest which are rather sustainable. For instance, in Pulkhot kebele part of the study area, the whole population is involved in collection of NTFPs such as flowers, fruits, leaves, roots, bark, as overpopulation, poverty and lack of other income sources are core issues (Addis voice, 2011).

Now, tension is mounting in the area as decisions are made by central government without respect for consultation with the local population. People are cleared from their land through a process of villagilization which is rather sustainable planned to facilitate access to education and health, but the promised services are not arrived yet (Onoja and Achike, 2015).

This might be due to diminishing production and productivity as a result of resources degradation and deforestation. So far not much studied has been made on trend analysis of NTFPs, and Few studies are specific to certain time and scope that prevent obtaining actual figures regarding to the trends in availability of NTFP in baro-akobo riverine forest which has led to the conversion 1499.22 ha of riverine

forest land to other land use between 1986 to 2016. Some studies are more general that didn't specify one from the other (Onoja and Achike, 2015).

Therefore, this research is proposed to know what was there in the past and compare with the existing conditions through land use land cover change detection and assess the change in NTFPs socio-economic values.

1.3. Objectives of the Study

1.3.1. General Objective

The main objective of study was: to explore the overall trends in availability of non-timber forest products as well as it socio-economics change with in the study area

1.3.2. Specific Objectives

The Specific objectives of study were:

- ✓ To assess the land use/land cover change of the study area in the past three decades and analyzed its implication on the availability of NTFPs
- ✓ To understand the change in NTFPs marketing, price and their prioritization by local people
- ✓ To identify the cause of NTFPs diminishing and assessed their effect on livelihoods of forest communities

1.4. Research questions

The research questions for this study were:

1. How much area of baro-akobo riverine forest converted in to other land uses? And how this change affected socio-economics activities of the local people in the study area?
2. What are the major NTFPs produced in the study area? And how their socioeconomic and prioritization change through time in the study? How they are changing?
3. What are the driving forces of NTFPs diminishing and how the livelihoods of local people are affected by NTFPs loss?

1.5. Significant of the study

The study was carriedout to investigate the land use/land cover change of baro-akobo riverine forest which was good information for forest managers and policy makers. The study was also trying to establish a cause-effect relationship for the diminishing NTFPs of the study area which is helpful for tackling the root cause. Prioritization and socio-economics stutus on the availability of NTFPs was investigated and assessed. This is the basic information to be used by agricultural, forestry and other development agents to create community awareness in the management and utilization of resources. Identification of forest dependent people and assessing their vulnerability to the diminishing NTFPs was the first stepping stone to design proper managing plan and policy. In addition, the findings would be useful for development agents and policy makers the results of this study provided firsthand information for other researchers who have interest to expand this finding further ahead.

1.6. Limitations of the study

Limitation was regarding the interpretation of satellite images of the riverine forests in the study area. In the first place, it was more prominent that the changes in forest cover should be studied up to 2017 as the least year, but there were difficulties of obtaining recently remotely sensed of the study area. Only Landsat images of 1986, 1996, 2006 and 2016 were used.

2. LITERATURE REVIEW

2.1. Definition and concepts of riverine forest

Riverine forest is a relatively continuous cover of trees, which are evergreen or semi-deciduous, only being leafless for a short period, and then not simultaneously for all species. The canopy should preferably have more than one story." Three categories of riverine forest is recognized: closed: crown cover of the upper stratum exceeds 80%; dense: crown cover of the upper strata is between 50% to 80%; and open: crown cover of the upper stratum is between 20% to 50% and forests grow along with the major river banks and spans 20m to 50m buffer from the river. It predominantly consists of common families of *Moraceae, Spidandaceae, mimosaceae* (FOA, 2015).

Non-timber forest products (NTFPs) are biological resources of plant and animal origin, harvested from natural forests, manmade plantations, wooded land, farmlands, and trees outside forests or domesticated. NTFPs include fruits and berries, nuts, spices, medicinal plants, oils, gums, resins, honey, mushrooms, weaving and dying materials, aromatics, butterflies, insect larvae, bark, dung, roots, fungi, furs, and recreation. These products are vital sources of income, nutrition and sustenance for many forest-based communities around the world (FAO, 1988).

Non-wood forest products consist of goods of biological origin other than wood, derived from forests, other wooded land and trees outside forests. The term NWFPs differs from the commonly used non-timber forest product (NTFP) in excluding all wood while NTFP includes wood for uses other than for timber, although there are still many grey areas (FAO, 2001).

Historically, interest in the productive capacity of tropical forests has focused on timber and other woody products. The lesser value had been placed on NTFPs, until it is recently well reflected in their designation called as minor forest products (MFP) not because they are of minor significance, but because they are harvested ‘or’ collected in smaller quantities. In recent times the increased attention paid to NTFPs stems from a number of factors. One is the much heightened interest in the value of biodiversity, carbon

sequestration and other environmental functions provided by tropical forests, and associated concerns with the consequences of the use of these forests in ways which lead to their destruction or degradation. A perception that management for NTFPs is more compatible with sustainable use of tropical forests than management for timber or shifting agriculture has consequently been one of the more powerful factors in stimulating heightened interest in NTFPs (Myers 1986; Fearnside 1989; Peters *et al.* 1989; Bennett 1992; Redford and Padoch 1992).

A second factor has been the growth in awareness that use or sale of NTFPs form important parts of the livelihood systems of very large numbers of people, outside as well as inside tropical forests. This has given rise to a thesis that sustainable management of forests for these products should therefore have valuable welfare consequences, as well as being environmentally sound encouraging the idea that in these way environmental and developmental goals can be pursued jointly (Falconer and Arnold 1989; Falconer 1990; Nepstad and Schwartzman 1992; Panayotou and Ashton 1992).

Though these different interests in NTFPs do coincide to some extent, they also contain inherent basic contradictions. In particular, throughout different theories, there are likely to be conflicts between conservation and development. For instance, most harvesting of NTPPs involves some damage and disturbance to a forests ecological structure and hence affects biodiversity. Some highly sought species may not be able to withstand pressures, causing drastic reduction in their population or even local extinction (Bodmer *et al.* 1988, Browder 1992; Redford 1992; Peters 1996).

Equally, limiting use to low-intensity off take activities is likely to adversely impact on people's ability to upgrade their livelihood systems, adding to the potential conflict between conservation and development from the forest dwellers perspective (Gonz.lez 1992; Redford and Stearman 1993; Conklin and Graham 1995).

2.2. Change in land use/land cover changes and its impact on forest resources

The rate of deforestation and forest degradation and associated impacts on forest cover in Ethiopia remained inconsistent trends through time. Some take the history of deforestation dated back to 5000 years and others argue the largest deforestation has been taking place for the last 150 years (Reusing 1998; (Lemenih and Woldemariam, 2010; Ayana *et al*., 2013). Millennium Assessment (MA, 2005) also considered Ethiopia as one of the 29 countries which lost 90% of its original forest cover. On the basis of trend of deforestation, the country is categorized under late forest transition phase (Hosonuma *et al.* 2012).

This implies slowing of deforestation rate in a small fraction of remaining forests and eventually will come into the post-transition phase (Hosonuma *et al.* 2012).

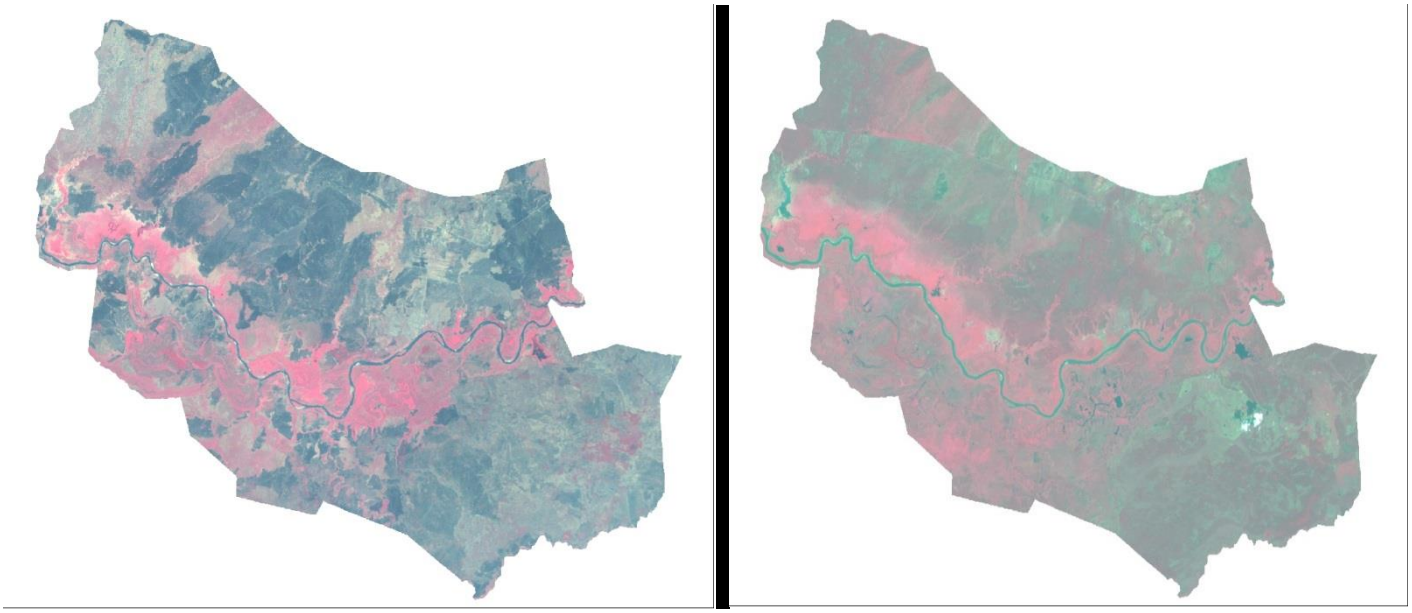
Overall, the annual rate of deforestation of high forests at national level varied from 5% (Reusing, 1998) to 2.08 (WBISPP, 2005), and to 1.0-1.5 (Lemenih and Woldemariam, 2010). Recently, FAO (2010) reported annual deforestation rate of 1.0-1.1% between 1990 and 2010 with a deforestation rate of 141,000 ha per annum between 2005 and 2010. CRGE (2011) also predicted deforestation rate to be 2.5% per annum between 2010 and 2030. The same report also indicated deforestation rate would grow from around 280,000 hectares in 2010 to around 550,000 hectares in 2030. Unless action is taken to change the traditional development path, an area of 9 million hectares might be deforested between 2010 and 2030 for farmland alone (CRGE, 2011).

2.2.1. Land use land cover in Gambella region

The Gambella region, covering about 32,033 km2 (GRS, 2001) or about 3% of Ethiopia's total area and comprising relatively swampy lowlands, is dominated by pastoralists, with an altitude range of 410 to 2300 m.a.s.l. The greater part of the Gambella region is covered by woodland and grassland which account for 36.4% and 30.3%, respectively, of the region. Cultivated land, forest, shrub land, swamp and other land use types cover like riverine forest 3.4 %, 16.7%, 4.6%, 7.7% and 0.9%, respectively, of the region (GRS, 2001).

Gambella is considered to have very high agricultural potential. According to the federal government 200,000 ha of land have been leased to foreign investors – 165,000 to Indian investors MoA (2011) report 400,000 ha of land (large parts of which are located in the Gambella National Park) have been leased or declared to be leased to foreign investors.

Figure1. Baro-akobo riverine forest change



1986 2016

Source: *Change in baro-akobo riverine forest image (author, 2018)*

2.3. NTFPs for sustainable forest management

Extraction of timber from natural forest involves the harvest of the whole plant. By doing so, it affects the forest system in a number of ways. Besides, the process of extraction has a negative ecological impact on the remaining forest that includes reducing biodiversity, altering forest structure, soil compaction. Due to the timber extraction is perceived as the major causes of deforestation.

However, harvest of NTFPs involves extraction of plant parts like, roots, tubers, branches, bark, fruits, leaves, plant exudates. Thus NTFPs harvest is also, perceived as an alternative to deforestation and other land use change activities. Therefore, the management of NTFPs is found to be important activity for forest

conservation and as an alternative to conversion. The sustainable commercial exploitation of NTFPs through adding values to the forest could serve as a stimulus to sound forest management (Peters 1996; FAO 1989; Ros-Tonen 2000).

The extraction of NTFPs could be done sustainably if a periodic inventory on the impact of extraction on the population structure is carried out (Peters 1996; Hall and Bawa 1993).

In order to determine the sustainable level of any commercial utilization of a given NTFPs, accurate information is needed on the growth and regeneration capacity of the resource providing the product, in addition to information on the socio-economic and cultural aspects affecting the NTFPs use. Forexample, the traditional tapping technique, continuous burning, overgrazing, land clearing for farming and insect infestation are some of the major threats for the tree populations. The current tapping practice is said to have a negative impact on the survival, growth and reproduction of trees (Ogbazghi, 2001; Rijkers et al 2006).

2.4. Major NTFPs and their contribution to the livelihood of the community

NTFPs play an important role in the livelihoods of the rural poor, as a source of food, medicine, construction materials, and income. Particularly in dry areas, where very few people undertake rain-fed agriculture due to the extremely dry climate and the erratic nature of rainfall, most of the local communities are highly dependent on the forest resources. The collection of NTFPs provides considerable subsistence support to local livelihoods and offer employment opportunity that provides significant amount of income. When these products are marketed, the sales of NTFPs are also the major source of income generation for the local people. This additional income is important complement to other incomes and helps rural households to diversify their livelihood base and reduce their exposure to risk (Mulugeta Lemenih, 2005).

Some studies shows that majority of local communities, mainly the pastoralists, derive 34% of their financial gain from the collection of NTFPs that ranked second in the overall household livelihoods (Leminih *et al*.,

2003). In most cases the collection NTFPs is done by young people. Although NTFPs play an important role in pastoralist livelihood, the potential has not been realized. Among the contributing factors include lack of financial capital, transport, lack of sound market information to guide opportunities, trends and prices, lack of expertise to boost production and lack of policy implementation and infrastructural support (Getachew,2004).

2.4.1. Shea Nut Tree (Vitellaria paradoxa) as NTFP in baro-akobo riverine forest

Shea tree (also known as "God send Tree") occurs in a belt stretching across Africa, from Senegal to Sudan, marginally extending to the extreme west part of Ethiopia (Gambella). The oil/butter produced from Shea nuts had been used as cooking oil, medicinal ointment, soap making, skin moisturizer, and cosmetics. Shea is also an important source of income and empowerment for women, since females traditionally conduct the harvesting, processing, production, and sales. The Anyuak ethnic group of Gambella has begun producing oil from Shea since in the first decades of the 20th century. The oil extracted from Shea in the region is almost exclusively used domestically, and has so far had negligible commercial impact both in country and does not yet reach international markets, according to available data (HoARECN, 2015).

The Shea tree produces a lot of fruits which when ripen fall under their own weight and are gathered by women, children and some men from April to august of every year. The fruit pulp is nutritious and a very important source of calories, vitamins and minerals and an important source of food for many organisms including birds and bats. The fruits contribute to food security, particularly for the poor since their ripening coincides with the lean season of food production. The fruit of the Shea tree has a seed (nut) and in this seed is a kernel which is dried and stored for processing into Shea butter. Processing of Shea butter is a way of life for many women in study area. While many of these women still use the traditional Shea butter processing method they leant from their elders' years ago, others think the method involves lengthy, arduous processes requiring large (Addis voice, 2011).

2.4.2. The challenges of livelihoods income of NTFPs in Itang district

The multi-ethnic population is a mix of 'highlanders' and indigenous 'lowlander' people: semi-pastoralist Nuer, and the Anuak who mainly live as farmers along the rivers. Limited public services, opportunities and development have kept the area poor and marginalized and are a consequence of the region's geopolitical location and history (Cacao, 2013).

Political factors, such as internal conflict among the ethnic groups for control over land and water, external political interference, international aid, forced migrations; asymmetric power relations and fragility of institutions have determined socioeconomic development. Gambella has been targeted as one of the focal regions for agricultural expansion by virtue of its fertile soils, substantial water resources, and sparse population. As land is state-owned, that people had no formal land to tenure or property rights system. This has justified unregulated and random leasing of land by the government without any accountability to local communities (IO, 2011).

Even though the district owns large blocks of riverine forests, it cannot monitor and enforce usage, and so the forests are essentially open-access areas that anyone can use, especially in the north along the Makot and Kule mountain range areas. Most of the deforestation has occurred in forests that have considerable quantities of NTFPs of high commercial value. Saving Itang Baro-Akobo riverine forests is important because it will control river erosion and diminish the chances of flooding in town (Abraham Berta, 2016).

Saving the forest would require new incentive mechanisms for jointly involving people in the management of district forests and helping those people who must be excluded from the forest to find alternative energy sources to substitute for firewood. A coordinated effort among forest agencies, local people, local bodies and other stakeholders will be required to turn the tide of forest destruction in Itang (Onoja and Achike, 2015).

3. METHODOLOGY

3.1. Description of the Study Area

3.1.1. Location and topography

Itang special district is a town in the Gambella region in south-west Ethiopia, with area of 2,188.34 square km. Located on the Baro-Akobo River and has latitude of $8^0$40`N to $08^0$5`N and $34^0$30`E to $33^0$55`E longitude. It is approximately 35 km away from Gambella city capital and approximately 801Km away from Addis Ababa.The study area is mostly flat terrain; the altitude of this woreda ranges from elevation about 350-480ma.s.l. It is classified as lowland.

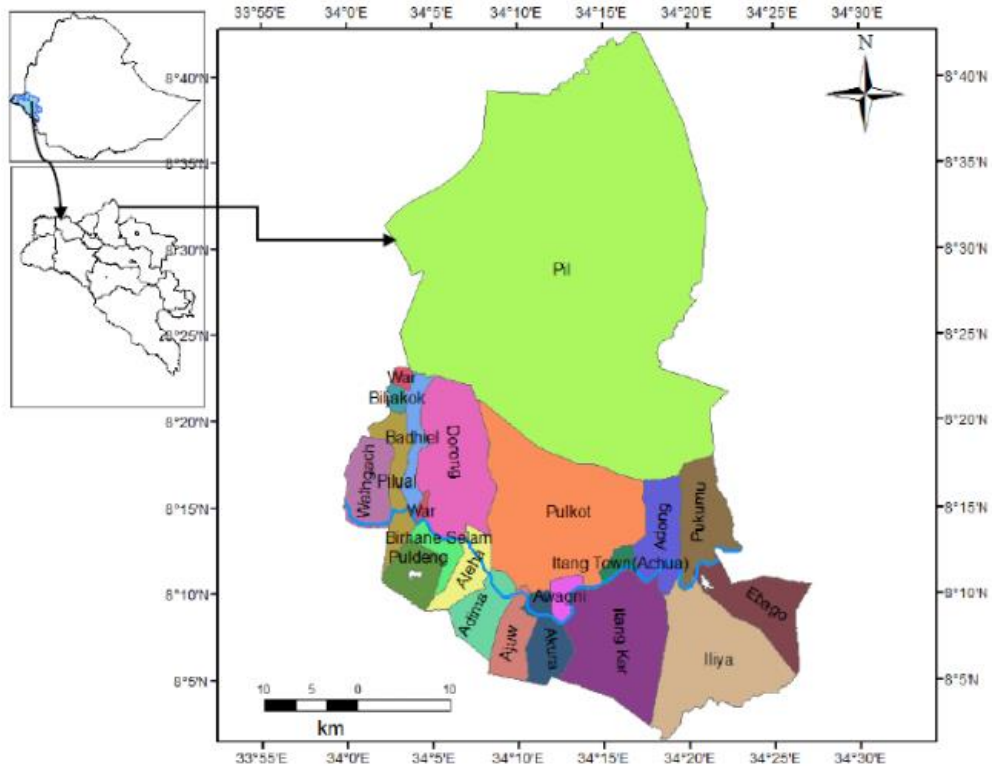


Figure 2: Location of the study site map (Tamiru, 2013)

3.1.2. Population

Based on the 2017 census conducted by the Central Statistics Agency (CSA), this district has an estimated total population of 48,673 of whom 24,548 are males and 24,125 are females. The ethnic breakdown are 53.7% Nuer, 28.54% Anuak, 6.79% Oromo, 6.41% Ahmara, 1.57% Tigray, and 3% others. Nuer is spoken as the first language by 68.72%, Anuak 25.75%, and Opo 2.66% (CSA, 2007). There are also a number of refugee camps which housing around more than 208,140 South Sudanese refugees (UNHCR, 2017).

3.1.3.Climate and soil type

The climate is hot humid with high temperatures before the onset of rains in May and Annual mean temperature is with a minimum and maximum of 18.09°C and 39.34°C respectively. The absolute maximum temperature occurs in mid-March and is about 45°C. The lowest rain fall is recorded in October to November whereas highest rainfall is in May to September. April to October is the rainy season having annual average rain fall of 1500-2000mm. Soils of the Itang area is predominated by; Very deep heavy textured, cracking clay soils of gilgai micro-relief (vertisols) with hard pans, which make them susceptible for surface logging during rainy seasons. Some gleysols are occurring within this unit in drainless positions. Very deep to deep, well drained, stratified alluvial soils (fluvisols) occurring on both sides of the Baro river.

3.1.4. Vegetation cover

The district is endowed with a vast fertile land which favors vegetation growth. The existing land use types are identified as cultivated land, forest land, wood land, bush land, shrub land, grass land, riverine forest, swamps, wetland (marsh land). The natural (i.e. undisturbed) vegetation patterns are closely related to patterns of rainfall and temperature, with local variations due to soil and drainage factors. It consist *Acacia commiphora* woodlands in the drier southern lowlands and abroad leaf *Combretum terminalia* woodland found in the southern wetter areas (WoldieSelassie, 1999).

3.2. Livelihood systems of the study area

According to (GRS 2001); the economy of the district lies in agriculture, animal husbandry and seasonal migration for trade and labor. The main category of this area is agro-pastoral (livestock and crop production), fishing, hunting and wild food collection in which the livelihoods of the community depends on. The common livestock productions are mainly rearing of domestic animals such as cattle, goats, sheep, and poultry respectively. Most people live in the woreda are subsistence farmers growing only enough food to feed their families. Still many find it difficult to raise enough food to feed their families. Rain fed and recessive flood-based agriculture is practice along the baro-akobo river by Anuak and Nuer and their cattle often have to cooperate in sharing use of territories and access to the same resources.

Maize, sorghum is crops grown for consumption, while mango, banana, papaya, sweet potatoes, cassava, sesame and others are grown for sale. Drought, flood, crop pests and livestock disease are chronic hazards that affect their livelihoods. The major issues of the district are high dependency on natural resources leading loss of biodiversity, extreme poverty, illiteracy and inadequate infrastructures to address wide range of conservation and development issues.

3.3. Baro-Akobo River

The river baro-akobo river is found in Gambella region. Numerous perennial rivers cross the Gambella landscape, including the Alwero, Akobo, Baro and Gilo Rivers. They all enter into the Baro-Akobo/Sobat river, which is the second most important river (after the Blue Nile/Abay), as it eventually drains into the White Nile, contributing 14% of the total Nile flows. The Gambella Landscape comprises approximately 40% of the Baro-Akobo Basin. The Baro-Akobo river basin has an area of 75,912Km^2 in general and 24636 Km^2 at Itang covering parts of the Benishangul-Gumuz, Gambella, Oromia, and SNNPR (Awulachew et al. 2007).

3.4. Data collection methods

The methods of data collection were field observation, LULC change detection using remote sensing and GIS to identify land use land cover categories in the study area and accuracy assessment of the developed land use land cover category. Also, GPS point data were collected within the study area to locate where the major types of land use land cover exist.

In addition to that socio-economic survey using questionnaire and interview were carryout on households, KIs and FGDs used to collect ancillary data from the respondents for better investigation the type of NTFPs used, their diminishing factors, maketing status and how NTFPs loss affected loacal people livelihoods through time in the study area. Secondary data were collected from all the possible documents, reports, articles, maps, official records, and other published and unpublished materials.

3.4.1. Primary data collection

The primary data were collected by different techniques such as field observation method, remote sensing and GIS detection, social survey with 150 HH structure questionnair in all four study area kebeles and 8-12 people for FGD, and KIs interview.

3.4.1.1. Remote sensing data acquisition

A comprehensive geographic information system (GIS) and remote sensing was among the tools used for this study to integrate different sources of data by means of satellite image interpretation. For this study, three decades (1986, 1996, 2006 and 2016) of LANDSAT satellite images were acquired from different source (Gloogle earth navigation) down loading from Google web. In achieving this, LANDSAT satellite images were acquired through Google earth navigation (down loaded from website address *http://www.earthexplorer.usgs).* The downloaded satellite images were in tiff format and were stacked in ARC-GIS map software and developing function in it to stack each layer to produce one single layer composing of each band. The sensor was LANDSAT ETM with path 171 rows 54 &55, path 172 rows 54

&55. The band is 7 with pixel size/ Ground Resolution (m) of 30m. Supervised image classification was a method for the study area. Assessment of the accuracy was done based on the data that collected in the field work.

Table 1: Description of the Land Use/Land Cover Classes in the study area map

Land use /cover types	Description
Agriculture	Arable and fallow land that grow annual crops) or perennial crops on the small scale or commercial level by rain fed or irrigation schemes
Grassland	Land covered with the natural growth of herbaceous vegetation or a land sown with introduced grass and leguminous for the grazing of livestock.
Settlement	It comprised areas of intensive use with much of the land covered by structures. Included in this category are cities, towns, villages, strip developments along highways, transportation, power, and communications facilities, and areas such as those occupied by mills, shopping centers, industrial and commercial complexes, and institutions that may, in some instances, be isolated from urban areas.
Riverine forest	A relatively continuous cover of trees, which are evergreen or semi-deciduous, only being leafless for a short period, and then not simultaneously for all species and spans 20m to 50m buffer from the river.
Dense woodland	A continuous stand of trees with a crown density of between 20 - 80%. Mature trees are usually single storied, although there may be layered under-stories of immature trees, and of bushes, shrubs and grasses/forbs. Maximum height of the canopy is generally not more than 20 meters, although emergent may exceed this. Dense woodland has more than 400 stems per hectare, whilst open woodland has between 150 and 400 stems per hectare.
Water bodies	Area occupied by major rivers of perennial or intermittent (width $\geq$ 15m), lakes, ponds and reservoirs.

Source: Global forest Resources Assessment (FAO 2015, Rome, Italy)

3.4.1.2. Social surveys

Out of 21 kebeles in Itang district the investigator has selected four kebeles namely Pulkhot, Puldeng, Baziel, and Leer by using purposive sampling technique by Bryman (2008). The areas were selected based on their vicinity and proximity to the forest. The investigators have also provided a structured interview KI and discussion with FGD with older farmers, kebele leaders and agricultural experts to identified the socio-

economic change of NTFPs in the study area. In addition, a total of 150 households' respondents were sampled from four kebeles by formula provided by Yamane (1968) to determine the required sample size at 95% confidence level, 5% degree of variability and at 8% level of precision.

$$\mathbf{n} = \frac{\boldsymbol{N}}{\mathbf{1}+\boldsymbol{N}\,(\boldsymbol{e})\mathbf{2}}$$

Where; n=Sample size,

N=Population size,

e=level of precision 8% (0.008)

3.4.2. Secondary data source

Secondary data were collected from all the possible documents, reports, articles, maps, official records, and other published and unpublished materials. The data were also collected from the Kebeles farmers, agricultural and rural developments office at kebele level, as well as woreda administration office. Previous studies, guidelines, manuals and literature and documented data were reviewed to characterize the trend of availability of NTFP.

3.5. Data analysis

Both quantitative and qualitative data analysis was accomplished by tools such as Arc-GIS, Erdas imagine, and excel.

3.6. Data intepretion

Data were presented in inform of tables, graphs, figures maps and interpreted though discussion.

4. RESULT AND DISCUSSION

Generally, this chapter is divided in to three parts. These include the land use/land cover change of the study area and analyzed its implication on the availability of NTFPs. Socio-economic change of NTFPs from time to time in the study area which include the demographic characteristics of respondents; the extent of and local causes of NTFPs trends.

4.1. Land use land cover change detection in the study area

The comparison of the land use land cover statistics assisted in identifying the percentage change, trend and rate of change from 1986 to 2016. In achieving this, the first task was to develop a table showing the area in hectares and the percentage change for each year (1986, 1996 and 2016) measured against each land use land cover type.

Table 2: Baro-akobo Riverine forests coverage in four kebele of Itang 2017

Name of kebeles	**1986**		**1996**		**2006**		**2016**	
↓	Area (ha)	%	Area (ha)	%	Area (ha)	%	Area (ha)	%
Pulkhot	1932.5	54.81	1621.4	52.35	1753.18	55.37	1581.3	52.99
Bazil	263.1	7.46	231.7	7.48	240.2	7.58	248.13	8.316
Puldeng	376.23	10.67	369.5	11.93	342	10.8	336.6	11.28
Leer	953.8	27	874.4	28.23	831	26.24	817.65	24.40
Grand total	**3525.63**	**100**	**3097**	**100**	**3166.38**	**100**	**2983.68**	**100**

Source: Author, Field inventory (2018).

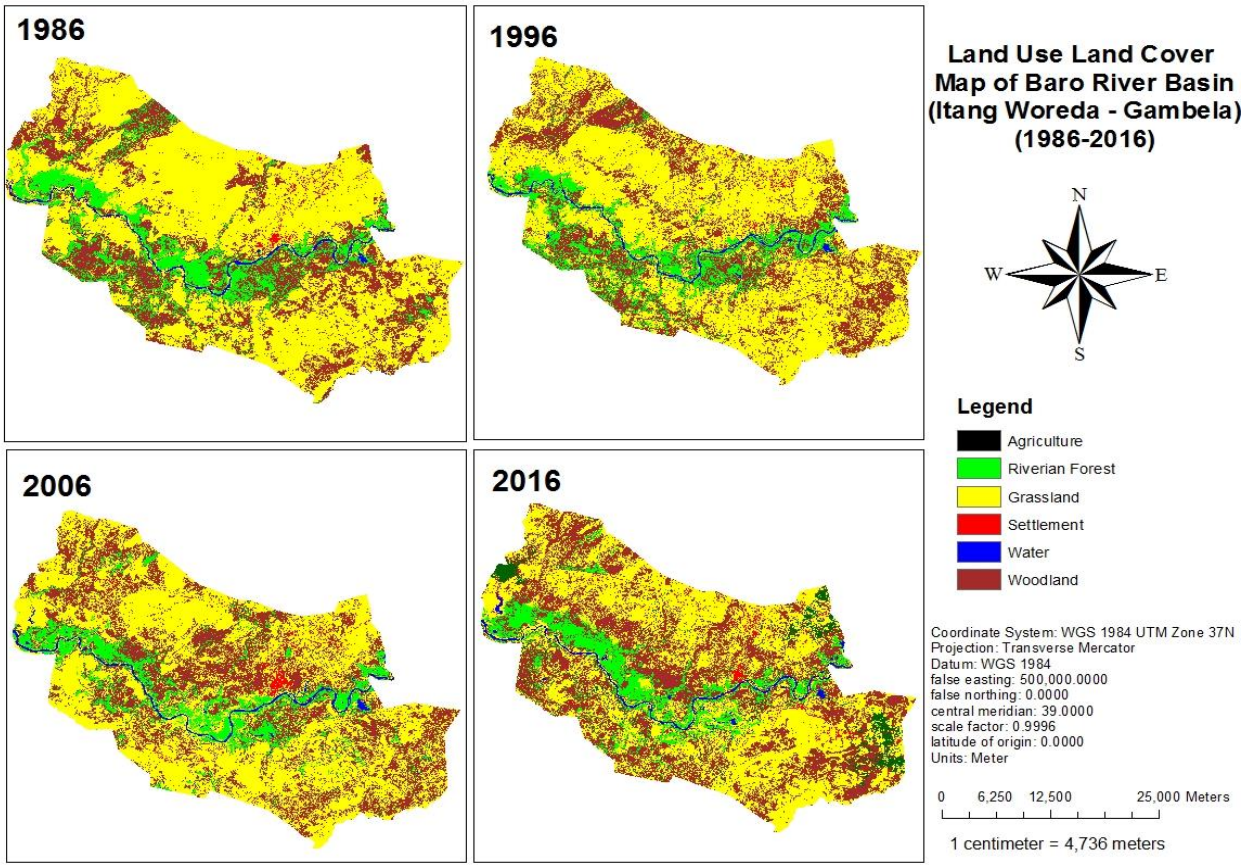
As shown in the table, in pulkhot villages between 1986 and 1996 there was huge decrease of riverine forest cover as 311.2 ha (28%) as compared to 131.78ha (26%) of 1996 to 2006 because of refugee settlement in 1986. The reason forest increased in pulkhot, and baziel villages in 2006 was because refugee between 1995

to 2006 were returned back to their home country before they come back again in 2013. Therefore forest cover improved before it shows adecline in 2016.

Followed by 2006 to 2016 a huge amount of forest land estimated as 172ha (26%) was changed to other land uses as refugee resettlement is witnessing in Pulkhot village and establishment of tharpam as second town in Itang woreda since 2013. The same is true in puldeng and baziel village; there is continuous decline in riverine forest cover because of recent large scale agricultural investment and palata nomadic people cattle herders. But in baziel kebele as shown in table above, we see forest cover improvement in 2016 as compared with 1996 and 2006.

This was because of villagilization enforced by federal government to relocate the local people to the near by public road side rather than previouse home in forest area.Leer village also indicated a forest cover improvement in 1996 as regeneration growth increase after the soldier left the area after their settlement between 1986 -1993.

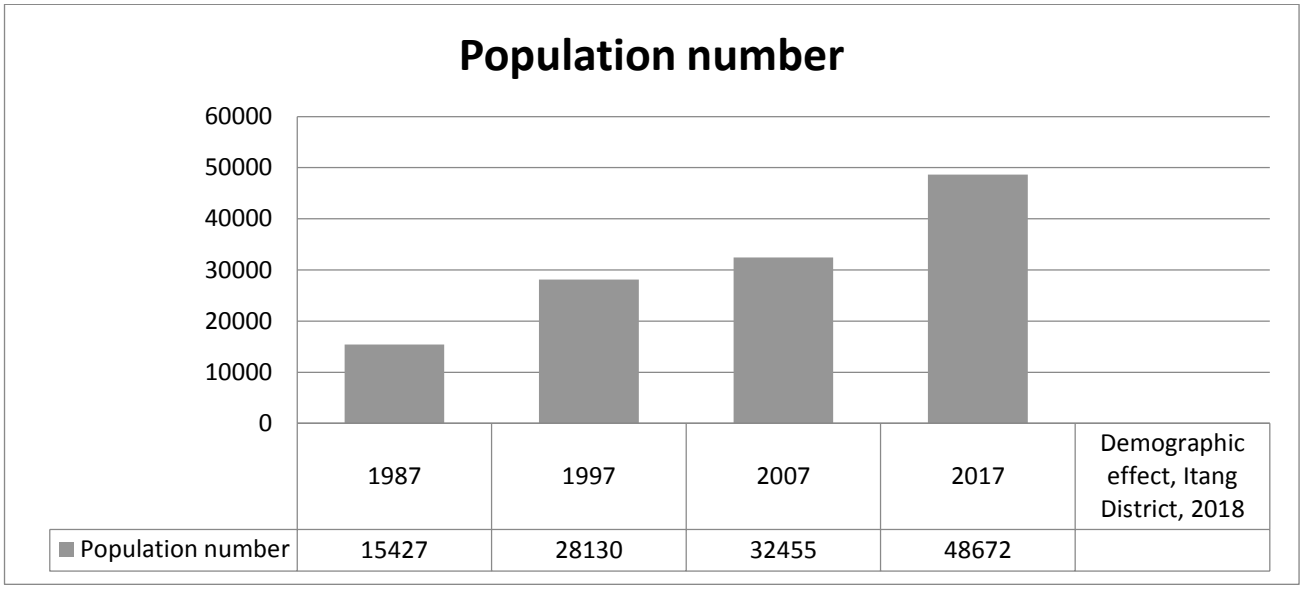
Figure 3: LULC map of baro riverine forest in Itang district (1986-2016)



***Source**: Author LULC categories (LAND satellite, 1986-2016)*

One of the indirect causes of NTFPs trends in Itang woreda was the population growth over the last three decades, which experienced an exponential growth in its population. As figure shows below, Itang's population has increased from about 15427 people in 1987 to about 28130 people in 1997, to 32455, in 2007 and 48673 in 2017.

Figure 4. Demographic effect of population, in the study area



Source: CSA (2017)

Figure shows the relationship between population growth and forest cover change. As the increased population has been accompanied by a decrease in forest cover in the study area. As population increases, the extent of forest cover decreases. The increasing population has led to high population density in some kebeles in the woreda especially in Pulkhot kebele.

At the woreda level the density of the population has increased two and a half fold from 3 persons per square kilometers in 1986 to 7 persons per square kilometers by 2009 to 20 per square kilometres in 2017. This translates into more pressure on the district riverine forest in the study area as the additional people seek more land for farming, and exploit the forest for such products as fire wood. This increase in population density means that the number of livestock has also increased, thereby resulting in more grazing pressure and hence degradation of the NTFPs. The increased demand for fuel wood as a result of the increase in population density has further compounded pressure on the dry land forests.

Table 3: LULC overall accuracy assessment in four kebeles (Itang District) from 1986 to 2016

Land cover	**1986**		**1996**		**2006**		**2016**	
class	Producer's	User's	Producer's	User's	Producer's	User's	Producer's	User's
Water	65.00	86.67	89.13	95.35	88.24	93.75	83.87	98.00
Settlement	87.50	77.78	90.00	72.97	92.16	79.66	89.29	96.15
Riverine Forest	67.86	86.36	86.67	96.30	86.36	95.00	73.68	56.00
Woodland	85.29	85.29	84.00	95.45	80.77	95.45	89.29	71.44
Agriculture	-	-	-	-	-	-	90.00	99.96
Grassland	87.10	72.97	86.96	80.00	89.19	89.19	57.14	88.89
Overall accuracy	83.05%		87.66%		88.24%		82.86%	
Kappa statistics	79.37		84.35		84.84		79.13	

Source: Author map classification result (2018)

Overall accuracy was greatest as 88% in 2006 the when buffered had no mixed riverine and woodland classification. Accuracy increased with the removal of mixed, which was often confused with woodland and riverine forest. Overall accuracy was relatively low at 82.86%, in 2016 as riverine forest was falsely classified in the woodland class.

Riverine forest which was falsely classified in as woodland forest further reducing overall accuracy as there were limited blocks of riverine forest. This accuracy result was reflects relatively simple analysis on the part of an analyst. Accuracy was increased with more effort from a skilled analyst. Increasing the number of classes defined in the unsupervised classification decrease the number of signatures that have to be forced into an individual category as the spectral range for each class increases. Some of the open areas (agricultural and shrub areas) carry the same spectral response as woodland and riverine forest, decreasing accuracy.

4.1.2. Underlying driving forces analysis

The image analysis has revealed that in many parts of the study area, NTFPs transformations have taken place at the large rate, but the question is what forces the have driven those changes needed further

investigation to understand the changes and associated underdriving forces. The interview result on the driving forces assessment indicated that the LULC in riverine forest are mainly driven by a combination of institutional, demographic, economic, and biophysical factors.

A. Institutional factor

There are several institutions with the legal jurisdition to admistered NTFPs in the region. However, KI inteviews indicated that frequenty restructuring and overlapping responsibilities among those institutions accountable for forest resource management were considered barriers to halting the severe trend in availability of NTFPs in the study area. Thus inadequate capacity of institutions at district level to educate and involve local community inmanagement and conservation of the forest resource was one of bthe cause that led to the destruction of NTFPs. Key informants confirmed that people considered for NTFPs as kebele common product. This situation make the community both actors and victim of NTFPs.

B. Demographic factors

According to census data (CSA, 2014) the population in the study area dwellers increase from 44,757 (22,651 male and 22106 female), 46,024 (23,200 male and 22,824 female) in 2015 and 47,280 (23,874 male and 23,406 female) in 2016 from 48,673 (24,548 male and 24,125 female in 2017). The immigration was one of the most important demographic factors that contribute to population increase. Based on interview results and my own observation, most of LULC conversion was population induced of large scale agricultural investment and refugee settlement.

C. Economic factors

Acccording to KI, increasing price of NTFPs in the district have negativelt contributed to the LULC change in the study area. KI informants also recognized that due to limiting off-farm employment opportunity, the majority of households need cash from other sources to pay for schooling, health care.This has increased the demand and pressure on NTFPs by encouraging people to heavily collect them inorder to earn the immediate income.

D. Biophysical factors

KI also pointed out that, suitability of land with flat-lying terrain has contributed to the expansion of agricultural land and refugee settlement. This condition has resulted to increase in the number of inhabitants.

4.1.3. Land use land cover distribution

The distribution of land use land cover categories in the study area are well examined in the field during December till March 2017/2018 and based on this critical examination of the land use land covers, sample of six land cover categories were identified. This includes water, settlement, riverine forest, woodland, grass land and agricultural land. The land use land cover categories in table below shows that grassland is the most predominantly land use land cover category in the study area follow by woodland, riverine forest, settlement, water body and agriculture.The static land use land cover distribution for each study year as derived from the maps are presented in the table below.

Table 4. LULC change of Itang woreda

Land cover	**1986**		**1996**		**2006**		**2016**	
class	ha	%	ha	%	Ha	%	ha	%
Water	1239.12	1.16	1396.17	1.31	1597.41	1.50	1655.55	1.55
Settlement	1160.73	1.09	1447.56	1.36	1914.03	1.79	2490.93	2.33
Riverian Forest	12941.73	12.12	12270.51	11.49	11873.52	11.12	11442.51	10.72
Woodland	28001.25	26.23	30188.88	28.28	33118.83	31.02	36826.92	34.49
Grassland	63420.75	59.40	61460.46	57.57	58259.79	54.57	50015.25	46.85
Agriculture	0	0.00	0	0.00	0	0.00	4332.42	4.06
TOTAL	**106763.58**	**100.00**	**106763.58**	**100.00**	**106763.58**	**100.00**	**106763.58**	**100.00**

Source: Author map classification result (2018)

In the above table the grass land cover decrease from 59.4% in 1986 to 46.85% in 2016 was because patatal nomadic people who freely move with their cattle with in the grassland. This cause agreat destruction which led to huge decrease in grassland cover. Again the woodland increase from 26.23% to 34.49% as

regeneration growth of vegetation were iimproved because of villagilization which force people to settled in one common area rather than scattered settlement in the woodland forest.

4.1.4. Area of land use / land cover classes gained by other classes

It was found that settlement (built up areas), woodland and water bodies increased tremendously in size from 1986 to 2016 (30 years), so many buildings were constructed in the forest, such as refugee settlement, churches.

As the result above showed, in 1986 the total rivenine forest land in itang woreda was estimated to be 12941.73ha which constitute 12.12%, of the total landuse in the study area. In 1996 riverine forest cover was decreased from 1227.51ha (11.49%) out of total LULC of the district because at that time refugee were settled in forest area. And then in 2006-2016 riverine forest cover were decreased from 11873.52ha (11.12%) in 2006 and 11442.51ha (10.72%) as investment and refugee resettlement brought the change in riverine forest cover.

Between that time 4332.42ha (4.06) of other land use were converted to agricultural land. According to our observation and feedback from key informants, increased price of NTFPs in the markets have negatively contributed to the LULC changed in the area. Key informants also recognized that due to limited off-farm employment opportunity, the majority of households need instants cash from other sources to pay for schooling, health care etc. This has increased the demand and pressure on NTFPs by encouraging people to illegally the minor forest products to earn the immediate income.

Table 5: Land Use Land Cover change Distribution (1986, 1996, 2016)

Land cover class	1986-1996		1986-2006		1986-2016		1996-2006		1996-2016		2006-2016	
	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%
Water	157.05	0.15	358.29	0.34	416.43	0.39	201.24	0.19	259.38	0.24	58.14	0.05
Settlement	286.83	0.27	753.30	0.71	1330.20	1.25	466.47	0.44	1043.37	0.98	576.90	0.54
Riverian Forest	-671.22	-0.63	-1068.21	-1.00	-1499.22	-1.40	-396.99	-0.37	-828.00	-0.78	-431.01	-0.40
Woodland	2187.63	2.05	5117.58	4.79	8825.67	8.27	2929.95	2.74	6638.04	6.22	3708.09	3.47
Grassland	-1960.29	-1.84	-5160.96	-4.83	-13405.50	-12.56	-3200.67	-3.00	-11445.21	-10.72	-8244.54	-7.72
Agriculture	0	0.00	0.00	0.00	4332.42	4.06	0.00	0.00	4332.42	4.06	4332.42	4.06
TOTAL	**-157.05**	**-0.15**	**-358.29**	**-0.34**	**-416.43**	**-0.39**	**-201.24**	**-0.19**	**-259.38**	**-0.24**	**-58.14**	**-0.05**

Source: Study area LULC map (2018)

According to some KIs, suitability of land with flat-laying topography has contributed to expansion of agriculture land and refugees settlement. This condition has resulted to increase the number of inhabitants and has led to destruction of NTFPs in the study area. Respondent also said that human induced fire has played assignificant role in the destruction of NTFPs as well as the whole forest. In table, it is shown that from 1986-1996, a total of 671.22 ha as (0.63%) and 1996-2006, 1068.21ha, 1% , 1986-2016 the 1499.22 (1.4%) which were recognized as thick forest was converted to other landuse in the total woreda land use and no otherlanduse were converted to riverine forest at that period.

Table 6: Land Use Land Cover Distribution (1986, 1996, and 2016) in four sample kebeles

Land cover	**1986**		**1996**		**2006**		**2016**	
class	ha	%	ha	%	Ha	%	ha	%
Water	132.84	0.45	159.57	0.54	195.84	0.66	223.47	0.75
Settlement	352.35	1.18	358.56	1.20	500.76	1.68	792.54	2.66
Riverian Forest	2957.31	9.94	2626.11	8.82	2642.94	8.88	2982.24	10.02
Woodland	6558.84	22.03	8022.69	26.95	10818.45	36.34	11524.23	38.72
Grassland	19764.81	66.40	18599.22	62.48	15608.16	52.44	13918.41	46.76
Agriculture	0	0.00	0	0.00	0	0.00	325.26	1.09
TOTAL	**29766.15**	**100.00**	**29766.15**	**100.00**	**29766.15**	**100.00**	**29766.15**	**100.00**

Source: *Author image classification of (1986, 1996, 2006 and 2016)*

As shown in the table above, the total rivenine forest land in four sampled kebeles was 2957.31ha which constitute 9.94%, of the total landuse in the study area. In 1996 riverine forest cover was decreased from 2626.11ha (8.82%) because at that time refugee were settled in forest area. And then in 2006-2016 riverine forest cover improvement was witnessing as villagilization make people to settle in one common area established by government near the public roads were local people can get their service easly.

Result also indicated that agricultural practice was null from 1986 to 2006 this was because there was no large scale agricultural investment practiced at that time before it's started in 2010. In 2016, the little agricultural land as 325.26ha (1.09) gained from other lands uses was converted to agriculture. According to respondents, population pressure worsened by low agricultural technology had significantly contributed to expansion of agricultural land and excessive extraction of NTFPs. This creates suplus labor force and usual trend for this force.The recent trend show that this labor forces migrated to other undisturbed areas in search of farmland and resettlement. Some of the key informants noted that the combined effect of investment and refugees settlement has been one of the causes in reducing the availability of NTFPs since 1986.

Table 7. LULC converted to other land use

Land cover class	1986-1996		1986-2006		1986-2016		1996-2006		1996-2016		2006-2016	
	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%
Water	26.73	0.09	63.00	0.21	90.63	0.30	36.27	0.12	63.90	0.21	27.63	0.09
Settlement	6.21	0.02	148.41	0.50	440.19	1.48	142.20	0.48	433.98	1.46	291.78	0.98
Riverian Forest	-331.2	-1.11	-314.37	-1.06	24.93	0.08	16.83	0.06	356.13	1.20	339.30	1.14
Woodland	1463.85	4.92	4259.61	14.31	4965.39	16.68	2795.76	9.39	3501.54	11.76	705.78	2.37
Grassland	-1165.59	-3.92	-4156.65	-13.96	-5846.40	-19.64	-2991.06	-10.05	-4680.81	-15.73	-1689.75	-5.68
Agriculture	0	0.00	0.00	0.00	325.26	1.09	0.00	0.00	325.26	1.09	325.26	1.09
TOTAL	**-26.73**	**-0.09**	**-63.00**	**-0.21**	**-90.63**	**-0.30**	**-36.27**	**-0.12**	**-63.90**	**-0.21**	**-27.63**	**-0.09**

Source: Author map classification result (2018)

Temporal trend of land use and land cover change in the last three decades shows that magnificent change detection has been noticed. In addition to that, the rate of grassland change is large compared to the other land use and land cover in the last three decades.

The distributions of land use land cover categories in the study area are well presented in table of different time periods of the study. The negative values represent the declined in the proportion of land use land cover categories in that particular time where positive values corresponds to the increased in the proportion of land covers class in that particular time of the study.

The result from Table shows that water woodland gained the highest area 4259.61 ha between 1986 to 2006 at (14.31%) of the total area of the study kebeles. Between 1996 and 2006 woodland dramatically decreased to 2795.76 ha at (9.39%) of the study area and then later in time 2006 to 2016 declined to 705.78 ha (2.37%) of lands. The rapid declined in riverine forest land during the year between 1986 to 1996 was attributed to the expansion of refugees' settlement in the study area. This has been witnessed by the respondents during the focused group discussions and key informant interviews.. From Table above, one can infer that wood land is the most predominant LULC category for four sampled kebeles in the study area.

4.2. Socioeconomic characteristics in the study area

This first section analysed the demographic characteristics of the 150 household respondents in the four communities. The key considerations were the gender; age; marital status; level of education; livelihood

occupations; wealth status; and the length of stay in the community. This was essential to gives an overview of the category of people who were involved in the study.

Table 8: Socioeconomic characteristic distribution in the study area by HH respondents

Variable		Name of kebeles	Pulkhot		Puldeng		Baziel		Leer		Total	
	Status of respondents	Total no	Fr.	%	Fr.	%	Fr.	%	Fr.	%	Fr.	%
	18-25 years	19	6	31.6	4	21	5	26	4	21	19	100
	26-33 years	22	7	31.8	5	23	5	23	5	23	22	100
	34-41 years	30	11	36.7	6	20	7	23	6	20	30	100
	42-49 years	37	14	37.8	7	19	9	24	7	19	37	100
	50 years and above	42	16	38.1	8	19	10	24	8	19	42	100
Age											**150**	**100**
	Poor	70	12	17.1	19	21	17	24	22	31	70	100
	Medium	60	16	26.6	14	23	15	25	15	25	60	100
	Rich	20	7	35	4	20	5	25	4	20	20	100
Wealths											**150**	**100**
	No schooling	33	5	15.2	10	30	6	18	12	36	33	100
	Basic level	65	17	51.5	16	48	16	48	16	48	65	100
	Secondary level	20	7	35	4	20	5	25	4	20	20	100
	Tertiary level	32	12	37.5	6	19	7	22	5	16	32	100
Educational Level											**150**	**100**
	Male	80	24	30	23	29	15	19	18	23	80	100
	Female	70	16	22.9	17	24	25	36	12	17	70	100
Sex											**150**	**100**
	Married	125	60	48	30	24	39	31	21	17	125	100
	Single	7	2	28.6	2	29	2	29	1	14	7	100
	Divorced	8	2	25	2	25	2	25	2	25	8	100
	Widowed	10	3	30	3	30	2	20	2	20	10	100
Marital status											**150**	**100**
	Agriculture	92	20	21.7	24	26	25	27	23	25	92	100
	NTFPs	26	10	38.5	5	19	5	19	6	23	26	100
	Trade	23	9	39.1	5	22	5	22	4	17	23	100
Livelihoods occupation	Alternative livelihoods	9	5	55.6	1	11	2	22	1	11	9	100
											150	**100**

Source: *Author (social survey, 2018)*

Though the household respondents were sampled with prior knowledge of their duration of stay in the respective communities, the findings reveal that every respondent involved in the study supposedly has stayed in the community for a minimum of 10 hence was able to share some experiences and knowledge regarding various aspects of the research questions.

Though respondents were randomly sampled, the highest responses came from the males and this is probably because their total household in the four communities was higher than their female counterparts. That notwithstanding the specific distribution between the all communities varies narrowly. Pulkhot kebele recorded 24 male respondents and 18 female respondents, which was reflective of the population for males and females. The reverse happened in Bazil where there were more female respondents (25) than male (15). There was no special explanation for this variation but it can be linked with the choice of sampling technique which offered every person whether male or female, the equal chance of being selected.

It was realized that most people in the four Kebeles in the study areas had attempted to acquire some formal education but the majority stopped at either middle school or junior high school and this cuts across the various age category. While that was noted, it was important to state that, those who have had formal education are able to speak and write in English and the local like Nuer, Anyuak and Opo, though not fluently except those with tertiary education.This may be inferred that the literacy rate in the four communities is high. This is because the cumulative percentage of literates (ability to read and write in English and local languages) was higher in the four kebeles and this far exceeds the illiteracy rate for the kebeles estimated to be low.

4.2. Characteristis on NTFPs in the study area

4.2.1. Prioritization of NTFPs

Matrix Preference Ranking was used to find out most preferred NTFPs. By using this tool, the most preferred NTFP species were identified from each kebele for the detail study. The criteria of preference were made by the users, availability of the resources and potential for value addition.

Table 9: Scale and values of species ranking in the study area

S.No	Criteria	Scale and Values
1.	Market demand	High (3), Moderate (2), low (1) no value (0)
2.	Margin/profit	High (3), Moderate (2), low (1) no value(0)
3.	Availability (in time)	Almost always(3), Occasionally(2), Seasonal rare (1)
4.	Geographical distribution	Widespread (3), Localized (2) , Rare(1)
5.	Conservation status	High (3), Moderate (2), low (1)
6.	Potential for cultivation	High (3), Moderate (2), low (1)
7.	Regeneration potential	High (3), Moderate (2), low (1)
8.	Contribution to income	High (3), Moderate (2), low (1)
9.	Gender impact	Only women (3), Both men and women (2) , only men(1)
10.	Potential for value addition	High (3), Moderate (2), Low (1)
11.	Processing technology	Manual\ local technology (3), Mechanical\expertise required (2), Sophisticated \ foreign technology(1)
12.	Ethno botanical value	Diverse use(3), Limited uses(2) , single use(1)

Source: Author field work (2018)

Table 10: Matrix preference ranking for NTFPs species in Pulkhot kebele Table

Sn	Criteria⇒ NTFP species ⇓	Market demand	Margin (profit)	Availability (in time)	Geographical distribution	Conservation status	Potential for cultivation	Regeneration potential	Contribution to income	Gender impact	Potential for value addition	Processing technology	Ethno botanical values	Total
1.	*Minychool(local name)*	3	3	3	3	2	0	3	3	3	3	3	3	**32**
2.	*Azadirachta indica (Nipe)*	3	3	3	2	3	3	2	3	3	3	0	3	**31**
3.	*Balanites aegyptiaca (Thoow)*	3	3	2	3	2	1	2	2	3	3	3	3	**30**
4.	*Fius sycomorus (Gnoop)*	3	3	3	2	3	1	2	3	2	3	2	3	**30**
5.	*Keach (local name)*	3	3	3	2	1	0	1	3	3	3	1	3	**26**
6.	*Ziziphus spina-christ (Buow)*	3	3	1	2	1	0	1	3	3	3	3	3	**26**
7.	*Acacia seyal (Luor)*	3	3	3	2	1	0	2	3	3	1	0	3	**24**
8.	*Flueggea virosa (Waak)*	3	3	1	3	1	0	3	3	1	2	0	3	**23**
9.	*Ziziphus pubescens (Rieek)*	3	3	2	1	2	0	1	3	2	2	0	3	**22**
10.	*Tamarindus indica (Koat)*	2	2	2	2	2	1	1	2	1	3	0	3	**21**
11.	*Dichrostachys cinerea (Kir)*	3	3	1	2	1	0	3	3	1	1	0	3	**21**
12.	*Ricinus communis (Pilir)*	1	1	1	1	0	0	2	2	3	3	3	2	**19**
13.	*Taw (local name)*	3	3	1	2	1	0	3	3	1	0	0	2	**19**
14.	*Thep (local name)*	1	2	1	2	1	0	1	2	2	1	0	3	**16**
15.	*Acacia Senegal (Gnuer)*	2	2	1	2	0	0	2	2	1	0	0	3	**15**
16.	*Calotropis procera (Pak)*	0	0	3	1	1	1	1	1	0	1	3	3	**15**
17.	*Piliostigma thonningii(Gnoang)*	1	0	2	2	0	0	1	1	0	1	0	3	**11**
18.	*Sarcocephalus latifolius (Miaar)*	0	1	2	1	1	1	1	1	0	0	0	3	**11**
19.	*Kigelia Africana (Luel)*	1	1	2	1	1	0	1	1	0	0	0	2	**10**
20.	*Gaar (local name)*	1	1	2	1	0	0	1	1	0	0	0	3	**10**
21.	*Vitellaria paradoxa (Wado)*	0	0	0	0	0	0	0	0	0	0	0	0	**0**
22.	*Hyphaene thebaica (Noor)*	0	0	0	0	0	0	0	0	0	0	0	0	**0**

Source: Author field inventory (2018)

Table 11: Matrix preference ranking for NTFPs species Baziel kebele Table

Sn	Criteria⇒ NTFP species ⇓	Market demand	Margin (profit)	Availability (in time)	Geographical distribution	Conservation status	Potential for cultivation	Regeneration potential	Contribution to income	Gender impact	Potential for value addition	Processing technology	Ethno botanical values	Total
1.	*Balanites aegyptiaca (Thoow)*	3	3	3	3	3	1	2	2	3	3	3	3	**32**
2.	*Minychool (local name)*	3	3	3	3	2	0	3	3	3	3	3	3	**32**
3.	*Azadirachta indica (Nipe)*	3	3	2	2	3	3	2	3	3	3	0	3	**30**
4.	*Keach (local name)*	3	3	3	2	1	0	1	3	3	3	1	3	**26**
5.	*Ziziphus spina-christ (Buow)*	3	3	1	2	1	0	1	3	3	3	3	3	**26**
6.	*Fius sycomorus (Gnoop)*	2	2	2	2	1	1	2	3	2	3	2	3	**25**
7.	*Acacia seyal (Luor)*	3	3	3	3	1	0	2	2	3	1	0	3	**24**
8.	*Flueggea virosa (Waak)*	3	3	1	3	1	0	3	3	1	2	0	3	**23**
9.	*Dichrostachys cinerea (Kir)*	3	3	1	2	1	0	3	3	1	1	0	3	**21**
10.	*Ziziphus pubescens (Rieek)*	3	3	1	1	2	0	1	2	2	2	0	3	**20**
11.	*Ricinus communis (Pilir)*	1	1	1	1	0	0	2	2	3	3	3	2	**19**
12.	*Tamarindus indica (Koat)*	1	2	1	1	1	1	1	1	1	2	0	3	**15**
13.	*Calotropis procera (Pak)*	0	0	3	1	1	1	1	1	0	1	3	3	**15**
14.	*Acacia Senegal (Gnuer)*	1	2	1	2	0	0	2	2	1	0	0	3	**14**
15.	*Thep (local name)*	1	1	1	2	1	0	1	1	1	1	0	3	**13**
16.	*Piliostigma thonningii(Gnoang)*	1	0	1	2	0	0	2	1	0	1	0	3	**11**
17.	*Sarcocephalus latifolius (Miaar)*	0	1	2	1	1	1	1	1	0	0	0	3	**11**
18.	*Gaar (local name)*	1	1	2	1	0	0	1	1	0	0	0	3	**10**
19.	*Taw (local name)*	3	3	1	2	1	0	0	0	0	0	0	0	**10**
20.	*Kigelia Africana (Luel)*	1	1	2	1	0	0	1	1	0	0	0	2	**9**
21.	*Vitellaria paradoxa (Wado)*		0	0	0	0	0	0	0	0	0	0	0	**0**
22.	*Hyphaene thebaica (Noor)*	0	0	0	0	0	0	0	0	0	0	0	0	**0**

Source: Author field inventory (2018)

Table 12: Matrix preference ranking for NTFPs species in Puldeng kebele Table

Sn	Criteria⇒ NTFP species ⇓	Market demand	Margin (profit)	Availability (in time)	Geographical distribution	Conservation status	Potential for cultivation	Regeneration potential	Contribution to income	Gender impact	Potential for value addition	Processing technology	Ethno botanical values	Total
1.	*Hyphaene thebaica (Noor)*	3	3	3	3	3	3	3	3	3	3	3	3	**36**
2.	*Balanites aegyptiaca (Thoow)*	3	3	2	3	2	1	2	2	3	3	3	3	**30**
3.	*Fius sycomorus (Gnoop)*	3	3	3	2	3	1	2	3	2	3	2	3	**30**
4.	*Minychool (local name)*	1	2	3	3	2	0	3	3	3	3	3	3	**29**
5.	*Azadirachta indica (Nipe)*	2	3	3	2	3	3	2	3	1	3	0	3	**28**
6.	*Keach (local name)*	3	3	3	2	1	0	1	3	3	3	1	3	**26**
7.	*Ziziphus spina-christ (Buow)*	3	2	1	2	1	0	1	3	3	3	3	3	**25**
8.	*Flueggea virosa (Waak)*	3	3	1	3	1	0	3	3	1	2	0	3	**23**
9.	*Dichrostachys cinerea (Kir)*	3	3	1	2	1	0	3	3	1	1	0	3	**21**
10.	*Acacia seyal (Luor)*	1	1	3	2	1	0	2	3	3	1	0	3	**20**
11.	*Ziziphus pubescens (Rieek)*	2	3	2	1	2	0	1	3	1	2	0	3	**20**
12.	*Ricinus communis (Pilir)*	1	1	1	1	0	0	2	2	3	3	3	2	**19**
13.	*Taw (local name)*	3	3	1	2	1	0	3	3	1	0	0	2	**19**
14.	*Thep (local name)*	1	2	1	2	1	0	1	2	2	1	0	3	**16**
15.	*Calotropis procera (Pak)*	0	0	3	1	1	1	1	1	0	1	3	3	**15**
16.	*Acacia Senegal (Gnuer)*	1	1	1	2	0	0	2	2	1	0	0	3	**13**
17.	*Sarcocephalus latifolius (Miaar)*	0	1	2	1	1	1	1	1	0	0	0	3	**11**
18.	*Piliostigma thonningii(Gnoang)*	0	0	2	2	0	0	1	1	0	1	0	3	**10**
19.	*Kigelia Africana (Luel)*	1	1	2	1	1	0	1	1	0	0	0	2	**10**
20.	*Gaar (local name)*	1	1	2	1	0	0	1	1	0	0	0	3	**10**
21.	*Tamarindus indica (Koat)*	0	0	0	0	0	0	0	0	0	0	0	3	**3**
22.	*Vitellaria paradoxa (Wado)*	0	0	0	0	0	0	0	0	0	0	0	0	**0**

Source: Author field inventory (2018)

Table 13: Matrix preference ranking for NTFPs species in Leer kebele Table

Sn	Criteria⇒ NTFP species ⇓	Market demand	Margin (profit)	Availability (in time)	Geographical distribution	Conservation status	Potential for cultivation	Regeneration potential	Contribution to income	Gender impact	Potential for value addition	Processing technology	Ethno botanical values	Total
1.	*Vitellaria paradoxa (Wado)*	3	3	3	3	3	3	3	3	3	3	3	3	**36**
2.	*Hyphaene thebaica (Noor)*	3	3	3	3	3	3	3	3	3	3	3	3	**36**
3.	*Balanites aegyptiaca (Thoow)*	3	3	2	3	2	1	2	2	3	3	3	3	**30**
4.	*Fius sycomorus (Gnoop)*	3	3	3	2	3	1	2	3	2	3	2	3	**30**
5.	*Minychool (local name)*	1	2	3	3	2	0	3	3	3	3	3	3	**29**
6.	*Azadirachta indica (Nipe)*	2	3	3	2	3	3	2	3	1	3	0	3	**28**
7.	*Keach (local name)*	3	3	3	2	1	0	1	3	3	3	1	3	**26**
8.	*Ziziphus spina-christ (Buow)*	3	2	1	2	1	0	1	3	3	3	3	3	**25**
9.	*Flueggea virosa (Waak)*	3	3	1	3	1	0	3	3	1	2	0	3	**23**
10.	*Dichrostachys cinerea (Kir)*	3	3	1	2	1	0	3	3	1	1	0	3	**21**
11.	*Acacia seyal (Luor)*	1	1	3	2	1	0	2	3	3	1	0	3	**20**
12.	*Ziziphus pubescens (Rieek)*	2	3	2	1	2	0	1	3	1	2	0	3	**20**
13.	*Ricinus communis (Pilir)*	1	1	1	1	0	0	2	2	3	3	3	2	**19**
14.	*Taw (local name)*	3	3	1	2	1	0	3	3	1	0	0	2	**19**
15.	*Thep (local name)*	1	2	1	2	1	0	1	2	2	1	0	3	**16**
16.	*Calotropis procera (Pak)*	0	0	3	1	1	1	1	1	0	1	3	3	**15**
17.	*Acacia Senegal (Gnuer)*	1	1	1	2	0	0	2	2	1	0	0	3	**13**
18.	*Sarcocephalus latifolius (Miaar)*	0	1	2	1	1	1	1	1	0	0	0	3	**11**
19.	*Piliostigma thonningii(Gnoang)*	0	0	2	2	0	0	1	1	0	1	0	3	**10**
20.	*Kigelia Africana (Luel)*	1	1	2	1	1	0	1	1	0	0	0	2	**10**
21.	*Gaar (local name)*	1	1	2	1	0	0	1	1	0	0	0	3	**10**
22.	*Tamarindus indica (Koat)*	0	0	0	0	0	0	0	0	0	0	0	3	**3**

Source: Author field inventory (2018)

As shown from the table above, matrix preference ranking for NTFPs species in study area. The result indicated that many species have highest market demand in Pulkhot kebele as compared to rest of NTFPs found in other kebeles of study area. This forced local people to illegally destruct the few available non-timber species in their surrounding area. Another reason, for highest market demand in Pulkhot kebele was the presence of refugees in the study area. It was shown

also in leer kebele, that many NTFPs found here have highest ethno-botanical values and the NTFPs species found in this study area contributed to the highest income generation when brought to market especially for Vitellaria paradoxa.

4.3. Collection seasons of NTFPs and marketíng system

4.3.1. Marketíng system

In the study area, the NTFPs value chains are complex, with multiple stages and actors involved in the process of getting a product from forest to consumer; they are also dynamic and change over time. Therefore, information about the quantity and quality of the product, price and their market is very important.

The market of NTFP is not structured well. At present forest dwellers collect NTFPs and sell it to local traders which in turn sell it to the urban centre and finally reach to consumers. The distribution channel from forest collector to urban wholesaler consists of 3-5 middlemen. These men are known as 'gaath' (middlemen), the agents of the traders. The 'gaath' speak the language of the tribals and in many cases sell out loans as advance payment for NTFP. They hustle the tribal, cheating them on weights and rates as tribals mostly count in traditional scales and are unfamiliar with the metric measure. The tribals have to sell their material as they need the money to buy weekly supplies. Yet most forest people have poor access to markets, insufficient capital to invest in improving their livelihoods and little or no bargaining power when selling their products in markets. Due to lack of direct access to markets, they depend on intermediaries to sell their products, reducing their share of the income. There were at least four levels of intermediaries between the collectors/gatherers and processing.

Different types of information, such as price, value addition options and sustainable harvesting techniques are required by communities to increase their bargaining power and receive higher prices for their products.

4.3.2. Types of NTFPs consume by household in the study area

Table 14 : Kind of NTFPs used for household consumption in the study areas

Type of NTFPs	Uses	Quantity needy in month	Source	Market price in unit/birr	Season of availability
Fuelwood	Cooking, heating etc	250kg	Market	50kg with 200br	All months
Honey bee	Nutrition, energy etc	10 litre	Natural forest	1litre with 100br	Dec-Jan
Bush meat	Calario, etc		Market	1kg with 120br	Nov-April
Foliage and spices	Stew preparation, powder etc.	100kg	Riverine forest	1 kg with 20br	April-nov
Fruit and seeds	Energy etc	25kg	Riverine forest	1kg with 17br	Dec-March
Forage	Food for domestic animal etc.	250 kg	Wetland forest	50kg with 150br	All months

Source: Author fieldwork (2018)

As in table above, the result showed that fuel wood and forage were the two importance NTFPs collected through out the year (all months) in huge amount as compared to other. This was because of the links between population and NTFPs were complex in the study area. Based on the prediction, over the next few years the Pulkhot kebele will experience ten times the population growth, but most NTFPs consumption will remain there. Analysis failed to identify a close correlation between deforestation and rates of either total population or agricultural growth. Nevertheless, there were also clearly cases where population growth in the Pulkhot kebele has had a detrimental impact on forests, for example through the need to increase the area of available farm land and demand for fuel wood. Identifying the precise role of population was difficult because of the relationship between total numbers of people and such issues as land tenure, debt and poverty.

Table 15: NTFPs income in birr for villager's small housholds in study area.

Name of NTFPs	**Annual collection in Kg/H.H**	**PC Rate**	**Annual income br by NTFPs/ HH (A)**	**Annual income in br (From agriculture) /HH (B)**	**Annual income From labors (C)**	**Annual income from livestock (D)**	**Annual income from fuel wood (E)**	**Overall total**
Fuelwood	259	5	1295.00	2800br/ year	1200br/ year	1200br/ year	1300br/ year	
Honey bee	69.8	12	837.60					
Bush meat	61.35	25	1533.75					
Foliage and spices	65	25	1625.00					
Fruit and seeds	22.5	5	112.50					
Forage	792	15	118.50					
Root and tuber	4.5	50	225.00					
Agriculture	3149.93	45	1417.00					
Total			7118.65br	2800br	1200br	2200br	1300br	**14618br**

Total income/year = A+B+C+D+E (7118.65+2800+2200+1200+1300) = 14618br

As indicated from the table, huge amount of money income from NTFPs as compared to mean of money income and next is crop production. But the lowest money income by many households was labour because in the study area there were few opportunities labour as there was no good development activities. The findings indicated that about 77 % of household respondents stated they extract NTFPs only and 3% extract TFPs only while the remaining 20% indicated to exploit both TFPs and NTFPs. It was therefore realized that the extraction of NTFPs was more likely to contribute more importantly to household livelihoods development than TFPs. Most respondent explained that they engaged in extracting more of NTFPs because it was difficult to obtain permit in order to have a concession for TFPs. In the literature review, it was clearly pointed out that trend in NTFPs promoted various socio-economic benefits in the form of livelihoods, income, employment and development of social amenities. Table above, represents the viewpoints expressed by household respondents regarding the benefits they derived from forests.

4.3.3. Access to market

According to KIs, in most of the household food requirements covered from agriculture sales was the main source of cash income but in food deficit periods, farmers use acoping strategy of selling fish, mango fruits, and fuelwood in order to purchase food grains from the local market. However, the open nearest market in the study area was found with the average distance of 17km on foot. Hence, carrying of goods was made with held of animal and human carry to this market which was difficult. Further more, people also used to travel to regional large markets and other service through bajaj (taxi) as the mean of transport.

4.3.4. Change of NTFPs price with time

Table 16: Changes in off-takes per effort for 4 key NTFPs in study area over the last 20 years

NTFPs	20 years ago	Today
Wildlife	Plenty of wildlife: turtle, monitor lizards, deer, guineafold,other birds.You could easily hunt them in your backyard.There was no outside market, no selling.	Many species dissappeared: turtle, monitor lizards, deer, guineafold, water ducks and other birds. You can work for 48 hours and sill no getting anything. Markets demands is big. Prices are getting higher. 1 guineafold cost 200br, 1deer cost 1200 br. Many come to hunt in our forest
Fish	You could catch 45 kg with in 1 hour. No selling, no destruction methods used, onlt traps and nets.	You canot even get 0.5kg in1 hour. There is no enough to feed our family. Strong outside market is witnessed.Destruction methods used by outsiders.
Herb	In 1 day you could get 300 stems or as many as man can carry. We used to also have big diameter rattan, now only small diameter species.	You can only get 20-30 stems aday. Harvesting has intensified over the last 2 years. 1 stem sell for 25 br we know there is not thing to do but we need to sell anyhow.
Honey Bee	Honey bee was easily collection in home garden and around homeyard. Water was in home surrounding for bee. Every household collected his/her honey bee without any difficulty with no market demand.	Declining extent of forest cover in the basin. Bees may leave the area earlier at end of dry season to lower areas with more moisture. Overharvesting of honey driven by increase in market demand and price

Source: Key informant interview (2018)

Table 17: NTFPs sell in the market

NTFPs sold	Amount sold in month	Selling for a unit	Source	Distance from the	Time required to	Season of collection

				source	collect unit of NTFPs	
Fuelwood	50kg	50kg with 200br	market	10km	4hours	All months
Honey bee	14 litre	1litre with 100br	market	25km	9hour	Dec-Jan
Bush meat	50kg	1kg with 120br	Market	50km	7days	Nov-April
Foliage and spices	200kg	1 kg with 20br	market	12km	6hours	April-Nov
Fruit and seeds	150kg	1kg with 17br	market	9km	4hours	Dec-March
Forage	250kg	50kg with 150br	Wetland forest	16km	7hours	All months

Source: Kebele DAs office (2018)

These NTFPs are harvested from forest around makot, and scrubland nearby village. Itang traders would come to the respective villages demanding NTFPs each year and accordingly the villagers collect the demanded NTFPs. Sometimes the collectors sell those NTFPs directly in tharpam town. The major route for the trade of NTFPs to tharpam town is through makot, nyale and few collectors sell the NTFPs in baziel, leer, and puldeng kebeles. In study area, the disatance which NTFPs are collected have much influence. Therefore, the nearest NTFPs were collected easily than those in the longer distance. For example, bush meat was collected from the longer distance of 50km but have higher price in the market as compared to other.

Table 18: Change observed in NTFPs availability in last two decades

NTFPs type	Availability			Price		
	5 years before up to now	10 years before	20 years before	5 years before up to now	10 years before	20 years before
Fuelwood	Low	Moderate	High	High	Moderate	Low
Honey bee	Low	Moderate	High	High	Moderate	Low

Bush meat	Low	Moderate	High	High	Moderate	Low
Foliage and spices	Low	Moderate	High	High	Moderate	Low
Fruit and seeds	Low	Moderate	High	High	Moderate	Low
Forage	Low	Moderate	High	High	Moderate	Low

Source: Field work (2018)

As we see from the above table, the availability and price of NTFPs is continuously changed from time to time. This was because, lack of money and alternative means of livelihood and population growth were critical factors driving many people to use NTFPs unsustainably.

Recent trends have indicated a widening gap between rich and poor in many kebeles. This increasing distance between "haves" and "have not" has further disadvantaged for the poorer sections in the study area. A substantial proportion of the woreda population remains in absolute poverty. Unemployment encourages forest loss, through illegal NTFPs felling or extraction, smuggling of forest products and developments such as illegal mining to generate income.

As change occurred, it leaves behind winners and losers; typically, the losers have few choices available and are forced to adopt short - term survival strategies under which longer term resource management considerations appear to be an unaffordable luxury. People without any hope or future in some kebeles have little incentive to manage forest resources well, and often have little option but to exploit them unsustainably, for short term survival. That is why price increased with time from 1986-2017.

4.5. Forest loss

4.5.1. The causes of exploitation

The first research question sought to identify the causes of NTFPs trends and how these are perceived by the local people and the key informants. The discussion here entails establishing an understanding of forest and

forest types, defining the rate and extent of NTFPs loss, and how these relate to the perceived causes of trends.

Given the limited economic opportunities available in these areas many of the residents have resorted to charcoal production and exploitation of the NTFPs for a variety of marketed products. As a result, the density populated areas have witnessed increased NTFPs degradation. The changing lifestyles in the dry lands have also seen many pastoral communities and palatal nomadic people become sedentary as they settle more permanently. This has led to formation of more permanent settlements, and hence, more permanent grazing areas. Establishment of such permanent settlement has further increased demand for forest products, thereby exacerbating degradation of the riverine forest. While Pulkhot and puldeng kebeles was mainly a dry season grazing area, it has today become a permanent grazing zone, leading to massive degradation of the NTFPs.

4.5.2. Extent and rate of deforestation

The loss of NTFPs was evidenced in Itang and for that matter Pulkhot and Baziel communities are no exception. This was because the majority of the respondents (59.3%) strongly agreed that NTFPs trend was being witnessed in their communities. It is discovered however that the rate of occurrence as perceived by the local people varies greatly. From table below respondents (59.3%) identified the rate of deforestation to be rapid. 30 respondents (20%) also indicated that the rate of deforestation is moderate; while 6 respondents (4%) indicated it being slow and the remaining 25 respondents (16.6%) noted the rate of deforestation to be unpredictable. To validate the claim that deforestation has been rapid, some respondents explained how settlement expansion and agricultural cultivation have caused retreat of forests from the residences and community centers over the years. Some used the scarcity of some non-timber forest products like snails which could easily be obtained around their settlements because the forests were closer than now.

Table 19: Rate of deforestation

Rate of deforestation	Frequency	Percent
Rapid	89	59.3
Moderate	30	20
Slow	6	4
Unpredictable	25	16.6
Total	**150**	**100.0**

Author (Fieldwork, 2018)

4.5.3. The Causes of NTFPs trends

The majority of household of 130 respondents (86.7%) indicated that the process of NTFPs trend in the study area is solely driven by anthropogenic factors, while 14 respodents 9.3 % is solely influenced by natural factors. The remaining 6 respondents 4% argued that the process of NTFPs trends is caused by a combination of both anthropogenic and natural factors. It is also identified that, the broad sources of anthropogenic deforestation in the communities include economic, demographic, conflict and governance, and social factors and that these are similar to the factors highlighted by the (UNEP, 2006).

4.5.4. Anthropogenic cause of NTFPs loss

It was also found out that the process of NTFPs loss results directly and indirectly from livelihood activities of the local people as affirmed by the 150 household respondents engaged in the study. As seen in table, 98 respondents (63.3%) indicated commercial agriculture operation as the major activity influencing deforestation. This is followed by 16 respondents (10.67%) who named, NTFPs crafting activities 15 respondents (9.4%) stated wood fuel production , with 9 respondents (6%) also noting hunting while only 12 respondent (8%) indicated a different livelihood activity.

Table 20. Major livelihoods activities causing NTFPs exploitation

Major livelihood activity	Frequency	Percent
Commercial Agriculture	98	63.3
Wood fuel production	15	9.4
Crafting activities	16	10.67
Hunting	9	6
Infrastructure	12	78
Total	**150**	**100.0**

Source: Author (Fieldwork, 2018)

It is observed from table that, NTFPs trend is mostly caused by agricultural operation and crafting though the impacts from the other activities are recognizable. Respondents argued that commercial agriculture operation destroyed forests much more than other livelihood activities because it occurs deep in the core of the forests as compared with the other livelihood activities which are most often carried out on the fringes of the forests. Quite apart from that, the felling of trees by commercial agriculture operators was argued to be carried out indiscriminately by investors in the study area. As a result of this, they hardly consider if a tree is harvestable or not. Or in a different understanding some respondents explained agri- investors do not consider the *"maturity"* (defined as the size and/or thickness) of a tree before felling.

It was also argued by respodents, that commercial agriculture operation induces wood fuel production (especially charcoal burning). This was because, most wood fuel producers only use dead trees or parts of logged trees as the raw materials to burn charcoal. Because investors cut indiscriminately destroying other trees apart from those they actually intended to cut, they invariably create chances for increased activity of wood gathering for both firewood and charcoal in the forests.

The operation of commercial agriculture was generally considered to be illegal in the communities. The discussion on the demographic characteristics of respondents revealed that, none of the respondents indicated commercial agriculture peration to be either the major or alternative livelihood activity, yet this activity was widely being practiced.

4.5.5. Type of non-timber forest products extracted

The products extracted from the forests were broadly categorized into Timber Forest Products (TFPs) and Non-Timber Forest Products (NTFPs). The former refers to all timber species that are extracted through authorized (timber contractors) and unauthorized (chainsaw operation) for the purpose of lumber (processed into logs) while the latter refers to other products derived from the forests which are not necessarily timber species. Table defines the specific elements that are extracted under NTFPs within study areas communities.

Table 21: The Socio-economic benefits of NTFPs trends

Benefits derived	**Frequency**	**Percent**
susitence	30	20
commercial	2	1.3
labor	2	1.3
Livelihoods and Income only	63	42
Livelihoods and Employment only	6	4
Income and Employment only	5	3.3
Livelihoods, income and employment	42	28
Total	**150**	**100.0**

Source: Author (Fieldwork, 2018)

It is observed from the table, that, the perceived benefits for exploiting forest resources vary among respondents. As indicated, some identified only one benefit, while others stated two or more benefits that influence their exploitation of non-timber forest resources.

The highest response of 63 respondents (42%) indicated that the forests contributed to their household livelihoods and income. The next highest response of 42 respondents (28%) indicated livelihoods, income and employments. It is generally observed per the explanation offered that these benefits are interrelated as a result the impacts on one benefit could be magnified in another.

4.5.6. Forest outputs and rural livelihoods

4.5.6.1. Livelihood input characteristics

The process of NTFPs trend substantively benefited household livelihoods in study area. The definition of livelihood adapted is *"the access and entitlement to a range of assets and opportunities which are essential in achieving human well-being"* (UNEP, 2006). The research findings indicated the exploitation of forest resources particularly NTFPs have contributed to household livelihoods through energy supply, food supply, materials for shelter and local craft materials.

Table 22: Contribution of NTFPs exploitation to livelihoods of *household*

Types of livelihood outcome	Frequency	Percent
Energy supply	19	12.67
Food supply	118	78.67
Materials for shelter	6	4
Local crafts materials	7	4.67
Total	**150**	**100.0**

Source: Author (Fieldwork, 2018)

The majority of the local people are into agriculture as indicated earlier and it is realized that the forests are sources of rich agricultural products. This is because of forest vegetation the support the effective development of the soils. The major cash and food crops cultivated include maize, sorghum, plantain, bean, cassava, yam, cereals and vegetable. And it was noted that the influence of the vegetation cover of open forests is a key factor in the soil formation and composition (abram, berta, 2016).

Respondents also argued there are varied edible fruits, honey, herbs and other food products which are also obtained from the forests.Another household livelihood outcome directly derived from the forests is energy supply.

Generally, it was also noted that forests provide local craft materials for households and other small scale in all communities of the sudy area. The major extracts are herbs, bamboo, and forest plant species which are used to develop items such as pistil, stools, beds, basketing, mating and doors amongst other designs household usage and sale in the local markets. In addition, some respondents also indicated that they directly derived materials for shelter from the forests.

5.CONCLUSION AND RECOMMENDATION

5.1. CONCLUSION

In summary, researcher identified how NTFPs had helped in fulfilling various socio-economic benefits for individuals and community at large. Forexample, 92 respondents (61.3%) indicated agriculture as their major livelihood activity, 26 respondents (17.3%) indicated NTFPs, and 23 respondents (15.3%) indicated trade and remaining 9 respondents (6%) indicated other like carpentry, masonry, hair dressing, petty trading and teaching. However, a lack of strong capacity of the forestry sector, coupled with lack of awareness about forest resources in the past years and ineffective forest policies implementation, have caused destruction of the forests as a result of unchecked use and mismanagement of forestland for agriculture and other purposes. Still, resource-poor households, who were less successful to generate additional income from off-farm activities or diversification of farm production, collected quite large quantities of specific forest products with a promising market demand.

The finding indicated that causes of trend varied and categorized into anthropogenic and biophysical factors. For the anthropogenic factors, increased wood fuel collection, clearing of forests for agriculture, poorly regulated non-timber forest products extraction, and socio-economic change. The studies also coincide on two main reasons influencing the collection of NTFPs in the study area. Firstly, the collection was understood as a reaction of households to seasonal or unexpected natural or social hazards such as flooding, crop diseases, market failures, higher sickness rate of household members, political instability, food or cash insecurity, while secondly it was considered as a regular activity which continuously contributing to the household cash balance. This both strategies lead to an unsustainable collection of NTFPs, which consequently could have a negative impact on the rural areas in terms of socio-economic and biodiversity decline.

This study present essential source of information where planners and decision makers can use to sustainably plan for the NTFPs management

5.2. RECOMMENDATION

- Long term management and conservation plan of NTFPs should be prepared for the sustainable utilization of the resources and participating of the local community.
- It should be better if one separate division for management of NTFPs in the forest sector would be open.
- Responsibility of NTFPs management for forest sustainability should not be given only to an expert (forester), but also inclusion of traditional knowledge through involvement of stakeholders in management of forest resource is vital.
- Finally, further research on possibilities of NTFPs management for forest sustainability and its related services is needed.
- Land use and land cover change would be a central component for managing NTFPs and monitoring environmental changes in this area.
- Marketing information center should be established for the promotion of NTFPs of the district.
- A collective marketing centre should be established in the towns so that the collectors could bargain for the better price. NTFPs based community enterprise should be established for processing NTFPs of the area for premium price.
- Alternative source of livelihood for the people of in the study area should be addressed so that the exploitation of Timber and NTFPs would be minimized.To sell NTFPs at fair prices, forest dependent communities need access to an open and efficient market. Collective marketing approach as an NTFP based intervention can support communities with knowledge, confidence and processes to operate as a non-exploitative channel for the marketing of products. Creating such a market would generate higher revenues and offer a strong incentive for forest dependent communities to take on increasing responsibility for forest management and promote more efficient forest utilization.

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APPENDICES

APPENDICE-I

Questionnaires survey:

Good morning / Afternoon my name is……we are here carrying out a study in this area on the '*Trends in the Availability of Non-Timber Forest Products in Baro-Akobo Riverine Forest: Case of Itang Special District, Gambella, Ethiopia'*. We met your Kebele chief the other days and he recommended us to see you to help us with the questions we have on research. All the information given will be treated with confidentiality and be used for the purpose of the study only. Thank you very much for welcoming us!

Question 1: Personal information

1. Survey number: _____ Date: _____ Interviewed by: _____
2. Village name: _____
3. Name of the respondent: _____ sex: _____ age: _____
4. Education level: _____
5. Marital status: _____
6. Weaths: _____

Major livelihoods occupation: _____
_____
_____

Question 2: What kind of NTFPs do you use for household consumption?

Non-timber forest products you are using	**Purpose of the NTFP**	**Quantity you need for a month**	**Source of the NTFP**	**Market price for a unit of NTFP**	**Season of availability**

Source of NTFP: **collection** from forest, **produce** on own farmland, **buy** from the market

Question 3:

Do you sell NTFPs to the market?

Non-timber forest products you sell	**Amount of NTFP sold in a month**	**Selling price for a unit of NTFP**	**Source of the NTFP**	**Season of collection (production)**	**Distance from the source**	**Time required to collect a unit of NTFP**

Question 4: Have you observed some change in the availability of NTFPs in the last 20 years?

Non-timber forest products	**Availability**				**Price**			
	5 years before	**10 years before**	**15 years before**	**20 years before**	**5 years before**	**10 years before**	**15 years before**	**20 years before**

Question 5: What are the main reasons for these changes?

a) For availability change: _____

_____

_____

b) For price change: _____

_____

_____

Question 6: How does these change affects you/ your family? _____

_____

_____

_____

_____

Question 7: How is the status of the NTFPs availability in your locality for the last twenty years? Increasing or decreasing?

Question 8: what non-timber forest products are collected from the forest? _____

_____

_____

Question 9: How non-timber forest products price change with time? _____

Question 10: What kind of NTFPs income do you get?

Question 11. What is the cause of NTFPs exploitation?

Question 12. How do you estimate the rate and extent of deforestation? How is the anthropogenic cause of NTFPs loss?

Question 13. What is the socio-economic benefit of NTFPs trends? How the exploitation of NTFPs contribute to the house hold livelihoods income?

APPENDICE-II

Field activities picture

Appendice-III

Variable	Name of kebeles	Pulkhot		Puldeng		Baziel		Leer		Total	
	Status of respondents	Total no	Fr.	%	Fr.	%	Fr.	%	Fr.	%	Fr.	%
Age	18-25 years	19	6	31.6	4	21	5	26	4	21	19	100
	26-33 years	22	7	31.8	5	23	5	23	5	23	22	100
	34-41 years	30	11	36.7	6	20	7	23	6	20	30	100
	42-49 years	37	14	37.8	7	19	9	24	7	19	37	100
	50 years and above	42	16	38.1	8	19	10	24	8	19	42	100
											150	**100**
Wealths	Poor	70	12	17.1	19	21	17	24	22	31	70	100
	Medium	60	16	26.6	14	23	15	25	15	25	60	100
	Rich	20	7	35	4	20	5	25	4	20	20	100
											150	**100**
Educational Level	No schooling	33	5	15.2	10	30	6	18	12	36	33	100
	Basic level	65	17	51.5	16	48	16	48	16	48	65	100
	Secondary level	20	7	35	4	20	5	25	4	20	20	100
	Tertiary level	32	12	37.5	6	19	7	22	5	16	32	100
											150	**100**
Sex	Male	80	24	30	23	29	15	19	18	23	80	100
	Female	70	16	22.9	17	24	25	36	12	17	70	100
											150	**100**
Marital status	Married	125	60	48	30	24	39	31	21	17	125	100
	Single	7	2	28.6	2	29	2	29	1	14	7	100
	Divorced	8	2	25	2	25	2	25	2	25	8	100
	Widowed	10	3	30	3	30	2	20	2	20	10	100
											150	**100**
Livelihoods occupation	Agriculture	92	20	21.7	24	26	25	27	23	25	92	100
	NTFPs	26	10	38.5	5	19	5	19	6	23	26	100
	Trade	23	9	39.1	5	22	5	22	4	17	23	100
	Alternative livelihoods	9	5	55.6	1	11	2	22	1	11	9	100
											150	**100**