Chapter One
1.0 Introduction

1.1 Background:

Forest is large area of land covered with trees. But a forest is much more than just trees. It also includes smaller plants, such as mosses, shrubs and other wildflowers. In addition, many kinds of birds, and other animals make their home in the forest. The global forest cover is 3952 million ha, which is about 30 percent of the world, land area (FAO, 2006).

Forest contains as much as 907 of terrestrial biodiversity, with tropical forests being practically important in terms of both species riches and their concentration of endemic species (WRI, 1997). The world's forests are also globally important carbon store and sink (FAO, 1983) and provide a wide variety of other ecosystem services for people such as protection of fishers, watershed and soils. Furthermore, forests constitute an important source of raw materials. The rural poor depend on forest products to meet basic livelihood and industry needs it also provides them with timber and non-timber products.

Approximately 30% of the global land area is currently forested, but mean global deforestation rates amount 13% million hectares a year (Ruitenbeek, H, 1990). This is related to the continue forest destruction and forest degradation. Particularly is also threatened in herbal and temperature due to increasingly industrialized forest management.

Hundreds of million of people in developing countries depend on forests for their livelihood in spite of this 12 million hectares of natural forest are lost in the tropic every year, either through the permanent destruction of forests or through their degradation (FAO, 2000). Forest is necessary for our survival through photosynthesis by producing gas (oxygen) that we cannot live without it.

Forests and woodlands make up roughly 29% of South Sudan land area (roughly 192,000 square kilometers). Approximately 20% of the country land areas are forest reserved that received a special level of protection and management. The country has a wide range of forests reflecting regional variations in climate and soil. Desert and semi-desert trees and shrubs are Southern regions. South Sudan also has some tropical forests as well as teak and pine plantations surviving from colonial times. Most of the country forests are open or semi-open habitat (GOSS, 2006).

South Sudan is a country with a very high potential for expanding and developing the agricultural sector as 90% of its land is considered suitable for agricultural lands 5% are prime agricultural land. The country has covered 30 million hectares of arable land with only 5% currently in use (FAO, 2010). South Sudan has a range of forest types, from savannah to tropical. These provide a large variety of resources used by communities, which are often more heavily exploited in time of stress.

Natural forests in the South Sudan cover about 60% of the country, consisting of various types of tree species. The area extends up to the north, Upper Nile State. Recently *Acacia senegal* trees, the sources of Gum Arabic started to

expand over large areas in Upper Nile, it is believed that (Hashab) grows on abandoned fields (GOSS, 2008).

Upper Nile State together with Unity and Junglei State has up to sixteen gazetted forests totaling to 22.518 hectares. The main causes of forest depletion are selective logging of commercially valuable trees. This has caused serve damaging to many of the states of the country and especially in Upper Nile State (FAO, 2010).

The degradation of forests is of great concern for environment and development in many developing countries. Africa in particular unsustainable use of forests has regulated in serve environmental problems, especially land degradation which is manifested by soil degradation, has been the cause of stagnating or declining yields in parts of many countries, especially on fragile lands from which the poorest farmers attempt to wrest a living(UNEP, 2012).

South Sudan its forests, and with no unfilled policy the rate at which people are cutting trees is worrying, if this trend continue future generations are going to suffer and Sudan maybe come desert (GOSS, 2010).

South Sudan have a part from using forest lands for farming, local people had eleven types of uses of the trees, including charcoal, firewood, poles, timbers, medicine, withies, ropes, fibers, live fences, carving and rituals.

Socioeconomic factors are contributing to alter or delete the forest cover and affect the forest structure and species compositions (FAO, 2003).

Other causes of degradation are forest fires, excessive removed of non-timber forest products and increase of population. The local people around Jalhak forest in Upper Nile have been clearing land for agriculture to meet the food needs of the ever-growing population. Most forest communities, follows

shifting cultivation where they clear a patch of forest, and cultivate crops (Ogwaro, *et al*, 2011).

1.2 RESEARCH PROBLEM AND JUSTIFICATION:

South Sudan diverse natural forests and woodlands are estimated to have a total area of 191,667 km2. About 30% of the total land area has been seriously degraded since the past protected wars (FAO, IFAD, EU, 2010 in MAF; FAO, 2014). It has also been estimated that some 45% of the forest cover and a large proportion of biodiversity has been lost since 1983. On the hand, the International Council for Research in Agro-forestry(ICRAF) extrapolated from a number of case studies concluded that annual forest loss was on average 2% a year a rate which if sustained would lead to complete forest loss within 50 years(ICRAF, 2007).

The forest sector database in South Sudan is extremely poor so there is little or no documentary evidence to base a judgment on the comparative condition of forest cover in the country. However, it is certainly true that the opinion that forest cover has decline in recent years is widely held. The reason for that decline is usually given as an increase in demand for forest based products especially among people living in urban centers. There is some evidence that in the recent past forest resources in South Sudan have been exploited to an extend that is unsustainable.

Forests and forests products are rapidly being degraded, logged and cleared for agriculture and other developmental projects. Forest resources in Upper Nile State may play a great role in the improvement of the economy of people living in Upper Nile areas especially Jalhak forest reserved (MARF, 2012).

Upper Nile State has been losing its forests at an alarming rate. As people displaced by the war returns; demand for land for settlement and cultivation increases. Hence; forest cover suffers as a result of this demand difficult situation is made worse by the absence of a clear and unified government policy for dealing with these problems (MAF, 2014).

One critical aspects of knowledge gap is the shortage of reliable economic values of depletion in Upper Nile State. Because of this shortage policy and market often do not have credible evidence bases to promote sound forest management.

The past studies did not produce quantities estimates about the economic losses from degradation. Moreover, the disputes and conflict over land ownership between shepherds and farmers leads to deterioration of the vegetation cover in the State.

Generally, the socioeconomic influence of forest exploitation and consumption are overlooked in South Sudan includes Upper Nile State; many households depend on fuel wood as source of energy for cooking. This is dependence of fuel wood has contributed to the growing exploitation of the State forest.

Also, no researches carried out to study the depletion and deterioration of the forest cover in the study area, and their impacts on people living around them. This research is highlight problems.

1.3 RESEARCH OBJECTIVES:

The purpose of this study is to highlight the influence of some socio-economic factors on forest degradation in Jalhak forest reserved.

1.3.1 Specific Research Objectives:

The specific objectives were to:

1- Identify the economic activities of local communities around Jalhak forest.

2- Assess the economic behaviors of local communities and its effects on forest.

3- Assess the social behaviors of local communities and its effects on Jalhak forest.

4- Highlight the awareness level of local communities around the Jalhak forest reserved.

5- Suggest guidelines' to improve Jalhak forest and to enhance sustainable management.

1.4 RESEARCH IMPORTANCE:

The forests are important as a source of income generation for local people in the State. Moreover, the outcomes of this study will open new opportunities for other studies in the area and other similar areas in order to stop forest degradation.

Finally, the study has to expose ways to help ensure better sustainable forest management practices in the study area in the country as a whole.

1.5 RESRACH QUESTIONS:

It will help answer the following pertinent questions:

Q1- What are the economic activities of local communities around Jalhak forest?

Q2- What are positive economic behaviors, of local communities around Jalhak forest?

Q3- What are the negative economic behaviors of local communities around Jalhak forest?

Q4- What are the positive social behaviors and their effect on Jalhak forest?

Q5- What are the negative social behaviors and their effect on Jalhak forest?

Q6- What are direct benefits to local communities around Jalhak forest?

Q7- What are indirect benefits to local communities around Jalhak forest?

Q8- What are the perceptions of local communities around the Jalhak forest of forest policy, laws and administration?

Q9- What are the levels of awareness of local communities about forest resources, in particular and environment in general?

1.6 LIMITATION OF THE STUDY:

Numerous restrictions were faced during this study. Some are listed below:

- Accessibility to some of the rural places was not easy due to poor terrain and distance. Some of the places were very remote.
- Difficulty in obtaining quality data from both government agencies and rural household respondents.
- There was problem of data collection from the respondents because most of the respondents on memory recall giving the data for this study.
- Despite the above mentioned challenged this study was carried out.

CHAPTER TWO
2.0 LITERATURE REVIEW

2.1 Background:

Forests and woodlands cover an area of about 650 million hectares, or 21.8% of Africa land area, representing about 17% of the world's forest area. An important feature is the uneven distribution of Africa forest woodlands between different sub-regions of countries. Forest is important sources of ecosystem good services to billion people around the world (Woodally, 1992).

The livelihood of forest dependent communities is being threatened. The urgent needs for forest protection roles of tropical forests for climate mitigation and sustainable development have increasingly recognized by world leaders through their efforts in reducing deforestation (Guppy, 1984).

Forests are a key component of the natural resources of rural area for much of the early part of last century the role of many of these forests has changed. Today local people demand a broad range of functions from forests, including functions for the benefits of local industries, recreations, housing, nature conservation and the environment (Grieg, *et al*, 2002).

Forest produce a wide range of timber and non-timber products, they serve as fuel wood and consumption goods, such as food and shelter by serving the basic needs of numerous indigenous and tribal groups. Forests play the role in socio-

cultural development as well. At the national level, forest resource can help rearing foreign exchange through exportation of forest product, in which round wood is the most valuable(Matus, 2007).

Historically, forests have played a major role to influence patterns of economic developments, supporting livelihoods, helping structure economic change, and promoting sustainable growth. Forest continues to provide the high level of commercial benefits of household, companies, and governments that initial impacts for protective statutes and policies. FAO (2010) estimates that forests industries contribute more than 450 U$ billion to national incomes, contributing nearly one percent of the global in 2008 and providing formal employment to 0.4% of the global labor force.

Forests also provide other resources of incomes and subsistence benefits, generate work opportunities, and constitute resources of economic values that help to meliorate shock to household incomes, particularly in rural area in countries (Garret, and Buck, 1997).

Forest provides essential resources such as food, firewood, building materials, fodders, medicine, and many other things. Trees and forests also play an important role in sustaining a healthy environment. They keep the air and water clean, prevent erosion and flooding, enrich soil and make homes for birds, animals, and plants for flora and fauna (FAO, 1999).

South Sudan gained independent in 2011. The country has been losing its forests at an alarming rate. As people displaced by the war return, demand for land for settlement and cultivation increases and the forest suffer as a result of people needs.

South Sudan has extensive and drives, forest and woodland resources that provide food, oils, medicines, timbers, poles and firewood, as well as habitat for much of the South Sudan wildlife.

Forest ecosystems are generally robust, yet some areas they have been degraded by decades of uncontrolled fire, uncontrolled grazing, and over-cutting of more desirable species (WFP, 2004). This difficult situation is made worse by the absence of clear and unified government policy for dealing with the problem.

2.2 Concept of Forest:

The forest principles defined these needs as forest products and services including wood and wood products, water, food, fodder, medicine, fuel, shelter, employment, recreation, habitats for wildlife, landscape diversity, carbon sinks and reservoirs and other forest products and services. Moreover, the principles stressed the importance of addressing forest issues and management in a comprehensive and holistic way, the overall context of sustainable development and environmental sustainability. In addition, the principles state that appropriate measure should be taken to protect the forests against harmful effects of pollution, including air-born pollution, fires, pests and diseases, to maintain their full multiple value (Sheil,D and Wunder, 2002).

Based on the erroneous traditional human-centered of the environment, forests are one of the reserves of unlimited resources of the environment being exploited, managed and utilized for human purpose.

Forests are important natural resource that covers approximately one third of the earth’s surface, equivalent to a billion hectares (FAO, 2010). They comprise a wide variety of ecosystems that range from open savannah woodlands to dense

tropical rainforests and are some biological diverse systems on the plant (FAO, 2010). These forest ecosystems not only provide arrange of environmental service include soil and watershed conservation and carbon sequestration, but also extensive economic benefits of timber and recreation (FAO, 2010).

However, present day forest cover is a approximately that of what in pre-agricultural times, the majority of which has been attributed to various factors that include changing livelihood patterns, such as the transition from hunter-gathering to sedentary agriculture (Lebedy, 2008), and the socioeconomic demands of development for timber, wood, fuels and urban expansion. Although deforestation showed, in the years 2000 and 2005, the process is progressing a clearing rate, with forest loss estimated (Oksanen and Mersmam, 2003).

2.3 Definition of Forest:

Different schools of tough have different concepts concerning a forest. According to Dunster(1996) forest in narrow technical sense is defined as a vegetation community dominated by trees and other wood, shrubs, growing close enough together that the tree tops touch or overlaps, creating various degrees of shade on the forest floor.

As further reported by Dunster (1996), the etymological derivation of the term forest is thought to be quite literally, a place designed by the kin for the rest of wild animals (from the latin fera and statio, meaning a safe abode or sanctuary for animals). It is believed that this was later compound to foresta. Later on, the meaning of forest changed as the emphasis shifted away from retention of wildlife for hunting to more utilitarian wood and non-wood value.

On the West African perspective, forest is a type of the vegetation consisting predominately of wood plants (trees, shrubs and climbs) and for which grasses are virtually absent (Hopkins, 1981).

The term of forest as indicated by FAO, (1997) is subdivided according to its origin, into categories area. Another category is plantation forests which are established artificially by a forestation on lands which previously did not carry forest within living memory. Or those established artificially by indigenous species by a new and essentially different or genetic variety. Furthermore, forest could be primary or secondary forest (or closed forest) is that forest that has not been tampered with by any agent of forest removal secondary forest (or open forest or degraded forest) is that forest that has been altered by either in man or natural phenomenon such that quality is no longer of original component.

2.4 The Value of Forest:

The value of forests is well recognized both in timber terms and in terms of the non-timber forest products sold in great quantities out of forests the entire world. Forest valued only as a source of timber is considerably undervalued. All too often the financial value of commercial timber sales has been sole or predominant value reported. Value estimates often and soils, in capturing, or in providing livelihood opportunities outside the formal monetary economic (FAO, 2010).

Forest provides different ecological and social functions, in South Sudan. For people who live in or near forests they represent the main source of different materials, including foods, as well as cultural identity. For others, they mean as a source of timber and other products. For still others, have items, recreation, biological conservation, this proper valuation should be intended to provide a

rational basis for directing funding into objectives to which community attaches importance (UNDP, 2006).

2.5 Cultural Values:

Forests, including particular tree species, hold particular values of local people, who need in particular benefit such as from forest and woodland services and management regimes. These values are especially important for the group's dependent on forests, but also for other communities. The values context-specific, and management planning needs to recognized and incorporate these.

2.6 Economic Values:

The economic value of forest refers to the instrumental value from the objectives of economic players. Economic value is anthropocentric (value for humans) and it is preference based. i.e. because the main subject is the human being, economic value is related to the maximization of human well being or at least improving human welfare.

The nation of value is closely related to the consumer theory in which the objectives is to maximize utility subjects to available resources. Because of scarcity resources are not available in quantities adequate to meet all human wants and hence the need to make a choice (trade-offs). Philosophers consider moral value as important in determining the object of value which results in such values having intrinsic or inherent value. If moral values are subjective, the moral value is whatever the value thinks it (Adams *et al*, 2010).

Some values relate to cultural or religious benefits that do not lend themselves to valuation. Since the nation of economic value is based on human preferences, the value placed on a good or service will depend on the motivation, economic

players have, e.g., that of intrinsic, cultural, social and spiritual value (FAO, 1997).

Economic valuation of forest goods and services is based on the notion of willingness to pay that assesses individual preferences. Willingness to pay is determined by motivation, which may vary from pure self-interest to altruism, concern for future generation and environmental stewardship. Survey techniques in environmental economic revealed that motivations vary significantly between individuals, but that self-interest is only one of many motives for environmental valuation. Market prices reflect willingness to pay. Because some consumers are willing to pay more than the price offered by the market, there is always a consumer surplus in market transactions (Rowe, and Sharame, 1992).

The types of economic value to be found in forests are use value and non-use values. Use values refer to the willingness to pay to make use of forest goods and services. Such uses may be direct, e.g., extractive uses or indirect, e.g., watershed protection or carbon storage. Use values also contain option for future use even though no use is made of the forest now. Such options may be retained for one own use or for another generation (sometimes called a bequest value). Non-use values related to willingness to pay, which is independent of any use made of forest now or any use in the future. The sum of individual use and non-use values are the total economic value (Matus, 2007).

2.7 Descriptions of Ecosystems and Biological Diversity in South Sudan:

South Sudan has a broad diversity of habitats that include lowland forests in eastern and western equatorial, afronmontana forests, high attitude plateaus, wooded savannah, grasslands, wetlands and flood plains. The drivers' habitats are occupied by a wide range of plants, avian and mammalian species (GOSS, 2007).

In terms of ecosystems and biological diversity, South Sudan is credited with having the following:

- One of the world's most spectacular animal migrations, though to rival the migration of the wild beast in the Masi, Mara and Serengeti ecosystem in East Africa.
- The largest intact savannahs in Africa.

The principal ecosystems of South Sudan are described below:

2.7.1 Montana forests:

These are found in the mountains (Imatong). Dongotona, Asholis, Didinga and Jabel Gumbirr to the Southeast in eastern equatoria State. The Montana forests of South Sudan are part of the eastern Afro-Montana ecosystem, which is categorized as one of Africa biodiversity hotspots (GOSS, 2010) and they cover 0.4% of the total land area of South Sudan (Africa Forest Forum, 2011).

Rainfall increases with attitude to an average of about 2.500 mm annually at an attitude of 2,500 mm above. These forests are rich with endemic plants, animals and bird life. However, this ecosystem is highly deforested due to extraction of timber and encroachment of agriculture (UNEP, 2007 and World Bank, 2007).

The Dongotona for example lost two _thirds of its forest cover from 1986 to 2011: it is likely to be cleared by 2020 (FAO, 2011). Common tree species in the Montana forests are *Podocarpus milanjianus, Juniperus procure* (pencil cedar), *Corton macaranga alibizia* and *Arundinalia alpina*(Bamboo), among others common animal species include the blue duiker and the bushbuck(UNEP, 2007).

2.7.2 Lowland forest:

These represent the extension of the Congo basin forests and are rich in forest biodiversity(plant and animal), in South Sudan, the area is confined to a few scattered small areas in the South near the Central Africa Republic(CAR), Ugandan borders and the foothills of the Imatong mountains. The area receives rainfall averaging 1,600 mm. other locations with this type of forests are in small patches on the *Aloma plateaus* (*Talanga, Lennonloti* and (IRG, 2007). Several forest species of animals have been known to occur in the region, but their status has to be confirmed. It is suspected that elephants migrate from the (CAR) and (DRC) into these forests. Other species likely to be found in the lowland forests are the eastern *Chimpanzees, Boocerus eutycerus*, African forest Buffalo (*Syncerus caffernanus*).

2.7.3 Woodland savannah:

These are mainly found in Equatorial. Upper Nile and Bahr el Ghazal, where rainfall ranges from 900_13,00 mm. species recorded in this forest type in western Bahr el Ghazal in 1984 included *Isoberlinia doka*, *Khya senegalensis*, *Daniellia oliveri, Afzelia africana*(Abu surge) *Prosopsis Africana* (MAF, 2008).

In 2007 during the field assessment for the environment threats and opportunities assessment(ETOA) the national forests in western Bahr el Ghazal

were reported to be intact(they were not affected by the civil war), while Mahogany was being harvested in northern bahr el Ghazal (Martin and Irina, 2007).

2.7.4 Savannah woodland recently derived from rainforest:

This sub-type is much localized and occurs in higher rainfall areas (1300mm), along the Congo border and some small patches of rainforest in other areas. These are high rainfall forest (i.e. rain forest) that has less than one a phase shift due to human- influenced degradation over the years. The dominant species are *Cellis zenkri*, *Chryophylum albidum*, *Midbraedendron excels* and *Holoptelea grandis* (FAO, 1987).

2.8 Economic Importance of the Natural Forests:

The importance of a forest to human well-being cannot be over stated. Forest provides raw materials for food, fuel and shelter. Forests ecosystem components such as micro-organism, soils and water, regulate the climate and recycle nutrients and wastes. Without these and many others ecosystem goods and services, life as we know it would not be possible.

South Sudan forest areas are important source of food, timber, fuel wood and habitat for wildlife, and provide economic opportunities. Fuel wood and charcoal supply 80% of the country energy needs. Forests also provide fodder for livestock, as well as marketable non-wood products such as honey, gum Arabic, tubers and medicinal plants (FAO, 2005).

2.8.1 Timber:

Timbers play a crucial role in the life of communities living surrounding forests and are used for building houses, pig/chicken pen, public works, irrigation

system and making fences. The commercial value of timber is of importance for the status of allocated forests.

South Sudan forests are sources for high grade timber, including Teak, Mahogany and Ebony (MAF, 2008). Currently, commercial exploitation is limited to Teak plantations forests (from plantations forests) and mahogany natural forest (GOSS, 2007). Teak plantations are found in the more humid parts of the country. Most of them lack proper management and were badly have harvested during the war (UNEP, 2007). Globally, there is a high demand for premium quality timber, such as the types found in South Sudan. Timber and logging companies have been in operation for several years, and have caused significant to the forests by operating without management plants in logging concessions that were obtained during or after the war, when there was regularly framework in place.

However, investment in the forestry sector in terms of improved management and establishment of new plantations is indeed for the sectors full potential to be realized. Large stands of Mahogany are currently found in the natural woodlands both reserved and unreserved systems for sustainable management and enhanced protection will be necessary to avoid overharvesting (Mandalazi, 2008).

2.8.2 Fuel wood:

Fuel wood is the cheapest fuel available per unit of heat in most developing countries the use of fuel wood has been estimated to be 12.00 million cubic meters worldwide (Sunderlin, *et al*, 2003). Fuel wood can be harvested on demand and easily stored and dried. It can be produced from most tree species and from wide range silviculutral systems. However, if fuel wood production is

a primary management aim of tree planting, a variety of factors need to be considered to optimize both the quantity and volume production.

2.8.3 Cooking with forests:

More than billion people depend on wood energy and heating, particularly households in developing countries. In parts of Africa, wood fuels-often the only domestically and affordable source of energy-account for almost 90 percent of primary energy consumption (FAO, 2009).

2.8.4 Fuel industry:

In some regions, such as parts of South Sudan, industrial and commercial use of charcoal is a major driver of demand, as an important source of income along production chains (FAO, 2005).

2.8.5 Hungry for energy:

Global energy is projected to increase rapidly in coming years, owing to many factors, including population growth, more people having access to energy supply grids, and lifestyle becoming more energy demanding. In the longer term forest biomasses have the potential to significantly lessen the strain on global energy supply when soil resources decline. Wood energy is the most important source of bio-energy in the world, providing nine percent of the global primary energy supply (FAO, 2010).

Well-managed forests can play a vital role in responding to future bio-energy demand and can help to create state a more stable energy future, improve environmental quality and increase economic opportunities (FAO, 2011).

In Upper Nile areas, people harvest fuel wood by cutting or copping shrubs, by lopping branches of mature tees, or by felling whole trees. In the rural areas local people prefer fuel wood from shrubs species that will regenerate after coppicing (Heltberg, *et al,* 2005). Cooking and heating are the major end use of fuel wood and charcoal. In some developing areas, wood and charcoal are important for commercial applications such as street food, brick-making foods and curing, Tobacco tea. Fuel wood is an important source of income and employment in many rural areas in South Sudan (FAO, 2010).

Since developing communities tend to shift from fuel to other sources for home heating and cooking, the change in fuel wood production and consumption reflects both a change in economics and a change in ecosystem impact. Fuel wood is often produced and consumed largely outside the market system, in subsistence communities and its value to human well- being is there forest not captured in unadjusted in national economic statistics(FAO, 2008).

2.9 Poverty and Fuel wood:

The role that play in reducing long term poverty and in helping people to scope of the poverty has proved to be a lot more complex than it was thought.

Originally, it was hoped that forest products could be identified, and their production intensified in such a way that poverty could be reduced. But the reality is with a few highly unusual exceptions.

2.9.1 Social impacts of wood fuel collection and use:

International Energy Agency (IEA) reported that the average load of fuel wood in sub-Saharan Africa was 20kg. The task of collecting fuel wood has become increasing numerous. Deforestation and forest degradation has increased the distance that must be travelled to obtain sufficient supply. In addition, fuel wood collection in remote and politically unstable area of significant risks to

women. The most time spent and distance travelled in the collection of fuel wood vary between regions, but most studies have found that women spend a significant time of their days in collection of fuel woods (USAID, 2002).

The main socio-economic concern related issues, some initiatives to develop standards for biomass production and use include social criteria. Wood fuel has a wide range of use in traditional cooking stoves, covering with charcoal, to dedicated biomass power-plants (including combined heat and power).

The socio-economic impacts of wood fuel vary depending on a range of factors including the country, feedback and use (World Bank, 2007). The impact of wood fuel its derivate (charcoal) on the energy requirements of developing nations cannot be scored. It supplies about 95% percent of the domestic and commercial cooking energy needs in the developing countries (FAO, 2010).

2.10 Non- timber Products:

NTFPs vary in types, and their abundance depends on the status of allocated forests as well as the experience and indigenous knowledge applied by local people. In reality, NTFPs which often play an essential role in the spiritual and material life of ethnic minority people, provide food, medicine, raw materials to produce working tools, and are used for sale and husbandry. Nevertheless, NTFPs are often scattered and only a few species of NTFPs can produce their products in big volume as rattan bamboo shoots, etc (Shepherd, 2004).

2.11 Non-cash Forest Income and Community Level:

There are obvious ways in which income from the forest may be organized at the community level as well as the individual household communities, if they

have right to do so, many activities managed their forest in order to enhance in the case of their own households economic activities(FAO, 1992).

2.12 Woodlands Important for Livelihoods:

Based producing timber and other products, forests provides other benefits such as wild berries and fruits that are consumed as food. These were useful during the civil war when food was scarce but can also be useful during periods of droughts. Forests also provide fibers, shade construction materials for housing and cattle shed and spiritual benefits. They are also a habitat for the bees needs for pollination of plants and soil fertilization (Jack, 2004).

2.13 Gum Arabic:

Gum acacia is a seasonal product from the widely-growing *Acacia senegal* and *Acacia seyal*. Gum acacia is widely used in the food and pharmaceutical industry for its unrivaled technical properties emulsifier for oil in water emulsion, carrier for encapsulation, stabilizer for colloidal systems, texturizer in sugar and polyols medium, film former avoiding fat, water and gas migration and binder for sugar and polyols compressed products. Unlike many other food ingredients that try replacing it, gum acacia is natural, gum tree and none chemically or enzymatic modified, filling completely the strong demand of consumers for natural products and birding valuable and image of the finished products international demands for the gum is high(Jack, 2004).

The current world demands are about 100,000 MT against a current supply of about 70,000 MT. the demand is projected to reach 150,000 MT by 2020(Schreckenberg and Hadley, 1995).

Gum Arabic is another resource with sustainable economic potential. Prior to South Sudan separation with Sudan, Sudan was responsible for 80% of the world's gum Arabic production, exporting 45,000 tons annually (Elsiddig, 2004).

2.14 Carbon Sequestration:

The term carbon sequestration is used to describe both natural and deliberate processes by which Co_2 is either removed from the atmosphere or diverted from emission sources and stored in the ocean terrestrial environments(vegetation, soils and sediments), and geologic formations (Guppy, 1994).

The vast and woodland resources in South Sudan provide for carbon sequestration, an important function in reducing greenhouse gasses (GHG). At this time, data were not available on the carbon sequestration rates of the forest and woodland resources in South Sudan (UNECA, 2010).

2.15 Honey:

Honey is another non-wood forest products around the world, in South Sudan it is reported that honey is a very important food for many tribes. Honey provides nutritionally important sources and animal based food products.

Honey and bee wax are two of the most important NWFP in rural areas of South Sudan. Honey is important as a sweetener and as a source of raw material for alcoholic beverages and medicinal industry. Bee wax is used locally in a wide range of applications (Ahmed and Mbwombo, 2004).

The vast woodlands of South Sudan are ideal for honey production with many of the local communities keeping traditional hives. There is great potential for productions of honey both for the domestic and external markets. Currently is a

source of income for rural communities, however, the quantity and quantity of homey produced and sold are not documented (WRI, 1998).

2.16 Forest and Air Quality:

Trees and plants make their own food from carbon dioxide in the atmosphere, water, sunlight and small amount of soil elements.

In the food making process, they release oxygen for us to breath. Trees produce enough oxygen on each acre for 18 people every day (Glen, 2002). Air pollution in our cities is serious concern.

The burning of forest fuels has introduced steady flow of deadly pollutants into our atmosphere and very few urban areas can meet national clean air standards. Likely, we are surrounded by efficient air clearing machines-trees which remove many pollutants from the atmosphere, including nitrogen dioxide sulfur dioxide ozone, and carbon monoxide. The trees help to settle out, trap and hold particulates and absorb them through the pores in the leaf surface. Particulate are trapped and filtered by leaves, stems and washed to the ground rainfall (Galen, 1982).

2.17 Income and Development Level:

As income rises and development process, people tend to shift from low cost, heavy, or inefficient fuel source, that more but require less effort to obtain and use. As development efforts succeed in raising income and living standards, pressures on local ecosystems for fuel wood will dimension as people move the energy ladder to other sources (Barrachoughm and Chimire, 2000).

Forest provides other sources and subsistence benefits, generate informal work opportunities, and constitute reserves of economic values that help ameliorate

shocks to household incomes, particularly in rural areas in poor countries (World Bank, 2007).

Historically, forests have a major role to influence patterns of economic development, supporting growth. Forest continues to provide the help levels of commercial benefits to households, companies, and governments, which formed the initial impacts for protective status and policies. The FAO, (2005) estimated that forest industries contribute more than 450 billion to national incomes, contributing nearly one percent of the global labor.

2.18 Tourism:

The biodiversity resources of South Sudan and in particular the migration of white eared cob and other a companying species have great potential for the development of tourism in the country. The Sudd wetland is a unique phenomenon that enhances the eco-tourism potential of the country. The concentration of a large mammalian biomass (10,000 kg in the seasonal flood plain in the Sudd provides excellent opportunities for traditional hunting and tourism (GOSS, 2010).

2.19 Environmental Services:

An environmental service area of high potential and under discussion and development, including payment for environmental services, for instance protecting water sources for irrigation supply, hydropower plans, absorption of Co_2 a key factor creating green house, ecotourism and biodiversity conservation.

Benefits from environmental services are of great significance, especially now as the world pays more attention to climate, thus the role of forests will be given

greater emphasis. This requires the development of macro-level policies and negotiation on payment for environmental service among international and regional countries (Sunderlin, W, D *et al*, 2003).

As such, the benefits received from the exploitation of commercial timber are most direct and depends on the status of allocated forests; therefore various different kinds of forests should be taken into account when developing FLA policies for communities, to manage forest effective and creative income. FLA policies should not only deal with allocating of quid lines, appropriate procedures, and equitable benefit sharing mechanism adaptable for local people (Shengoma, 2000).

2.20 Forest Plantations in South Sudan:

There are about 8 million hectares plantations in Africa, established with a variety of objectives, including the protection of industrial round wood, a forestation of degraded land, production of the environment, increasing wood supplies, etc, although globally there has been a perceptible ship towards sourcing of wood from plantations, in the case of Africa this is limited to a small number of countries, in particular South Africa, Swaziland, Zimbabwe and South Sudan (UNEP, 2012).

The forest resources in South Sudan occur mainly in the high rainfall woodland savannah zone, which cover most of Southern Sudan with the exception of the flood plain around the Nile and the Montana zone of Didinga and Imatong Mountain.

Forest plantations in South Sudan consist of teak in central and western equatorial and western Bahr el Ghazal States. In addition there are plantations of softwoods in the Imatong Mountains of unknown extent and smaller areas of the

species planted as greenbelts around major towns, but these mostly disappeared during the war (GOSS, 2010).

Maps and inventory data on the forest plantations were lost during the war and therefore, data on the status of the plantations are limited. In 2004 the USAID funded South Sudan agricultural revitalization program set out the map of all the teak plantations using land sat imagery.

During the war the plantations in central equatorial were exploited by concessionaries. The teak trade caused tension and conflict between those involved. Concessionaries, local communities, local authorities, forestry authorities and the SPLA/SPLM, public confidence in the institutions responsible for regulating the trade was low.

Alter setting up the GOSS in early 2006, one of the first measures taken by the MAF was to cancel existing teak harvesting concessions and initiate a program to reform forest concessions and revenue collection systems and to improve regulation of the plantations in central equatorial are currently in a degrade State with most plantations in Bahr el Ghazal are in similar condition due to heavily those degrade plantations is to clear fell and regenerate. The plantations in western equatorial are generally fully but due to lack of good quality due to the slow growth rate (UNEP, 2012).

The teak plantations are the largest of their kind in the world, because of the high demand for premium-quality timber, the country is exporting products to international markets. However, the sector is poorly managed reliable numbers quantifying exports and economic potential do not exist, and investment in the forestry and timber trade is limited. Barriers to investment include: lack of access to capital poor road and transportation infrastructure , limited institutional capacity of ministry of agriculture and forestry, poor access to

international markets: obsolete harvesting and processing machinery and equipment, lack of knowledge of forests, shortage of skilled labor and land mine forest areas(GOSS and FAO, 2010).

2.21 Natural Forest in South Sudan:

Natural forests in South Sudan cover about 60% of the country consisting of various types of trees. Due to the conflict, materials of forests in South Sudan have been relatively undisturbed since the early 1980. The entire major sawmills closed down and commercial harvesting was reduced to relatively minor exploitation by chainsaw milling or mobile sawmill. There has been no active production or other forest management activities due to the inability of the forestry staff to operate. For the commercial production of hardwood timber resources after the war; a priority issue for the forest authorities should be given to ensure that its operations are in the line with current international standards of sustainable forest management.

2.22 Conceptualizing Deforestation and Forest Degradation:

2.22.1 Deforestation:

Deforestation such as is the loss or continual degradation of forest habitat due to either human related, Agriculture, urban sprawl, unsustainable forestry practices, mining and petroleum exploitation and forest fires, or natural factors such as tsunami, forest fires volcanic eruptions, glaciations and desertification.

Deforestation can be defined broadly to include not only conversion to no-forest but also degradation that reduces forest quality, the density and structure of the trees and the ecological services supplied the genetic diversity. Narrow definitions of deforestation define deforestation as the removal of forest cover to an extent that allows for alternative land use.

The United Nations Research Institute for Social Development uses a broad definition of deforestation, while the food and agriculture organization of the UN/ FAO, 2010 uses narrow defecation. The term deforestation has also been used to refer to fuel wood cutting and commercial logging and slash and burn cultivation; it is also used to describe forest clearing for annual crops, for grazing, and establishment of industrial forest plantains (UNEP, 2007).

Characterizing deforestation at a given time and place involves as rule determining with some certainty what more or less the future of the deforested area will be. There is no deforestation if clear-filling is done on an area maintained as a forest as in the case of temporarily unstuck forest); deforestation of the land exist when the forest land cleared in order to be cultivated or abandoned for a long time and its regeneration cannot take place before several decades have passed (Barnes, 1997).

Agriculture is the predominant driver of deforestation worldwide. According to the UNCCC, subsistence agriculture in poor countries is responsible for 32% of deforestation, and commercial logging responsible for only 14% deforestation. Charcoal and other wood removals account for les than 6% of deforestation, but those uses can generally be assigned to subsistence practices (FAO, 2008).

2.22.2 Relationship between deforestation and forest degradation:

Very often degradation does not mean a decrease of wood vegetation but rather as a gradual reduction in biomass, changes in species and soil degradation (FAO, 2010).

2.22.3 Forest degradation, loss:

According to FAO (2006) forest degradation is the changes within the forest which negatively affect the structure and function of the stand or site, and

thereby lowers the capacity to supply products and/or services. This takes different forms, particularly in open forest formations deriving mainly from human activities such as overgrazing, over exploitation (for fuel wood or timber), repeated fires, or due to attacks by insects diseases, plant parasites or other natural sources such as cyclones.

Forest loss and degradation are mostly caused by the expansion of agricultural land, the intensive harvesting of timber for fuel and other forest products, as well as overgrazing (SRAAD, 2009).

Increasing food production is one of the reasons for the conversion of natural habitat into agricultural land. One of of the reasons why people carry economic activities in ways and at levels that degrade forest area is to can gain economic benefits. Conversely, there is often little immediate economic gain from conserving forest resources or using them sustainably.

The uses of forest management regimes have long denied communities legitimate opportunities to use forest resources for their own economic gain (FAO, 2010). In search for adequate subsistence and income and in the absence of alternatives, people often tend to degrade forests for their economic activities. As long as situation holds and great economic and finical benefits can be gained from degraded or depletion forest resources; these activities should be involved in sustainable forest management (UNEP, 2007).

2.23 Forest Degradation in South Sudan:

Forest depletion is a kind of deforestation, which broadly spoke; it refers to the gradual or process of temporary or permanent removal of trees resulting in partial or complete eradication of tree cover in a locality. It can occur due to natural and human factors. Negative changes qualitative and or quantities, characteristics of forests may term forest deterring (Terefe, D, 2003). Most of

the forest depletion happens in tropical developing countries where the status of development and welfare of citizens is critical in deterring the extent of the forest depletion, poverty; over-population and indebtedness accentuate deforestation in many of the low income tropical countries.

The requirement for economic growth and expansion of income result in growing demand for agricultural and forest derived products (FAO, 2010). Forest degradation can be natural or anthropogenic in origin common examples of forest degradation include logging and deliberate litter forest fires to open up land for agricultural or urban expansion.

Natural resources of South Sudan are being depleted through different factors and causes, it's essential to protect, conserve and manage them (Sheil, and Wunder, 2000).

2.23.1 Human activities:

Human activities are degrading the South Sudan forests in various. The people activities include over cultivation, overgrazing, deforestation and unskilled irrigation. Population growths as well as the economic situation of the people influence the manner in which people utilize forest lands.

2.23.2 Shifting cultivation:

The most important factors responsible for total forest clearing are cultivation. The average small-scale farming household used about 0.4 to one ha of land for cultivation of subsistence crops. However, the total area under cultivation in South Sudan is still low. It may be expected that the cultivated area will increase proportionally with the increasing population and in the longer term when mechanized agriculture becomes more (FAO, 1997).

Shifting cultivation has contributed to both positive and adverse environmental impacts. On the positive side, this practice restricts the intensity of land use, reducing the rate of environmental degradation situation where capital and land management capability are low. In situation where conservation practices on sloping is permanent shifting cultivation help avoid social dislocation by providing farmer opportunities to landless around own villages (FAO, 2005).

2.23.3 The role of over-cultivation in land degradation:

Tow pressures contribute to over cultivation, the need for more food to feed, the increasing population and the need to grow more food for monetary gain especially, foreign exchange. This has led to land fragmentation, reeducation in fallow periods and expansion of cultivation into marginal lands which traditionally, were reserved for livestock. The cultivation of these less productive and more drought lands has resulted in declining soil fertility and failing crop yields (Barnes, 1997).

2.23.4 Fuel wood and charcoal burning:

Fuel wood and charcoal accounted for about 91% in Africa, round wood production in 2000. While the share of wood fuel in round wood production has declined over times, this remains unchanged in the case of Africa and has sometimes even increased. Although wood fuel is the most important forest products for several countries, reliable statistics on its production, trade and consumption surveys (Matus, 2007).

Wood fuel and charcoal are primary sources of energy for cooking in South Sudan. Overall, 86% of the population uses fuel wood for energy with only 10% using charcoal. However, 44% of the population uses charcoal for cooking in urban centers. Fuel wood is also the primary source of lighting in the rural area 35%, while 15% of the population uses grasses for lighting (FAO, 2010).

Figure (2.1) Charcoal market in the Jalhak area, 2015

In addition, trade in charcoal is fuelling deforestation in most of the States according to GOSS, 2010 and EIRO assessment on an average bag of charcoal contains more less 1.5 trees, to give an indication of the potential for deforestation due to charcoal burning in the Upper Nile State. According to various interviews, one family(one average five person) uses approximately one bag of charcoal per week, if we assume that so larger trees are found per hectare on an undisturbed savannah(based on Google earth image of Upper Nile), then each removed tree results in the deforestation of 0.03 ha. The one of family accounts for 2.6 ha of deforestation in that area.

Figure (2.2) Jalhak charcoal market

Source: Research field, 2015

Charcoal trades also there across the borders with large quantities of the commodity being exported. For the example provides a good market for charcoal and the countries boarding the Sudan are a source of the commodity. Monthly, trade data given an estimate that 60.000 bags of charcoal are exported from the Renk county to Sudan annually equivalent to about 2.700 hectares of deforested land (FAO, 2010). Another factor worth noting is that since the South Sudan has lost most of its woodlands, there will always be a demand of charcoal and other wood based products from other countries. The overall impact of loss of forests and woodlands is enormous.

2.23.5 Brick making:

In many parts of South Sudan naturally occurring stone needed for construction is not available, which creates a high demand for earth fires brick. Brick making in itself is also damaging to the land and other natural ecosystems such as wetlands where clay soil is found and mined as a key input. Firing bricks activities consume lot firewood, source of fame either or woodlands it is estimated that one kiln producing 160.000 bricks could consume an average of 18 truckloads of firewood per year (GOSS, 2010).

2.23.6 Fires:

Fire is a major tool used in clearing the forest for shifting and permanent agriculture and for developing pasture. Fire is a good servant, but has a poor. Fire used responsible can be an available total in agricultural and forest management significant cause of depletion (Rowe, 1992). In the tropics, a fire can occur a season by in savanna wood, fire in the tropical rain forest can be greenly classified as a forest surface fire and deforestation fires (Arnold, M, 2004).

Forest fire is used for following purpose in South Sudan:

- To born old tough grasses and promote growth of rush green pasture.
- To open up land for cultivation.
- Avoid hunters by flashing wildlife from their habitat and natural and/or accidental fires, if the temperatures generated by such fires are too high, the seeds are burned and this affect the potential of rangelands to regenerate thus leading to forest gradation. This in turn affects grassland biodiversity. Repeated fires also retard the growth of affected trees and shrubs, and the trees are unable to grow to their full potential.

2.23.7 Limited livelihood options and high poverty levels:

IDPs and returners find themselves with limited options for survival, which forces them to over exploit natural resources such as forests woodlands and wildlife. Main activities undertaken for sustenance of livelihood that have adverse impacts on forests and biodiversity are charcoal burning, hunting game meat and making earth fire bricks. Charcoal and bricks making operations consume high volume of wood and directly cause deforestation or forest degradation.

2.23.8 Construction materials (timber and poles):

Timber and poles are a major input in construction activities. With returns to South Sudan and the relocation of IPDs to their original lands, demand for construction materials (housing, commercial centers, social amenities such as schools clinks, churches and other facilities) is high. For timber, a higher quality wood of larger, older trees such as the African balsm tree, (*Daniella oliveri*) and the African mahogany (*Khaya senegalensis*) is exploited depending on location.

Local woodland resources are exploited to provide poles for construction of houses. The amount of forests and woodland resources exploited to serve this need is dependent on the number of people who need to construct and settlement patterns. Exploitation of large numbers of trees alters the forest /woodland structure and biodiversity (GOSS and UNECA, 2010).

2.23.9 Inefficient use of wood basis fuels:

Sourcing for wood fuel is major contribute to forest/woodland degradation. The amount of wood used and by extension the number of trees for the purpose is dependent on household consumption of wood fuel based energy. Most of the families use the open fire cook stoves, which consume a lot more energy. Significant reductions in the amount of deforestation can be achieved by using less energy (Vogt, K, 1995).

2.23.10 Agriculture expansion:

The expanding agriculture is one of the important causes of forest depletion. Local people have always modified the natural ecosystems in, such a way that environment becomes more favorable for crop grow whether using traditional or new methods of agriculture. As demands for agricultural products, rises, more and more land is brought under cultivation. And for that; more forests are cleared, grasslands and lands under water reclaimed.

The forest soil after clearing will be unable to support farming for long periods due to exhaustion of nutrients. Once the soils become unfit for cultivation, the area suffers from soil erosion and degradation (Michale, 2009).

2.23.11 Overgrazing:

Overgrazing is more in drier area of the tropic where pastures degrade by overgrazing are subject to soil erosion. Stripping trees to provide fodder for grazing animals is a problem in some dry areas of the tropics.

Livestock in South Sudan especially, in Upper Nile State particularly, cattle: sheep and goats consume grass and tress (leaves, branches and seedling). Grazing land, browsing is sustained if the re-growth capacity of the vegetation matches the level of use. If the off-take by livestock is too higher or if other factors of degradation (e.g. fire, clearing for different purpose, low rainfall, a drop of water table) interact with grazing the vegetation will degrade, which means that open tree savannas may fragment and at the long run they turn into grassland desert (FAO, IFAD and WFP, 2002).

Clear cutting and overgrazing have turned large areas of north Upper Nile State. Grazing animals also have an effect on the botanical composition by trampling and selective grazing. Furthermore, animal and urine change the element content of soil and trees. Species composition is also influenced by the time of the year that a pasture is grazed. Hyde *et al* (1996). Pointed out that heavy grazing during any particular month in the growing season had approximately higher effect on key species as well as did grazing during the month when trees were senescent (Giller and Halorn, 2004).

The impact of livestock grazing is less visible and more difficult to quantity than that of clearing for agriculture and cutting for charcoal, fuel wood or construction. The most important contribution of livestock to deforestation is the removal of seedlings, which estimate the capacity of the forest regenerates. Heavily grazed forest therefore often shows a very pen structure on the ground. There is very mush associated with livestock keeping as pastoralists burn grass

to promote the re-growth of perennial in the dry season (Barrio and Louertory, 1997).

Overgrazing has detrimental effects on soil and vegetation, but changes are reversible. High grazing pressures decrease plant density, changes botanical composition and often accelerate the invasion of unpalatable species.

Moreover, overgrazing increases area covered by vegetation reduces infiltration, soil moisture and fertility. It also accelerates soil erosion; increases soil bulk density, penetration resistance, soil ammonia and nitrate content and change soil microbiological activity. Nevertheless to reverse these changes content proper grassland management practices are needed (Klempere, 1997).

2.23.12 Illegal logging:

Logging is the removal of trees from the forest for the producing, using and exporting of timber. Demand for timber is another cause for degradation. This demand leads to the illegal logging and cutting down of immature tree in the forest areas (Adams W.R and Hutton, J., 2007).

This practice does not only reduce the population of tree species in Upper Nile State but also damage or injure the unlogged thereby leading to their death when this happens, tree crowns and canopies that provide shelter and protection to non-timber forest products in the forest are damaged thereby leading to their death. This eventually, led to extinction of all species of the flora and fauna in the forest leaving the forest degraded.

Figure (2.3) Illegal charcoal production in the study area

Source: Research field, 2015

Another logging activity that contributes to depletion is the small-scale logging undertaken by migrant farmers. This is considered illegal but it is continuing and extended due to its important contribution to the farmer's income, especially during the agricultural off-seasons. Looking at individual's farmers their contribution to depletion might be significant especially near settlements. The farmers, logging activities are motivated by the need to generate income within the short period off-season.

The high demand for wood in the local building, local materials and furniture's in local industries helps maintain the persistent operation of this small-scale logging activity. Thus many sectors of the South Sudan economy are benefiting from the continued operations of small scale logging (FAO, 2009).

2.23.13 Urbanization:

Urbanization is a problem that is caused by the high population rate and population urban migration. This involves the increase in the concentration of human population in a particular location. This phenomenon put large for infrastructural development (such as roads, house, electric power stations, and health centers to cater for needs of the people in the density populated areas.

Forest in South Sudan cleared in an attempt to provide these infrastructural facilities (Shepherd, 1989).

Since, (2005) more than 50,000 people have returned to South Sudan. Most of them have gone to Juba (already with more than 500,000 people) and other places such as Upper Nile, Rumbek, Wau, Bor Yei and Renk. There has been a rise in the demand for resources such as water, building materials, charcoal and firewood (GOSS, 2010).

2.23.14 Poverty:

Poverty can be defined as a pronounced deprivation of wellbeing related to lack of material income or consumption, low values of education and health, vulnerability and exposure to risk, no opportunity to be heard and powerlessness (World Bank, 2004).

These militate against woodland loss where fishing is a livelihood along the Nile. Bearing in mind that there is under production of fish in Upper Nile State and that government has committed to expand the sector, urgent measure must be taken to ensure the requisite measure are in place.

2.24 Extension Services in Natural Forest:

Extension is the set of organization that supports engaging in forest production to solve problems and to obtain information and technologies to improve rural livelihoods and well-being. Extension has been interact with partners in to knowledge, information and technologies facilitate interaction with partners in research, education, agribusiness and other relevant situations and assist them to develop their own technical organizational and management skills and practices (Townsom, 1995). However, donors e.g. (World Bank) agree that services must

be provided in a fundamentally different provision that might be under the current circumstances in developing countries.

2.24.1 Rate of forestry extension in natural forest:

Our forests cannot protect and conserved unless extensive list demonstrate the local people that make a reasonable livelihood from the forests on a sustainable basis. The best way to protecting the forest and its vast diversity to create awareness among local inhabitations of their value and involve the people in protective measures through extensive forestry management.

Forestry extension will enable the population to know that forests will be better enjoyed sharing their benefits if sustainably managed (Lopez, 2003). Extension is necessary to the rural dwellers, to understand that the public, especially the rural dwellers of land for agriculture rising has resulted in the destruction of our tropical rain forests. Extension contributes to social development, homemaking and youth development and subsequently poverty reduction (FAO, 2008).

In Upper Nile State, forest extension services need to reinforce or strengthened to obtain maxim, co-operation from rural communities towards sustainable forest management such, services should be aimed at helping rural communities to articulate their needs, environmental problems and their perception of possible solutions to identified problems. The system of extension and information dissemination including materials and methods relating to conservation and sustainable development cultivation and management, harvesting and processing of forest products need to be strengthened (GOSS, 2008).

Felling in some areas usually for the provision of wood fuel for use or sales charcoal production, as well as for other timber related needs. Nonetheless, the

role of traditional and local institutions in the management of forest resources should not be ignored especially in area where the social fibers are still strong (FAO, 2010).

During the civil war the utilization of natural resources was generally not controlled. And in some cases, excessive exploitation occurs in many areas because of inaccessibility due to mires, the pressure on resources was generally low.

2.24.2 Effect of civil war on natural forest in South Sudan:

More than 800 million people worldwide live in or near forest and savannas, and rely on these ecosystems for fuel wood, and income (FAO, 1992).

Since the civil war virtually halted forestry production in South Sudan, from which come the overwhelming amount of forestry products? The civil war that divested south and Sudanese communities in general did not spare the forests of South Sudan. The ecosystems and structures that had from time immemorial adequate protected forest resources were weakened by war and are being further under the mind by the changes brought by a space. The forest resources are vulnerable to separations of the growing population and communities of South Sudan.

Forest sector database in South Sudan is extremely poor and absent. There is little or no documented evidence to base a judgment on the comparative of forest cover in the country. However, it is certainly true that the opinion that forest cover has declined in recent years, is widely held (WFP and MAF, 2007).

The reason for that decline is usually given as an increase in demand for forest based products, especially among people living in urban centers. There is some evidence that in the recent past forest resources in South Sudan has been exploited to an extent that is unsustainable. For instance, it is reported that only

an estimated about 16,000 ha. This process of degradation has not only affected plantations, but also natural forests (FAO, 2005).

In 2010, FAO used a land cover map to show the forest it was 20% of the total country area. This figure did not include mixed woodland and shrub land or pasture areas. This percentage is likely to have recently taken place in the last two years as a result of the socioeconomic changes that have recently taken place in the country. It is often social that certain trees have specific roles in the arrangement. While that has traditionally been the case, rapid urbanization is taken a toll on the past. In many cases, these traditional norms are no longer observed.

CHAPTER THRREE

3.0 STUDY AREA

3.1 COUNTRY BACKGROUND:

The Republic of South Sudan is located in East Africa, and borders Sudan, Uganda, Central Africa, democratic Congo and Kenya. It covers an estimated 644,329 km^2.

The country has a population of 8.26 million people; half of them are under the age of 18 slightly more than one- fourth of all households are female headed. It is estimated that 83% of the populations are rural, and 78% households rely on agriculture or small husbandry as their primary source of livelihood (GOSS, 2007).

The country is endowed with abundant natural resources, including a large section of fertile rain-fed agricultural land which potentially irrigable, livestock aquatic and forest resources and significant oil reserve. Agriculturally, the country is classified into many ecological zones. In this prospect, South Sudan has a major advantage of past- conflict countries (GOSS, 2007).

South Sudan is well endowed with diverse natural forests and woodlands, with an estimated total area of 191,667 km^2, constituted about 30% of total land area. However, forest assets of South Sudan have been seriously degraded by the prolonged conflict affecting the country (SSCCS, 2006).

Almost all the forests in South Sudan are on commercial land, hence the importance of community forestry appear, where the total communities play a

significant role in forest management and land use decision making. The timber industry is an important development opportunity for republic of South Sudan, if its practices are environmentally sustainable (Guvel, 2009).

Upper Nile State is located in South Sudan (north- eastern). It has a total area of 77,283 sq/km and estimated population of 964,353. The State is composed of 13 counties which include Akoka, Ballet, Fashoda, Longochuk, Maban, Malakal, Luakinky, Naser, Panykang, Ulang and Renk. The State dominated tribe is Shilluk but also residents from the Nuer and Dinka tribes (GOSS, 2010).

Upper Nile State lies northern the equatorial region. It is lies between 6 and 12 latitude N. it shares borders with Ethiopia in the east on the longitude of 23 and 28, 50 and eastward, towards the borders with the White Nile where at this borderline, the State used to face conflict and tribal problems between nomads and trans-boundary settles overgrazing areas, agriculture and lamenting(MAF,2008).

Upper Nile State has a high number of both national and international boundaries which permit proliferation of small from multiple sources, making it different to control. Counties bordering Ethiopia and Sudan are particularly unstable (Guvel, 2009). The most important characteristics feature south of Malakal city, the capital of the State, is associated with the existence of open swamp known as Sudud, where most of the water of Bahr Eljebel is collected and may be lost through evaporation. That was why the government thought of digging Jonglei canal in the year 1983 that coincided with the time when the war broke out.

The most important rivers in the state are the Sobat, which combined with Bahr Eljebel to form the White Nile 17 miles south of Malakal town (Guvel, 2009).

3.2 PROFILE OF THE STUDY AREA:

3.2.1 Location:

The study is located in the north-eastern part of the central clay plain of the Upper Nile in the dry land savanna zone, it lies between latitudes 6 northern and 12 and longitude 35 south and 28.5 southeast (GOSS, 2007).

3.2.2 Climate:

Most of South Sudan is characterized by sub-humid climate. The region has two seasons, namely, rainy and dry seasons. The rainy season commences in April and ends in November, while the dry season lasts from the December to March.

3.2.3 Temperature:

The average temperature approximates 34, 17 c, maximum in summer and the minimum is 18 c in winter (GOSS, 2007).

3.2.4 Rainfall:

Jalhak area is characterized generally by six months, rains from May to November. The annual amount of rainfall varies between 500 mm at Renk and 120 mm. The average temperature approximates 34,17c maximum in summer and the minimum is 18 c in winter (MAF, 2008).

3.2.5 Vegetation covers:

Forests cover areas of the payam with non wood forest products tree species. The types of forests are natural woodlands, provide farms. NTFPs trees are passively maintained, as both propagation and management are generally left to nature. Inhabitants consider some of these so valuable sources of income and serve as a type of natural credit (GOSS, 2000).

Generally, the vegetation of the area is largely dependent on rainfall and soil type. Acceding to Harrison and Jackson (1958) the upper Nile State lies in the low rainfall woodland savannah belt on clay.

In the South of the area tall grass and scattered big trees are experiencing, and when one emerges northwards, the grass gets shorter and this is due to rains. There are various types of tree species in the Jalhak reserved forest such as *Acacia seyal* var.*seyal, Balanites aegyptiaca, Azadrichta indica, Acacia senegal, Acacia nilotica* and *Adansonia digitata* where rains are plenty. Towards the north *Borassus aethiopum* and wild palm trees, fiber producing trees for cottage industry and *Acacia seyal, Acacia senegal*(Gum Arabic) production trees found especially north to Jalhak area, agriculture alters the species composition and leads vegetation degradation.

Figure (3.1) User bringing fuel wood from forest

3.3 Population Tribes:

The study area is composed of many tribes, including the Dinka who are the leading tribe in number following the Dinka in the number, are Boron and their areas are Maban. Adar and Bonj, Shilluk who are found in Jalhak town and west Nile from the Nile and other Sudanese's (GOSS, 2005).

3.4 Culuture:

Jalhak area is rich with cultures and traditions, among which are initiation, marriage, removing the lower teeth in Nuer and Dinka marriage is finalized after paying above 35–50 cows according to laws. While in Shilluk are 11 cows and 20 goats.

Removing the teeth is almost common among the tribes of Dinka, Nuer and Maban. The Shilluk ceased this practice long time ago (GOSS, 2005).

3.5 Religion:

Like any area in South Sudan people of the Jalhak area believe in three religions, Christians, Islam and traditional religion. The Islam religion is a majority in the Jalhak area.

3.6 Economic Activities:

Jalhak area is considered to be one of the riches in the state. The most important economic activities in the study area included agriculture, livestock, gums and fisheries.

3.6.1 Agriculture:

Jalhak area is characterized by the flat muddy fertile soil, yet agriculture is second after cattle rearing in importance in areas characterized by lands forms usually not affected by the floods. There are large agricultural schemes in the northern south on the Jalhak area. Depending on rainfall, in this schemes Dura and Sun flowers are cultivated under the supervision of the mechanized agricultural organization. Recently cultivation of vegetables and fruits for local consumption has started. Agriculture and animal considered as the main activities in the area (FAO, 2010).

Agriculture is the primary activity in the Jalhak area. People are nomadic agro-pastoralists who engaged in both agriculture and rearing of livestock primarily cattle. Local farmers are particularly susceptible to the vagaries of the areas, unpredictable patterns a factor which generally affects their productivity from two years. Even when the rains come, its patterns are unreliable and spores making it difficult for farmers to plan effective crop rotations.

Figure (3.2) Agriculture crop close to the forest reserved

Source: Study area, 2015

Cultivation starts at the onset of rain in May and continue through June (Crops like Sorghum and Maize) are grown at different times in order to spread risk and ensure cereal availability times during the year. Short-term varieties are planted in May and harvested (FAO, 2010).

3.6.2 Animal resources:

The animals are good buffers against famine as they are sold locally in the area. Selling of animals in Jalhak market is becoming a growing economic activity.

The major problems encountering livestock in Jalhak area include insufficient grazing land, water point and high incidence of diseases (Research Survey, 2015).

All the Jalhak area agro-pastoral communities practice the subsistence agriculture as well as rearing, animal, such as cows, sheep, goats and pigs.

Rearing pigs are common in Maban near Jalhak and Koma tribes in other areas around the study area. In the all tribes in the study area especially, Dinka tribe communities have a good number of cows considered a high social prestige.

Figure (3.3) Livestock in the traditional season in Jalhak area

Source: study area, 2015

3.6.3 Fishery:

Fishing is practiced widely across the area-albeit to varying degrees in each livelihood zone. In the study area fishing constitutes a major (if not primary) food. Fishing is a source of community's livelihood; communities here have tremendous knowledge about fishing method and marketing. The marketing and sale of fish have improved and expanded over time. The main constraints to expanding fish production in the area, is the lack of appropriate tools and equipments and insecurity along the river corridor (Field Research, 2015).

Figure (3.4) Fishing in the study area

Source: study area, 2015

Fishing has been one of the main sources of food security in Jalhak area due to the presence of swamps, lakes, rivers and streams. Fishermen are not much involved in the practice due to lack of fishing equipment, processing facilities and profitable markets for fish products. Therefore, fishing is a very much seasonal practice, done during seasons but in time of famine.

However, it is generally regarded as shameful to do commercial fishing, because a wealthy man with cattle does not fish, while the poor equally does not want to be seen practicing it for the fear of being despised by non-admiring girls who abstain from marrying them. Nevertheless it is becoming a growing economic activity to well established fishermen from Juba (Field research, 2015).

3.6.4 Other activities:

Cultural values and market are yet limiting factors to active participation in such areas like selling of firewood and charcoal. Poor rural women are seen selling

firewood in the market, while the selling of charcoal mostly done by persons who come from urban centre as Renk.

People in the area, mostly depend on agriculture for subsistence livelihood support, producing sorghum, Sesame, Millet, Kerkede and vegetables on a small scale. The most important activity for the villagers is cattle rearing practically cows, sheep and goats. On top of these activities the people hunt wild animals and fish. The forests constitute an important resource for the production of energy and other wood-based materials in addition to non-timber products (MAF, 2010).

Figure (3.5) Map of South Sudan indicating the study area_ Jalhak area

Source: MAF, 2007.

CHAPTER FOUR

4.0 RESEARCH METHODOLOY

4.1 INTRODUCTION:

Two types of data were used to achieve the research objectives, namely primary data and secondary information. The primary data were collected by direct observations during the field survey local resident's interviews by questionnaires interviews by questionnaire. The sources of secondary data include ministries, files annual reports and relevant articles.

4.2 SOURCE OF DATA:

Data for this study were collected from the primary and secondary sources. The primary data were obtained by the use of structured questionnaire. Information sough include, among others, ages of households, income sources, occupation of households, information of forest products extracted, agriculture practices, forest benefits(direct and indirect), positive social behavior of local people around the forest .

Negative social behavior of local people around the forest, cases of forest depletion in the study area and even other constraints associated with depletion activities. Furthermore, personal contacts, oral interviews and observations and observations were accompanied the structured interviews to judge the reliability of the answers given.

The institutions from which the secondary data were collected are directly involved in the study such as forest administration, ministry of local government.

4.3 DATA COLLECTION PROCEDURE:

Participatory tools which included secondary data search, group discussions, and semi-structured interviews were used to collected data.

4.3.1 Unstructured interview (Check list):

Unstructured interviews, are a kind of in-depth informal conversion, are used as a primary method of data collection in fundamentally, the core purpose of conducting an unstructured interview is to uncover to the researcher unanticipated themes, and to help him or her to develop a better understanding of the interviewees' social reality from the interviews' perspective (Patton, 2002) suggested unstructured interviews as a natural extension of participant observation.

4.3.2 Observation:

Direct observation method was also used. It allows the investigator the opportunity to visit the case study area.

Through observation, the researcher found that the local people depend on forest resources in their lives which may have a negative impact on the forest, as noted in the behavior of the respondents during period of the study, observation have helped greatly in data analysis.

4.3.3 Structured interview (Questionnaire):

A questionnaire interview was used to elicit information from the community. The answer to these questions was noted in separate notebook. The questionnaire constituted checklist of important element of information required

and guided the interview on a semi-open ended basis. Individual interviews were conducted within households.

Based on through background research a questionnaire (Appendix, 1) was developed. Some of the questions were close ended with a requested for justification of responses. Given that reliability and validity are important in evaluating the quality of quantities research instrument (Muller, 1986).

The researcher designed a questionnaire as tool to collect data from the local people in the study area, taking into account scientific points in designing the questionnaire, including easy and simple questions while avoiding sensitive's (Appendix, 1).

4.3.4 Group discussion:

Group discussions were used to extract information from the community on various issues. This also included the importance and values attached to the forest by the community. The checklist used during the discussions is shown in appendix2. During group discussions efforts was made to encourage every person to participate. The local people were regarded as experts and principle source to obtain information about local peoples' perceptions.

The main advantages of group discussions noted by (Maundu, 1995) quoted in (Mapanda, 2003) are:

- High rate of information generation
- More correct information

4.4 Reconnaissance Survey:

The first visit was carried out to Jalhak reserved forest, to up-date information on the area. Primary data of past forest status (e.g. area and type of tree species),

was collected by reviewing the document available from the forest administrations in Melut county, and other relevant literature.

4.5 Type of the Study:

A descriptive study is designed to find out some of major economic and social factors that caused the degradation of Jalhak natural forest reserved northern Upper Nile State in South Sudan, where the study used survey method.

4.6 Research Population & Unit:

The household survey is the most important component of this research. It provides core information on the households' livelihoods in study area. The questionnaire used for the survey includes both open ended and closed format questions.

Households in the three villages constituted the research population, while the family or household members constituted the research unit.

4.7 Selections of Respondents:

The study covered Jalhak area in northern Upper Nile State, which bordered Melut and Renk and Maban in the south east Jalhak area. The local resident was considered in data collection. The primary data was collected from the survey population used questionnaire as a tool for face interview.

The research was carried out in the Jalhak area which is located in South east region (figure 3. 6). Three villages in and around the Jalhak forest were chosen as a sample villages for this research. The three villages around the Jalhak forest were selected because they claim customary rights to the forestlands.

The total population is calculated from by 250 families of the three villages since each family is comprised of 6 individual. So the total numbers of population comes to be 250×6= 1500. Random selection was made on the principal that only one respondent represent a household. No consideration was given to gender and age factors, but whoever is available to their places (male or female) was selected to interviewing during data collection.

4.8 Dada Analysis:

The analysis of the qualitative data in the pre-field work phase, in the formulation and clarification of research problems and continues through to the process of writing reports, articles and books(Hammersley and Athkinson, 2007).

The statistical analysis carried out through exploratory manipulations of the data obtained from the study area. This process was accomplished by critical examining the data through the use of the simple techniques of analysis.

The main tools are the construction of simple tables and selected cross-tabulation which allows tentative answers too many of the questions being asked in the social survey. The statistical package software used for social survey data was SPSS.

CHAPTER FIVE

5.0 RESULTS AND DISCUSSION

5.1 Introduction:

This chapter comprises the results of field work and presented according to the specific objectives of this study. The data sources on which the results are based include the households and visitors'' questionnaires as well as outcomes of the interviews and discussion. This is discussed alongside with some literature.

5.2 General Characteristics of the Respondents:

General characteristics were considered for any large group perception by forming a cognitive architecture to target sample, different stages varying education levels by type require guideline, and various programs and according to these qualities (WRI, 1997).

5.3 Demographic Characteristics of Respondents:

This section analyses the demographic characteristics of the 150 household respondents in the three villages. The key considerations are the gender; age material status; level of education; source of income. This is essential to give an overview of the category of people who were involved in the study area.

The tribal and family links characterize the people of the area in Upper Nile. Extended families and strongly linked members to a family settle and live in close dependence on each other. This strong link is a source and lineage between family members collaborative.

Tribal families are usually very big varied between 4—6 members of small families and 7— 10 in middle size of moderately big families. In few cases large with 3—4 wives and big numbers of children.

It is worth to mention that when the size of families is large an indication of having wide powers within the tribe. That is to say there will be an increase of cattle rear and wood cutters among the family, plus those who will carry out agricultural activities and other trading resources. A family with large size is credited and socially considered. The family has position within the society.

5.3.1 Gender of respondents:

Results showed that, there were significant differences among the respondents according to the gender. However, about 65.3% of the respondents were male and 34.7% were female (Table, 5.1).

The male is higher than female and this due to the absence of female in the war area. They migrate to the safe area in the State. According to society labor division the girls work in forest activities and agriculture while the male are responsible of animal rearing.

Table 5.1: Gender

Gender	Frequency	Percent
Male	98	65.3
Female	52	34.7
Total	150	100

Source: (Field survey, 2015)

5.3.2 Age Distribution of Respondents:

Most of the respondents interviewed for this survey were between 30-40 years of age, representting 62% of the population surveyed (Table, 5.2). Respondents less than 30 years make up the second largest age group (24%). And 21% of the respondents were more than so years of age. The majorities of the respondents were adults and may have matured and generated valuable experiences and information to share in relation the research questions.

As result the young groups were the majority which means the working groups area constituting good number. According to the customs and traditions of the tribe's studies area, marriage is usually at early age.

Large sized families are usually owners of large cattle herds. Group discussion with gathered leaders from life-sized families indicated that the household has no problems with herds rearing. They integrate cattle rearing with agricultural activities. According to the group discussion with elders and key informants the activities concerning cattle rearing is the function of the young and middle age boys while the activities of agriculture and forest activities are the responsibility of the girls and women.

Table 5.2: Age distribution of respondents

Age category	Frequency	Percent
20—30	36	24
30——40	58	38.7
40——50	35	23.3
>50	21	14
Total	150	100.0

Source: (Field survey, 2015)

5.4 Marital Status of the Respondents in the Study Area:

Figure(5.1) below showed that, 40.7% of respondents were married, while 25.3% unmarried and 18% divorced, in addition to 16% widowed. These resulted illustrated the social stability of community sample in which men tend to marry more than one woman as a sign of verity and wealth and gives a big status in the community, usually leaning mayors and members of civil administration to multiple marriages as usually inherited in the tribe.

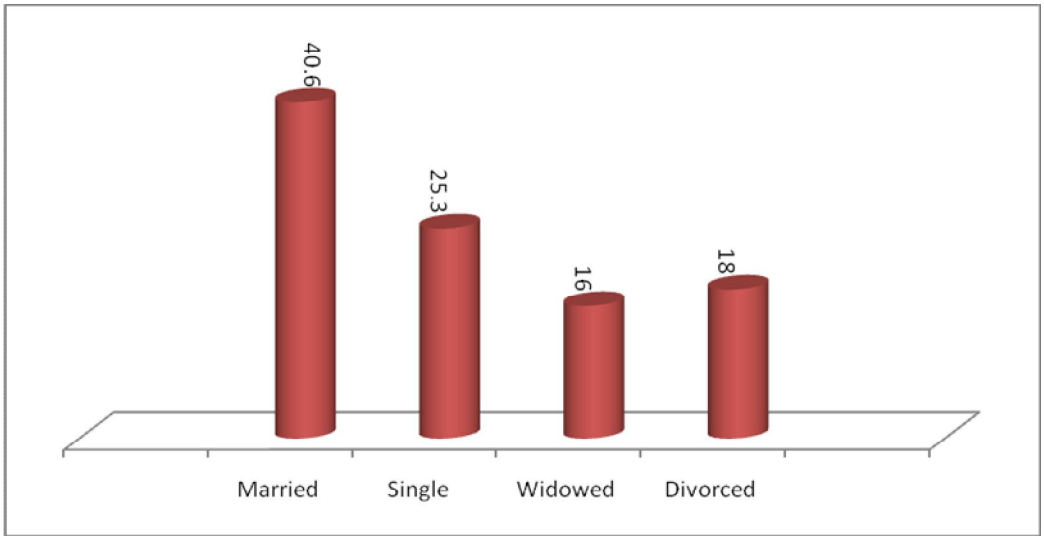

Figure 5.1: Marital status of the respondents in the study area

Source: (Field survey, 2015)

5.5 Educational level:

The results in figure (5.2) showed that, 38% of the respondents were illiterate. The educated groups were 61.9% where the primary school level made 28% and the secondary level constituted 21.3% in addition to 12.7% of university level. There is no any kind of education provided before the primary school level. This means that future programs of extension and knowledge transfer will not be based on read message for the majority of people in the study area.

GOSS and NGOs need more efforts to provide more educational services in the area.

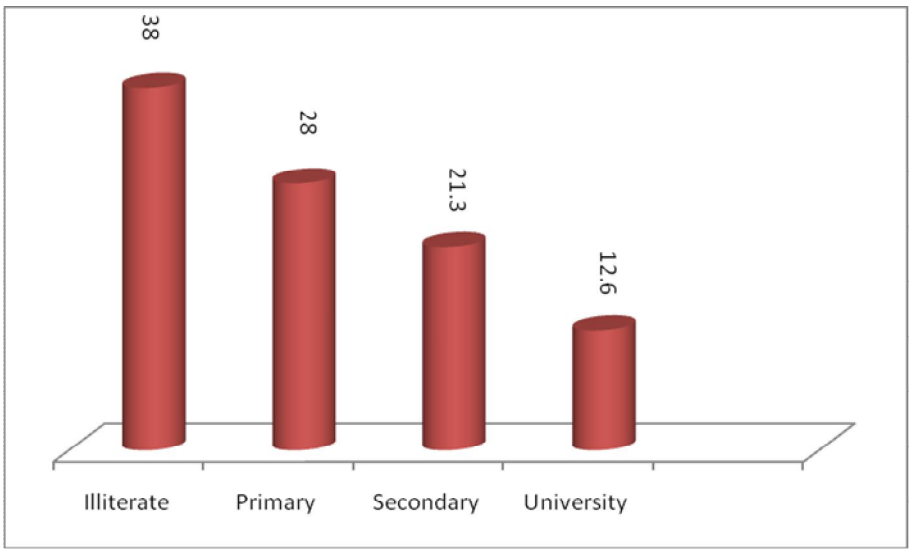

Figure 5.2: level of Education of respondents in the study area

Source: (Field survey, 2015)

5.6 Source of Income of the Respondents in the Study Area:

As part of the research objectives, it was necessary to identify the major income activities practiced by the local communities.

The source of income is diversified and very much related to natural resource, Cattle rearing, wood and non-timber products and cottage industry products which together constitute the major sources of income.

Figure (5.3) below showed that 40.5% of the respondents depended on agricultural products as their source of income. While 38.3% depended on livestock (animal rearing) as a source of income generation and 12% depended on the trading of goods and animal products. Moreover, 9.1% of the respondents work as government's employee.

However, most of people in Jalhak area associated with cattle rearing depending on animals for their food particularly the products from the milk and meat.

Figure5.3: Major Livelihood Occupations of Respondents

Source: (Field survey, 2015)

5.7 Agriculture Practice in Jalhak Area:

Results showed that, there were significant differences among the respondents according to agricultural practices. Moreover results in table (5.3) revealed that 64.7 of the respondents engaged in agriculture through the territory of the forest as well as within the forest in order to increase agricultural production and expanded their agricultural farming.

While 35.3% of the respondents engaged in agriculture on their own land in order to meet their daily needs and sell the surplus in the market to increase their income. They used the traditional technique in agriculture and some of them used tractors for the preparing the land.

The continuation of shifting cultivation practiced by farmers inside the forest will affect positively the natural regeneration compared with other areas where this type of agriculture did not practiced.

Table 5.3: Agriculture practice in Jalhak forest

Agriculture practice	Frequency	Percent
Inside the Jalhak forest	97	64.7
Outside the Jalhak forest	53	35.3
Total	150	100.0

Source: Field survey, 2015

5.8 Types of Livestock in the Jalhak Area:

The cattle's, sheep's and goats were the main animal species in the study area and constituted 42.2% cattle, 30.7% sheep's and 27.1% respectively (fig5.4).
In the study area, cattle are a symbol of good and wealth and most pastoral communities' rear livestock to provides (milk, and meat) to meet social obligations (bride price stock alliances and stock patronages) and to insure against disaster (drought epidemics and raids).

Livestock products contribute to subsistence in two ways: directly, via milk and meat for home consumption, and indirectly via sales to generate cash or exchange for cereals and other crops (observation and group discussion in the study area). Cattle rearing play a significant socioeconomic role in the life of the people; they are slaughtered during ceremonies and festivals, and serve as a source of ready cash for small farmers.

Through the researcher observation in the study area, sheep and goats breaded are meat producing animals adapted to the various ecological zones in which they are found. Goats and sheep are sometimes known as the poor man's cow

because of their ability to provide sufficient meat, skins and fiber. For people own use, with perhaps a little surplus left for sale. There are many reasons why these animals are more convenient than cattle for the small holder in the study area because they are cheaper to buy and reproduce and easier to obtain than cattle.

They reduce at an early age, more frequently and have young's. They reproduce manageable amounts of meat, milk, skins and fiber for family consumption or sale. They have an ability to survive on low quality foods or in different conditions on relatively small amounts of food, and they integrate well with both crops and other livestock production.

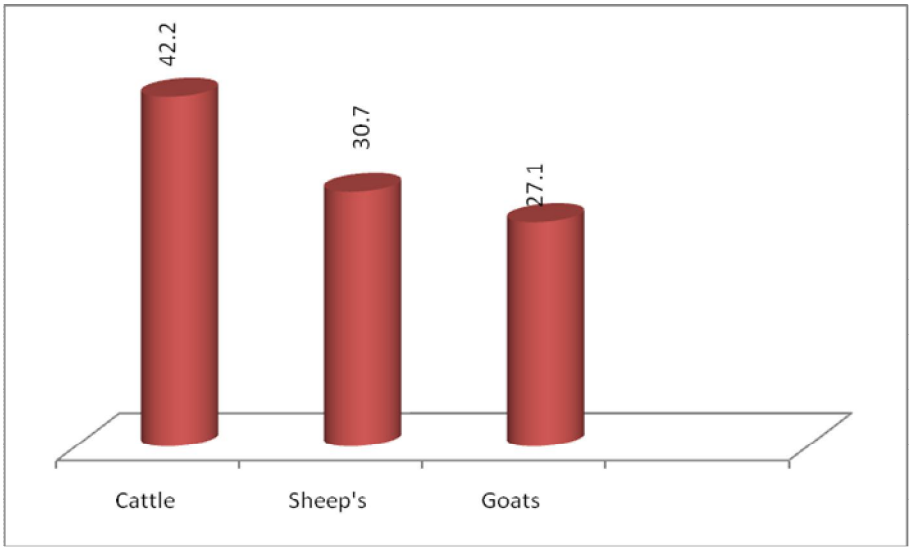

Figure 5.4: Livestock types of the respondents in the Jalhak area

Source: Field survey, 2015

5.9 Source of Fodder in the Jalhak Area:

Figure (5.5) below showed that, 44.1% of animals got their food from the forest, flowed by 33% from agricultural residues and 22.9% sold from market.

As showed 44.1% of the respondents were getting fodder from Jalhak forest where the forest considered as main source of nutrients which is important for animals. Rearing is done via the admission and animals feed their animals. Moreover, the findings showed that 33% of the respondent's received forage from agricultural waste in different forms of residue.

Agricultural waste in the study area was considered as one of the main sources of fodder that relieves pressure on the forest especially during the harvest season of crops where the forage resulted from waste is available in abundance to feed the animals (Cows, Sheep and Goats).

Crop residues encompass all agricultural waste as straw, stem, leaves, husk, shell, peel, pulp and stubble. Which, come from cereals (rice, wheat, and maize or corn, sorghum, barley and millet).

Third a category of respondents were those who buy fodder to feed the animals from the markets, and that was confirmed by 22.9%. It was noted that most of these animals (sheep and goats) are owned by small numbers of the families as well as some of the traders who are active in goat and sheep trade and also by some of family members with good income.

Forests are vital community sources for fodder, fuel wood and timber. Fodder trees and shrubs are sued in the study area as a protein supplement in ruminant diets during the long dry period (group discussion). The constraints to livestock production were mainly due to food scarcity from October to May, and during this long dry period fodder trees and shrubs are the major source of green fodder in the study area.

Forage trees and shrubs as forage have useful the nutritive value which is determined by its ability to provide the nutrient required by an animal to balance the requirements. Tree and shrubs have been primarily used as food for ruminant (cattle, goats and sheep's).

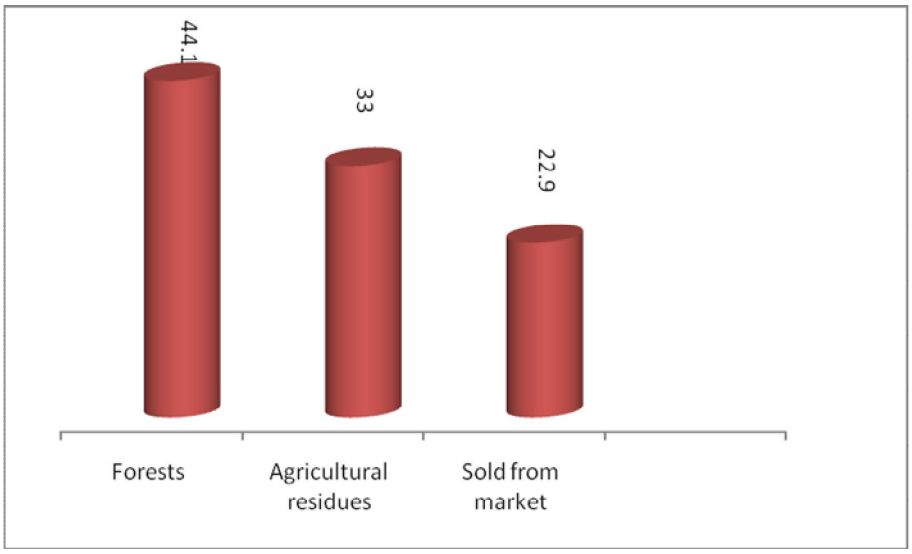

Figure 5.5: Source of fodder in the Jalhak area

Source: Field survey, 2015

5.10 Products Gained From Jalhak Forest:

Figure (5.6) below showed that, 45.5% of the respondents gained charcoal from the forest, while 35.9% gained firewood in addition to 18.6% gained sawn timber.

As mentioned 45.5% of respondents were using charcoal on a basis of the woods, for ease of getting it and it practiced a lot of family's coal trade for big return from work. The increase of demand for charcoal is one of the threats to Jalhak forest and will lead to forest removal if the situation continues in the future with in the absence of plan, and production even, will make the forest depends on the natural regeneration.

In the study area, there is current demand for cooking fuels. The current rate of charcoal production followed in its production sites in the Melut area and charcoal business are negatively affected the forest in the study area. In other parts of the State studies showed that, demand for charcoal rises with urbanization and population growth, as does the pressure on forests and woodlands, most of which are poorly managed and prone to degradation. When researcher asked the respondents they mentioned that, they use a lot of charcoal in all cooking process in the daily life.

Meanwhile, 35.9% of the respondents confirmed adopting wood as one of the most forest main source of basic energy for domestic and commercial purposes, and also essential for construction of schools, homes and places of worship.
The forest authorities in the study area needs to exert more efforts to meet the demand for firewood in the recent period as the population increase due to the displaced from fears of recent war.

As well as, 18.6% of the respondents have access to forest products, wood fuel, wood and sawdust from the small business saws in the study area. These saws were illegal and did not follow the forest authorities which is a commercial saws owned by individuals, where they work in agreement with the traders to get the wood without involving the forest authorities in the area.

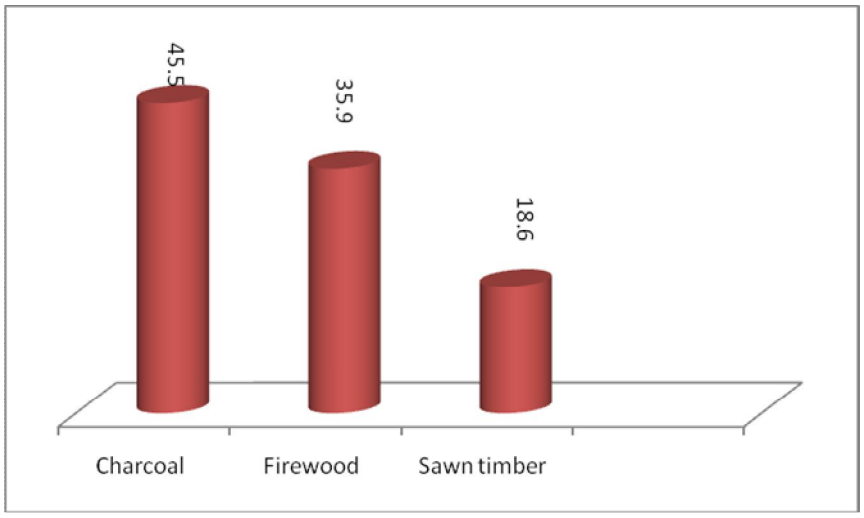

Figure 5.6: Products gained from the Jalhak forest

Source: Field survey, 2015

5.11 Ways of Forest Products Extracted From the Jalhak Forest:

Results in figure (5.7) below showed that, 42.9% of the respondent's extracted products from Jalhak forest through cheating while 36% through free access, in addition to 41.1% through license.

Forest are lugs of the land by breathes, and they considered of the most renewable natural resources. Which in turn possess a vital role in the absorption of the carbon dioxide, harmful gases and release pure oxygen. It also have a role in and flittering the air and dust deposition and outstanding harmful parts, in addition to that they are place for stroll and a source of construction materials and reliable rural communities totally dependent on their daily lives (Adel Nour,H.O and Abdel Majid T, 1997).

As showed in the results, 42.9% of the respondents have access to the various forest products in the study area without permission through cheating. During the debate in the group discussion the researcher has noted that most of the respondents were most active in trade of charcoal and firewood.

The continuation of the over exploitation of the Jalhak forest by the some local trader is mainly due to the increasing demand for wood, weakness of forest laws and lack of their effective implementation, and to the weak environment awareness. All these factors threaten the forest in the future the authorities to development urgent plans and flexible policies are required to protect this vital resource.

Meanwhile, 36% of the respondents have access to forest products in the study area without paying fees for forest administration, where they allowed to take the branches and shrubs of trees and dead shrubs as well as free access to non-timber forest products like the fruits of *Acacia nilotica*, *Zizphus spinacharsti*, *Balanites aegyptiaca* and other forest products in the area.

Access to wood and non-wood forest products is one of the most problems facing the forest authorities in the study area due to the lack of environmental awareness among the local residents and the lack of effective forest laws which resulted in the deterioration of this vital resource due to over cutting and exploitation of forest products.

During group discussion about this negative practice, some of the respondents have complained about this situation. They stated that because of the weakness of forest administration some of residents are taking advantage of entering the forest and permits and enter the forest products, where they cut down trees for firewood, poles, and charcoal without approved or permits from the forest authorities in the area. These situations need to call the forest authorities to address this over exploitation by traders to reduce the negative effect of this practice.

Moreover, 41.1% of the respondents were getting a license of permission from the forest administration in the study area and often there is a tender or auction for the sale of wood as customary in the Sudan and other countries.

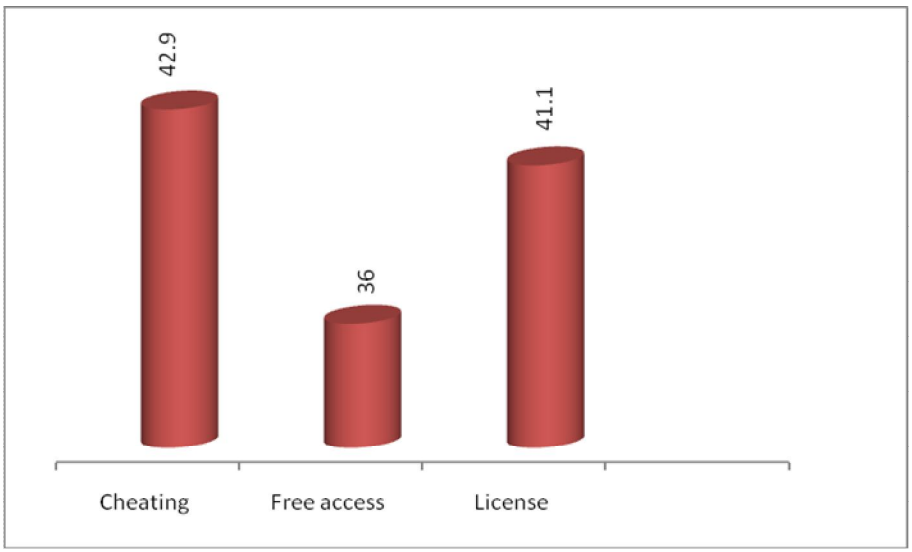

Figure (5. 7) Forest products extracted from the Jalhak forest

Source: Field survey, 2015

5.12 Forest Products via the Need of People in the Study Area:

Results showed that, the respondents according to forest products via the needs of people in the study area. Meanwhile, the results showed 64.7% of the respondents get their needs from Jalhak forest, while 35.3% of the respondent stated that their needs were not satisfied (Table5.3).

The majority of the respondents rely on the Jalhak forest which provided them with their needs of wood products and the indirect benefits such as deodorant soil conversation, increased agricultural production and other benefit. The crumb consider this resource as very important for them and must be preserved, and they were ready to participate in any programs organized by the forest authorities or any other agencies concerned with forests.

Moreover, 35.3% of the respondents confirmed that, the forest no longer meets all their daily needs, and they attributed this to the extreme pressure on the forest during the last five years due to population growth in the region.
This resulted from people displacement to the southern part of the state and return of southern people after independent.

During group discussion and some of the elder's views about the Jalhak forest, they agreed on the importance of the forest, and it must be maintained, rehabilitated, protected, preventing the illegal cutting of trees and involving local people in the management of forest in the future.

Table 5.4: Forest products via needs of people around Jalhak area

Needs of people	Frequency	Percent
Yes	97	64.7
No	53	35.3
Total	150	100.0

Source: Field survey, 2015

5.13 Positive Economic Behaviors of People around Jalhak Forest:

Results showed that, the respondents according to positive behavior of residents around the study area. Likewise the results revealed that, 64.7% of the respondents agreed that legal grazing is one of most positive practices in the study area, followed by 35.3% mentioned legal cutting of trees (Table5.5).

5.13.1 Legal Grazing:

Legal grazing is one of the practices in the study area, and this was one of the observed by the researcher during his field work for data collection. Grazing under the supervision of the forest authorities in the study area is aimed to

maintain the quality of the pasture, keeping grass and weeds. The existence of a legal grazing under the supervision of the forest authorities in the recent periods is attributed to the insecurity, and the absence of regular sponsored operations. Respondents agreed of usefulness of regular grazing to ensure the protection of pasture grasses inside the forest. Rural communities are the most consumers of biomass products such as firewood, charcoal. Community members are responsible for methods of grazing animals they own, as well as how to treat with the forest products because forest is a vital resource which they entirely in the region (FAO, 1981).

5.13.2 Legal Logging and Cutting Trees:

Meanwhile, 35.3% of the respondents agreed to the presence of the legal logging of trees under the supervision of forest authorities in the area, also this confirmed by the forest officials in the area, where the forest administration organizes a regular logging of compartments that need such operations. Commercial logging, involved cutting trees for sale as timber or pulp. The timber in building houses, furniture's, etc, logging generally categorized in selective ways and clear-cutting. Loggers choose only wood that is highly valued, such as *Khaya senegalensis*(Mahogany).

Table 5.5: Positive economic behaviors of people around Jalhak forest

Positive economic behavior	Frequency	Percent
legal grazing	97	64.7
legal cutting	53	35.3
Total	150	100.0

Source: Field survey, 201

5.14 Negative Economic Behaviors of People around Jalhak Forest:

Results in figure (5.8) below showed that, the respondents indicated several negative economic behaviors threatened Jalhak forests, where 34.3% mentioned overgrazing, 29.8% illegal logging, 21.9% shifting cultivation as well as 14% who mentioned agricultural expansion.

5.14.1 Overgrazing:

Overgrazing occurs when plants are exposed to intensive grazing for extended periods of time, or without sufficient recovery periods (Brawn, 1999). It can be caused either by the livestock in poorly managed agricultural applications, game resources reserves it can be caused by immobility and travel restricted population of native or non-native wild animals (World Bank, 1990).

Respondents argued that, overgrazing is one of threaten behavior which lead to the deterioration of the forest in the study area. The area infested by livestock of different types (cows, sheep's and goats) which increase the pressures on the forest, especially in periods of draught in summer off season.

During the field survey the researcher noticed that, there was deterioration in some areas of forest with to regarding grasses and weeds, although that period was in the autumn which reflecting great pressure on these areas during previous periods and delay generation of grasses and herbs. This is a serious indicator to over exploitation of forest pasture which needs urgent solutions. Responsible authorities do not follow the regular grazing of animals, and land lost the ability to regenerate new seedlings, herbs and grasses.

The lack of action to prevent this negative practice toward the pasture made by overgrazing will undoubtedly lead to more loss of grazing land in the study area. Clear signs of the deterioration of pasture were noticeable through observation, which requires urgent solutions, because the regions suffer from displacement people from of the civil war, which had great impact on the natural resources.

5.14.2 Illegal logging:

The term illegal logging is often used as shorthand to describe the illegal practice related to the harvesting, processing and trade in timber and products (Aryal, 2000). Illegal forest activities include acts related to forest ecosystems, forest industries and non-timber forest products. They include acts related to the establishment of rights to the land and corrupt activities used to acquire illegal logging continue to trees (Hyde, 1996).

Meanwhile, 29.8% of the respondents agreed that there were some negative practice harmful to the forest in the study area such as: illegal logging of tree for various purposes, including trade in timber, firewood and pole materials for construction.

In some cases logging in order to obtain large areas for the cultivation of cash crops is considered one of the most negative practices exercised by the local population against the vital resource in the study area. Logging often occurs without taking license from the forest authorities in the study area and without following scientific methods in logging tree operations. Officials in Upper Nile State were worried about losing one of the vital country resources if people continue to cut down trees in the forests.

Deforestation will extend, and will affect the rain patterns and make flooding worse. In addition to that, northern side could also run out of rare tree types, such as (Mahogany) *Khaya senegalensis* as mentioned by the officials.

The cuttings for firewood, charcoal, and pole materials for the purpose of expanding agricultural land to increase crop production was the most important threat to the deterioration of Jalhak forest. In addition to that agriculture and trading in timber products represented the main economic activities for the majority of the population in the study area.

Finally, the continuation of this negative activities will cause serve damage to this vital resource, including the death of seedlings and many causes countless pieces on certain types of trees of high economic value, which will damage the bio-diversity of the forest.

5.14.3 Shifting cultivation:

Results showed that 21.9% of the respondents practiced shifting cultivation patterns which were one of the most negative practices that threaten the vegetation in the study area, where farmers shift their cultivation in order to increase crop production.

Farmer continue to practice shifting cultivation will damage the Jalhak forest due to the cutting down of trees and shrubs, as well as clearing of weeds and grasses in order to grow crops.

Shifting cultivation is an agricultural production done by preparing the land to grow crops (especially a large scale). Where land clear from plants, shrubs and trees and then planted by crops for many years, when the grasses is spreading

dramatically then decrease the production of the crop and the farmer then move to the virgin land eating the same process(Godoy *et al*, 1993).

Farmers practiced this type of agriculture in the study area to increase crop production to meet the need of families and to improve standards of the life. This was mentioned by 14% of the respondents. They agreed that, this practice has been around since before the secession of the south from Sudan. Some of the elders in the study area mentioned that, the area was located within the White Nile projects, but reduce acreage after the Sudanese farmer's withdrawal from the secession of the Sudan.

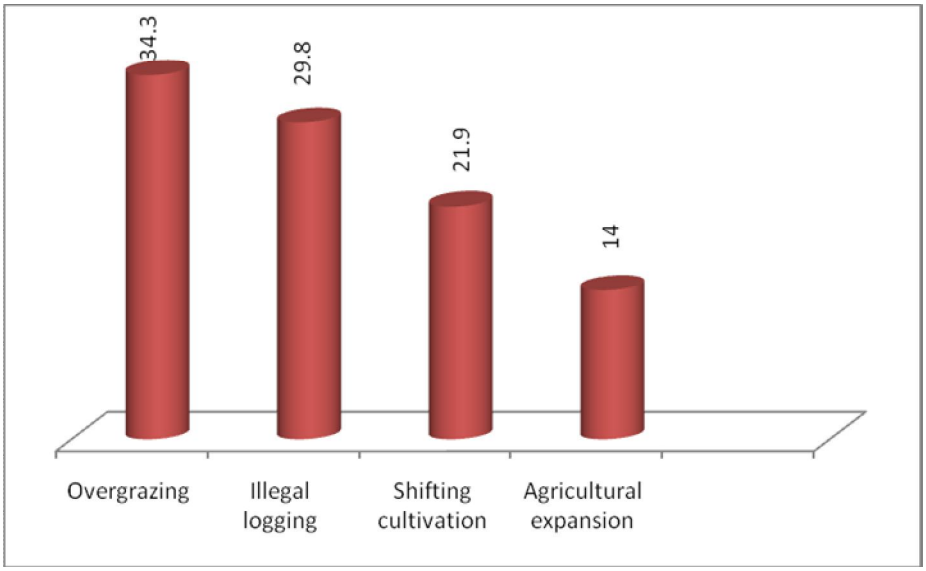

Figure 5. 8: Negative economic behaviors of people around Jalhak area

5.15 Positive Social Behaviors of People around Jalhak Forest:

Results showed that, there were significant different among the respondents according to positive behaviors of people around Jalhak forest. However, results showed that, job opportunities, social services and social fencing (taboos) 50%, 31.3% and 22% respectively, major positive social behavior in the study area (Table5.5). This reported by 50%, 31.3% and 22% of the respondent respectively.

5.15.1 Income generation:

As finding revealed 50% of the respondents agreed with the importance of the social role of forests in their life because it generates income to them in everyday life. Forests provide many job opportunities for the population in rural area, where many of the local population depend on field of the sale of forest products and non-wood products.

FAO, annual report, 2003 indicated that, providing jobs, forest can contribute to the alleviation of poverty in the world. Especially in developing countries, where poverty could be reduced to the optimum by use forest products. The reports focused on the role of forests in food security and encourage rural communities to practice agroforestry systems within the forests adjacent to them.

Generally, this practice can be applied to the Jalhak forest through the optimum exploitation of the forest products without damaging them, while working to improve agricultural production, diversification and poverty eradication.

5.15.2 Social services:

Meanwhile, 31.3% of the respondents indicated that, the Jalhak forest provides a good place to entertain families in the region as well as to residents of other village around the area, where they come into the forest to entertain during the holidays and feats season. Forests one entertainment places for humans and through the establishment of hunting a motor trip, parks and markets for selling some handicraft (Lebedy, *et al* 2008).

Forests play a growing role in supporting the natural economy in many countries of the world, especially after the worsening energy crisis, where the wood used as an alternative energy source.

5.15.3 Social fences (taboos):

Moreover, 22% of the respondents agreed to the sanctuary of cutting the trees, where they have stories and folk tales vary from one to another and all glorifying the tree and consider it as a gift of God. Because it is important for their daily lives and even for animals that they own. Forests provide fodders, grasses, and even small branches of the shrubs and trees during the summer periods.

Popular culture recognize the importance of forests and trees in general, it is mentioned throughout history in the heavenly regions, and in folk tales that he symbolizes the ongoing tender and is often described as a gift of God to human beings (Deepa and Pritchelt, 1997).

Table 5.6: Positive social behaviors of people around Jalhak forest

Positive social behaviors	Frequency	Percent
Job opportunity	75	50
Social services	47	31.3
Social fencing (taboos)	33	22

Source: Field survey, 2015

5.16 Negative Social Behaviors of People around the Jalhak Forest:

The finding in figure(5.9) below indicated that, removal of the trees that attracted birds and rodents 37.8% , removal of tree according to taboos 36% and other exploitation of some trees(Dokhan) 26%, were more negative social behaviors around Jalhak forest.

5.16.1 Removing trees attract birds and rodents:

As the findings revealed 37.8% of the respondent's cut the trees and shrubs around their farms because, they harbor birds that damage agricultural crops.

These practice of farmers to fight birds cause damage to the forest because it killed the trees and shrubs as well as grasses and herb. So the forest administration should organize the control over the birds and prevent these primitive ways in fighting birds so as to ensure the safety of the forest due to this practice.

5.16.2 Removal of some tree, according to taboos:

Meanwhile, 36.2% of the respondents were cut down trees of *Balanities aegyptica* and *Zizphus spinachersti* for charcoal and firewood more than other species of trees because they haven demons. The successions of belief in the region represent a major threat to these species of trees and may be lead to destruction of them. Therefore the forest authorities in study area needs intensive guidance campaigns to raise awareness of people regarding the importance of these species, economic and social aspects of trees, and involved the Mayors, elders in the awareness campaigns.

5.16.3 Over exploitation of some trees (Dokhan):

Acaica seyal trees used for ornamental purposes, where women used *Acacia seyal*(Telih) in the process of smoking(Dokhan) as usually passed down since ancient times and this was confirmed by 26% of the respondents in the study area.

Acacia seyal significance to the rural people inherited from ancient times due to it's an environmental pharmacological and economic use. The trees also make a lucrative business for many who work in the trade of firewood and charcoal. The tree is en damegened by many threatening factors which include lack of

natural regeneration, overgrazing and excessive cutting. Forest authorities should find solutions to these challenges.

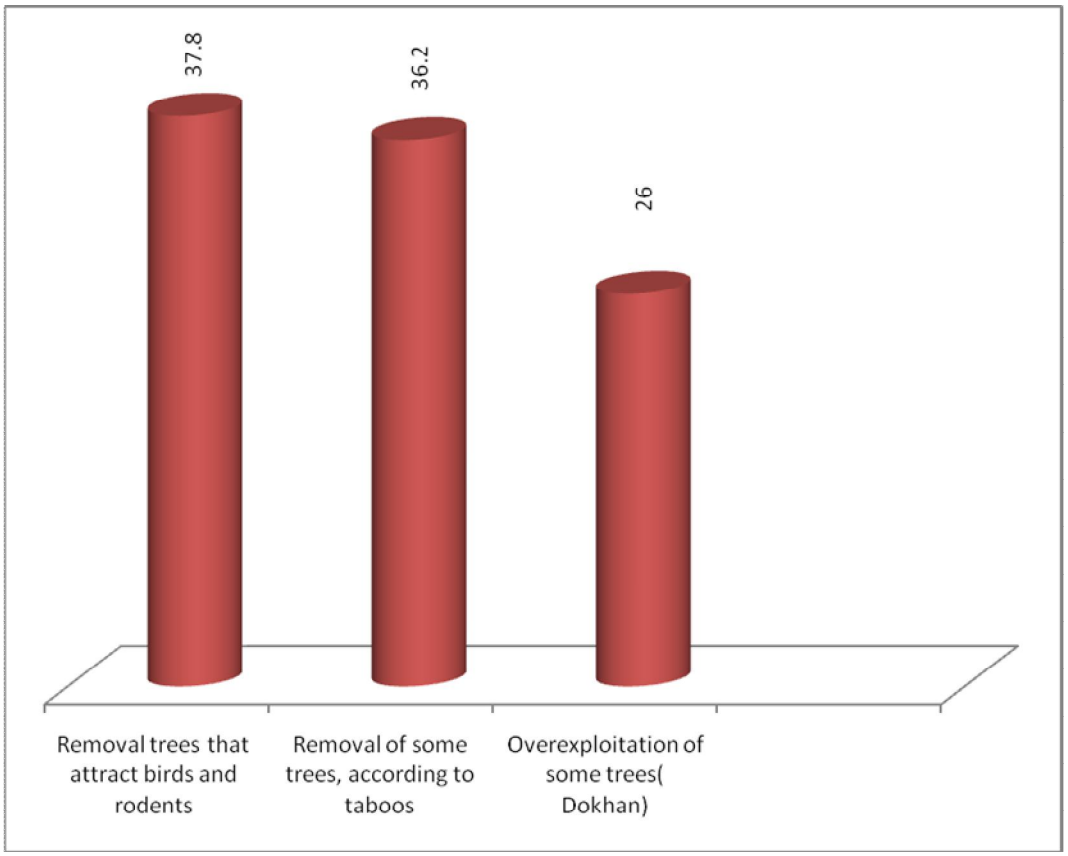

Figure (5.9) Social negative behaviors of people around Jalhak area

Source: Field survey, 2015

5.17 Benefits From the Jalhak Forests:

Results showed that, there among the respondents according to the benefits of forests in the study area. Moreover, results showed that, fuel wood, fodder; grazing and building materials were reported by the respondents in the as direct benefits from Jalhak forest, 40.7%, 34%, 28.7% and 20.7% respectively (Table5. 7).

Since the human ancestors, the forest was considered as the area for rearing living and the there have been local wisdom about human beings to protect and preserve the forest and environment. People began life on this planet as forest

dwellers. They were food gathers and depend on the forest for all their needs, food, clothing and shelters. Forest known to have benefits directly or indirectly to human life as presented as follows:

5.17.1 Direct Benefits:

Forest is one of the major sources of income (sale of timber and non-timber forest products) in addition to drug department (leaves, bark, sap and seeds). They have a major role in contributing to the economies of some countries (Godoy, 1993).

5.17.1.1 Fuel wood:

As findings showed 40.7% of the respondents acknowledged the importance of wood, (firewood or charcoal). Wood is an important source of energy for cooking and heating. They prefer smaller stems as these are easier to collect and carry. The wood that they select should be easy to spilt and have low moisture content to dry faster. Some of the wood is converted to charcoal and used for cooking.

Fuel wood prefers to materialize due to the reasons below:

- Availability. Fuel wood is easily available either in the form of firewood or wastes.
- Low cost. Firewood is inexpensive, especially in comparison to fossil fuels. An unlike other alternatives to fossil fuels does not require high initial investment.
- Environmentally friendly. As mentioned earlier, wood is not harming the environment if it is sustainability managed and if the right technology is used.
- Sustainability. Firewood is a sustainable source of energy because each tree that we cut down can be replaced.

5.17.1.2 Fodder:

Millions households in the developing world depend on food and fodder from forests to supplement their own and their livestock diets (Sharama, 1992). Meanwhile, 34% of the respondents agreed with the importance of the forest in the area, because it provided fodder for the animals in their study area.

Fodder from the Jalhak forest considered as an important source for cattle and other grazing animals in the area during the drought. There were many varieties of grasses, trees, and shrubs that supported nutrition for livestock. Care was taken to avoid poisonous trees to cattle. In addition, trees that produce a large crown above the reach of cattle were preferred. Trees also important in emergencies drought and famine, they provide food and cash money.

5.17.1. 3 Grazing:

Grazing inside the Jalhak forest was considered one of the direct benefits of the forest in the study area, where local population relied to feed their animals (cows, sheeps and goats), and this was confirmed by 28.7% of the respondents (table5.6). They recommended the great role of the forest in the provision of fodder in the region. There is grass, weeds and branches of shrubs and trees of different species of trees, especially Acacias, which is one of the favorites for animals because it contains high production plus its palatability.

5.17.1. 4 Building Materials:

Wood is renewable building materials that have impact on the environment. Moreover, 20.7% of the respondents were benefited from the Jalhak forest to get their needs of round wood and building poles which used in the construction of housing and animal husbandry (Table5.7).

Most of wood species used in the construction of hosing in the study area were *Adonsonia digitat*, *Borassus aethiopum*, *Hyphaene thepaica*, in addition to the *Azadirchta indica* and *Acacia seyal*. The rate consumption of these trees for the production of wood construction by the population growth in the region. This relationship was confirmed is highly increased by one of the FAO, studies linking the growing of the population and excessive cutting various trees for different uses. According to the study there has been lost of 65 million hectares of forests in the developing world1990_ 1995 due to the increasing population and over-cutting of forests to cover the needs of that region.

Table 5.7: Direct benefits of Jalhak forest

Direct benefits of forest	Frequency	Percent
Fuel wood	61	40.7
Fodder	51	34
Grazing	43	28.7
Building materials	31	20.7

Source: Field survey, 2015

5.17.2 Indirect Benefits from the Jalhak Forest As Perceived by the Respondents:

As showed in the results in figure (5.10) below improve crop production and income generation, job opportunities, soil conservation and watershed, were reported as indirect benefits from the Jalhak forest as perceived by 33.7%, 28.7%, 19.8% and 17.8 of respondents respectively.

The indirect benefits of forest were mostly intangible, where crowns of large trees reduce the amount of rain falling on the surface of the soil, which reduces soil erosion by water. Also trees and shrubs which fall on the soil increase the amount of soil organic matter and make them more fertile, in addition to the environmental benefits of forests and them beneficial impact on the climate. The presence of forests cover in many areas decreases temperatures and

increase moisture compared to the fire zones of forests in addition to the great role of forests in the absorption of carbon dioxide.

5.17.2.1 Improve Crop Production:

Forests, trees on farms and agroforestry systems contribute to food security, nutrition and livelihoods in several ways, including source of food, fuel, employment and cash income. Forests play a major role in the bossing crop production, which is reflected positive in the improvement of crop production and income for farmers. That was agreed by 33.7% of the respondents in the study area. As local people with their indigenous knowledge believed that the crop production covered the needs of families, where farmers have practiced to agriculture within the forest and believed that the forest increase the production of crops and soil fertility. People were also used resorted to the practice agriculture within the territory of the forest in the study area.

The persistence of the population on the agriculture within territory of the forest in the study area to increase crop production and cover family needs will have a negative impact on the forest in the future; especially this practice depends on the removing of many trees, shrubs and herbs.

To avoid soil degradation this practice should be under the supervision of forest authorities in the area, and the forest extension needs extensive efforts to raise awareness of people about the importance of forests and the need to be managed in sustainable manner.

5.17.2.2 Job Opportunities:

Job opportunities in a wide range of forestry related fields include maintenance, traders and silviculture and reforestation.

Meanwhile, 28.7% of the respondents showed that, the forest provided them with alternative job opportunities. Since the majority of the families lack the education of their children, especially girls, in addition to the lack of schools, and low of salaries for employees in the government sectors. All these reasons promoted many local residents to work in the sale of several forest products in the area to generate money to help them in the care of their families.

5.17.2.3 Soil Conservation:

Moreover, 19.8% of the respondents pointed the importance of the Jalhak forest in soil conservation and protection against erosion as it worked to ease the rain water flow, and reduces the damage and floods sweeping rainy season from time to time, in addition to that, forest acted as a regulate of groundwater to facilitate the leaking water into the soil.

Forests play an important role in protecting soil from erosion, air and water by installing trees to the soil and work on cohesion, as well as the minimization of the fall of the direct rain on the soil surface, which works to prevent erosion and make the most resident to any kind of erosion(FAO, 1983).

Some species have the ability to return nitrogen to the soil through root decomposition or fallen leaves such as trees were planted to increase the nitrogen content of the soil. Trees bind the soil and prevent erosion caused by wind or water. Leaf fall also provided soil cover that further protects the soil.

5.17.2.4 Watershed:

Eventually, 17.8% of the respondents emphasized the role of the forest as a source to collect rain water, where excavation were frequently inside the forest, worked as reservoirs to save water during the rainy season to be utilized during the summer for human, animals and small farms.

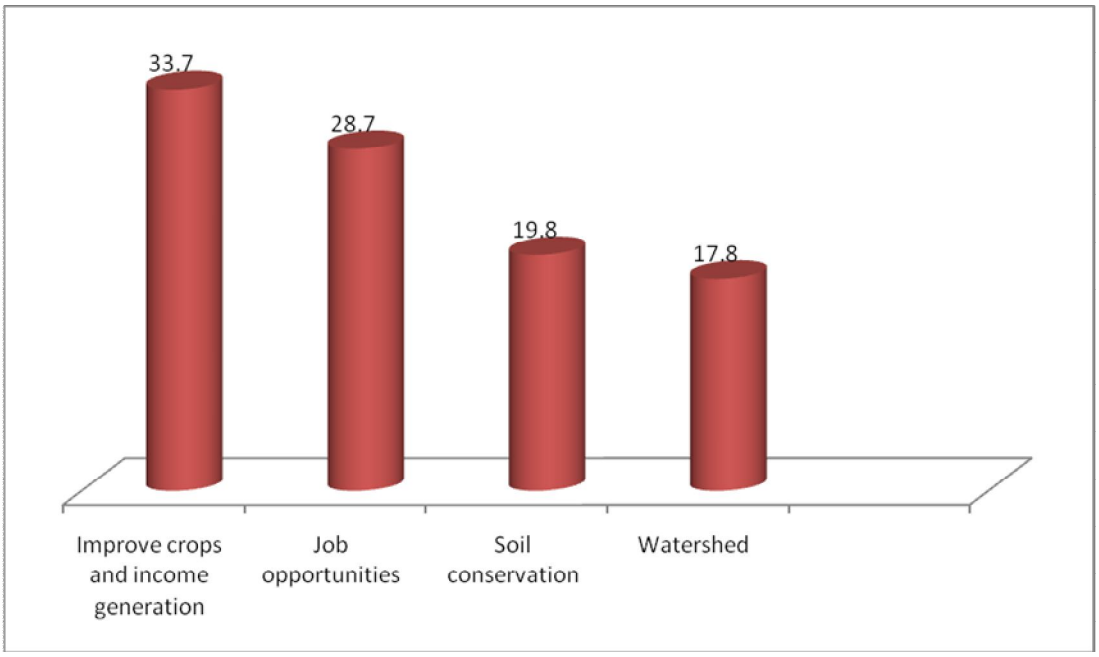

Figure 5.10: Indirect benefits from the Jalhak forest

Source: Field survey, 2015

5.18 Trees planted around the houses*:*

The results in table (5.8) revealed that, there were significant differences among the respondents according to planting trees around houses. Moreover, 65.3% of the respondents did not planted trees around their houses. This may be attributed to the failure to provide seedlings by the forest administration. In addition to weakness of environmental awareness of same residents pertaining home gardens.

Meanwhile, the findings showed that, 34.7% of the respondents were planted trees around their homes; it is provided them with fruits, seeds and other wood and non wood benefits. Moreover, sheep eat the fruits of *Tamrindus indica* and *Albizia lebbek*, while local population uses *Azadirchta indica* in storing water as well as the bark of *Khaya senegalensis(*Mahogany) in the treatment of abdominal diseases.

Table 5.8: Trees planted around houses in the study area

Trees planted around homes	Frequency	Percent
Yes	52	34.7
No	98	65.3
Total	150	100.0

Significant

Source: Field survey, 2015

5.18.1 Types of trees planted around houses in the study area:

The table (5.9) below showed the types of the trees around houses in the study area are *Azadirchta indica*49.3%, followed *Cassia acutifoia 35.3%, Eucalyptus spp* 20% and *Albizia lebbek 12.7%.*

Forestry authority in the region needs to exert more efforts and raise the awareness of people regarding the importance of planting trees around house (home gardens).

Table (5.9) Types of tree the around the house in the study area

Type of trees around hoses	Frequency	Percent
Azadirchta indica	74	49.3
Cassia acutifolia	53	35.3
Eucalyptus spp	30	20
Albizia lebbek	19	12.7

Source: Field survey, 2015

5.19 Community Forest:

Community forest has a significant role and positive impact in the protection of forest projects in South Sudan, and encourages the local population to

participate in a forestation programs and campaigns of environmental awareness to promote environmental understanding.

However, results in table (5.10) showed that, there among the respondents according to establishing community forest in the study area. Meanwhile, results showed that, 65.3% of the respondents pointed to the lack of community forestry in the study area. Some respondents some gardens owned by some families were grown by different types of trees reported that fruit trees, and shade trees, and there is no relationship between them and the forest administration in the area.

Community forestry is extremely important to protect the forest and take advantage of the population living in the forest areas in the process of farming, where community forestry works on the following: protection of forest coverage around the forest, which reduces the repeated attack operations. Rationalization of energy consumption by using improved stoves and promote the environmental awareness of the local population through the intensification of campaigns in the region are necessary.

Therefore, the forest administration in the study area should enhance the establishment of community forests, in the form of trees around houses and provide seedlings and involve local people in the management of forest plantations. This practice provides an opportunity to those communities to play major role in protecting their forest which disseminate the idea and reduces the over-cutting and overgrazing of forest and provide protection for many forests through the participation of the people living adjacent to the forest area.

Table 5. 10: The existence of community forest in the study area

Community forests	Frequency	Percent
Yes	52	34.7
No	98	65.3
Total	150	100.0

Source: Field survey, 2015

5.20 People's Perceptions of Forest Resources, laws& Policy and Administration in the Study Area:

5.20.1 The Importance of Forest to the People in the Study Area:

Results in table 5.11 showed that, there were significant differences among the respondents according to perceptions of people of forest resources, forest laws and forest administration in the study area. Moreover, results showed that 65.3% of the respondents perceived forest in Jalhak as important and useful resources. These results denoted a high level of awareness of people to the importance of forest in particular and the environment in general. Forest extension can build on this understanding to establish and protect forests in the Jalhak area.

Meanwhile, 34.7% of the respondents were not perceived forest as useful and important.

This may be attributed to the lack of environmental awareness of this group, which requires more extensional efforts regarding the importance of this vital resource to ensure the protection of the forest from repeated attacks by traders of charcoal and firewood.

5.20.2 The Effectiveness of Forest Laws As Perceived the Respondents in the Study Area:

Moreover, 65.3% of the respondents reported that, forest laws were not effective and not applied. Meanwhile, 347% mentioned it was effective (table5. 11).

So to ensure the activation of forest laws in the region, the enactment of legislation and laws that govern the relationship between the forest and the locals need to be consistent with their requirements and compatible with economic and social activities and the application of laws and regulations should be controlled.

The residents pointed to the non-application of these laws (phenomena) also the researcher has noted absence of specialized courts regarding issues related to the wealth of forest and this was confirmed by the officials in the study area.

5.20.3 Forests Administrated As Perceived by the Respondents in the Study Area:

Meanwhile, 64.7% of them complained and blamed for failing to protect the forest from over-cutting and overgrazing (table5.11). This may be attributed to actively trade in charcoal and firewood in the region.

In addition, to agricultural expansion in the territory of the forest land' with absence of extensional campaigns to promote environmental awareness of the residents to ensure the protection of the forest and contributing to sustainable forest management.

Moreover, officials in the study area have attributed the poor performance to forest administration in the region to:

* A shortage of funds, to protect and planting forests.

* The absence of legal deterrent and lack of specialized forest courts in the region, in addition to the lack of security services, and weak environmental awareness.

* To avoid the removal of the forest cover in the region the following issues should be addressed:

* promote environmental awareness of the residents in the area. Activation and implantation of forest laws against anyone involved in an unjust-cutting operations. Encourage residents to set up the community forests such as Sudan because it has a positive role in protecting the forests and establishment of specialized courts forestry regarding issues and develop technical plans for the forest management in the State.

Eventually, 35.3% of the respondents pointed to the good performance of forest administration in the study area.

Forest administration is the body responsible for implementation of the policy and forestry issues in a particular country. Through norms and legislation, financial means and information and forest programs, the forest policy hould aims to promote the sustainable management and use of forest land recourse (FAO, 2008).

Table 5.11: The perceptions of respondents of importance of forest laws, policy & forest administrations in the Jalhak area.

Forest resources are important			Forest laws are effective			Forest administration is good
Answer	F	%	F	%	F	%
Yes	98	65.3	52	34.7	53	35.3
No	52	34.7	98	65.3	97	64.7
Total	150	100.0	150	100.0	150	100.0

Source: Field survey, 2015

5.21 Forest Extension in the Study Area:

Results in table (5.12) showed that, there among the respondents according to the extension. Meanwhile, the findings showed that, 63.3% agreed on the absence of extensional services in the form of workshops, campaigns and conferences as reported by 47.3%, 39.3% and 24.7% respectively(table5.12) below hence the forest extension needs to exert more efforts to provide raring extensional services.

The extension material does not contain any advice on forest uses and conservation. Most of the extension material may be concerned with matters other than forestry affairs, maybe more concerned with peaceful use of the resources than on conservation of the resources.

Table 5.12: The extension services in the study area

Extension services	Frequency	Percent
Workshops	71	47.3
Extension campaigns	59	39.3
Conferences	37	24.7

Source: Field survey, 2015

5.22 Problems Facing the Jalhak Forest As Perceived by the Local People in the Study Area:

Results in table 5.13 showed that, there among the respondents according to problems facing the Jalhak forest as perceived by the local people in the study area. Moreover, results showed that, over-cutting, overgrazing, by pass ownership gardens in the forest land and fires were mentioned by 40.7%, 35.3%, 27.3% and 18.3% of the respondents in the study area as a main constraints respectively.

Results showed that, there were significant differences among the respondents according to problems facing the Jalhak forest as perceived by the local people in the study area. Moreover, results showed 40.7% of the respondents agreed that over-cutting is the most main problem that facing the Jalhak forest, this activity has a negative impact in the forest because of growing demand for firewood and charcoal in the study area. This situation requires the intensification of extension campaigns in the area to reduce this phenomenon.

Meanwhile, overgrazing was classified by 35.3% of the respondents as one of the problems that lead to the deterioration of pastures, especially when followed the traditional grazing, where the wandering of animals in the pasture without regard to the land and regulations pasture. Hence, rural people in the area should have the right to practice grazing in the forest without causing damage to seedlings and small growing. In addition to that, the number of animals that are allowed to graze per unit area should be under supervision of forest authority in the region.

Moreover, 27.3% of the respondents noted to the exposure of forest assaulted by the owners of some gardens near the forest land. This led to the decline of the forest land in the study area due to the ownership of land, which controlled by local community law.

Eventually, 18.7% of the respondents mentioned the fires as one threats to the Jalhak forest and these fires caused by farmers for using fire to clear trees, shrubs and remains of agricultural crops when prepared the land for planting. And we cannot ignore the world are caused by human or natural causes, where most of fires around require opening fire and lines inspection annually around the forest and the construction of watch towers, and sensitize the residents to the

danger of fires and farmers taking all necessary precaution to prevent fires and how to deal with the blaze when it happens.

Table 5.13: The problems facing the Jalhak forest as perceived by the respondents in the study area

Problems facing the forest	Frequency	Percent
Overcutting	61	40.7
Overgrazing	53	35.3
By pass ownership gardens	41	27.3
Fire	28	18.7

Source: Field survey, 2015

5.23 Suggestions of the Respondents to Develop Jalhak Forest:

The results in table 5.14 showed that, the there were significant differences among the respondents according to their suggestions to improve the Jalhak forest as perceived by them. Moreover, results revealed that, local people in the study area have a good knowledge and suggestions to improve Jalhak forest.
Meanwhile, as 46% agreed to establish a community forest in the area as well as in the villages around the forest.

Moreover, 40% of the respondents agreed on planting fruiting trees inside the forest to bring indirect benefits as well as environmental benefits, also this practice will provide safety from disease and pests that spread easily in single-type forests.
Nevertheless, the involvement of local communities in the decision-making process is essential to achieve the success of any projects directly related to

local communities and to avoid failure and collapse of the projects (Vedeld, *et al*, 2007).

Table 5.14: The important suggestion of respondents to activate performance of forest management in the study area.

Suggestions	Frequency	Percent
Intensification of planting trees around villages	70	46.7
Establishments of community forestry in the study area	69	46
Planting forest trees with fruit trees	60	40

Source: Field survey, 2015

CHAPTER SIX
CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions:

The study area is densely populated; cattle rearing and agriculture are the main sources of income for the people of this area, besides trading and some forest activities. Agriculture development is taking place the expance of forest extending from north to South Upper Nile State.

The most dominant trees species in Jalhak forest are: *Acacia seyal var. seyal*(talih), *Acacia senegal*, *Acaica millifera*(kitr), *Balanites aegyptiaca*(heglig) *Zizphus spinachesti*(sider) and *Acacia nilotica.*

Forest was the main source of food for animals in the study area particularly during periods of drought and summer. Local people in the study area used different forest products for energy mainly firewood and charcoal in housing construction. Respondent's emphasized that it proved them with food for their animals, crops and vegetables within the territory of the forest.

There were positive economic practices in the study area regarding social services in form of poles and roofs in the building of schools, hospitals and places of worship maintenance. There was wide spread belief in the study area that some trees should not be cut in order to not come down on any curse God, as some tribes glorify the trees as it provides them with comfort shade, fruit and fodder for animals.

There were negative social practices in the study area, where some people removal trees and shrubs around the farms under the pretext that they harbor birds that damage crops, in additional to that, some farmers were removed some trees in believe that it represents the abode of demons such as *Balanites aegyptica*. The habitat of smoking was an ancient tradition in the region, where women used *Acacia seyal* to smoke.

The local residents in the study area planted trees around houses as a kind of decoration such as *Azadirchta indica*, *Albizia lebbek* and *Golde more*.

Different factors are responsible for the deterioration of Jalhak forest, the main factors are: over-cutting of wood (illegal felling), over grazing due to increase in animals population and this resulted in depletion of forest, forage and replacement by the unpalatable grasses. Deterioration is also due to over cultivation by traditional mechanized farming, population increase climate change and fires.

Respondents were highly aware by the important of Jalhak forest as a useful resource but they were not longer argued the ineffectiveness of forest laws and that forest administration forested to protect the forest.

Respondents pointed out that, the forest was facing a lot of problems summarized in (over-cutting by charcoal and firewood merchants, overgrazing by shepherds, and fire usually occurs by a shepherds or the burning of farmers to crop cultivation).

The respondents have some solutions to overcome these constraints mainly included: Cultivating of trees, establishing of the community forests and cultivating of fruit trees inside the forest.

6.2 Recommendations:

The study recommended that:

- Government at all levels should reinvigorate adult literacy program or expand the universal basic education program to follow farmers with primary education to upgrade themselves. This will help them to increase their environmental awareness. The educational framework should handle issues like impacts of degradation to community, factors leading to the forest conservation, effects of conservation and ways of avoiding unnecessary conservation of the Jalhak forest reserved.

- The frequent use of workshops, and advocacy and seminars are necessary to educate the local people and farmer's more than negative consequences of depletion. This will help the rural households to have adequate information on the new policies of the government concerning forestry sector.

- Government should help the local people in the study area to build forest-based enterprises that would not only generate wealth but also offer livelihoods that are vulnerable to climatic shocks than are those that they depend upon at present.

- Community participation in the forestry conservation and protection initiatives should be made mandatory. This will encourage these communities to always innovate indigenous methods to stop under and over exploitation of forest. They will also develop a sense of ownership and commitment to all decision made about reducing degradation.

- Forest authority should encourage the local people in the study area in the development of agro-forestry by providing them with tree seedlings such as trees, have multiple benefits and trained them how to develop nurseries.

- Allocating budget for different activities and training of forest staff to realize sustainable management.

- Finally, the study recommends the provision of energy saving stove by government to the local people. This energy saving stove will help to reduce the quantity of fuel wood used and hence reduce the level of degradation.

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APPENDIX (1)

The QUSESTIONNAIRE

Title: The Influence of Some Socio-economic Factors on Forest Degradation in Jalhak Forest Reserved in South Sudan.

This questionnaire has been designed to collect information concerning the influence of some socioeconomic aspects on forest depletion in Jalhak forest reserved in South Sudan (rural people).

The information will be utilized in the research thesis for the degree of Ph.D. Sudan University of Science and Technology. So this research requires the participation and co-operation of the local communities, those of direct or indirect relation to forests.

Please answer the following questions as accurately as possible. Where actual data are not available, please use your own estimation, your answer will be strictly confidential and will not used for any purpose other than the research.

1- Personal details:

a- Name…….b- Gender…….c- Age…….

d- County……..Village…….

2- Marital status:

a- Married…….b- Single……c- Widowed…….

d- Divorced…….

3- Educational level:

a- Illiterate……..b- Primary……..c- Secondary…….

d- Others…….

4- Source of income:

a- Agriculture……..b- Livestock……c- Labor…….

d- Trading…… e- Others……..

5- What are the economic activities around Jalhak forest?

a- agriculture…….b- Fishing……c- livestock……

d- Grazing…….e- Beekeeping…….f- Labor……

g- Trading in forest products…….h- Other (specific)……..

6- Where you practice agriculture around Jalhak forest?

a- Inside the forest……..b- Outside the forest……

7- What are the types of Livestock you own in the area?

A-Cattles…….b-Sheep's……c- Goats…….d- Others…….

8-What are the sources of fodder for your livestock?

a- Forests……..b- Agriculture residues……c- Sold from the market…….

d- Others (specific)…….

9- What are the types of products you gained from Jalhak forest?

a- Firewood……b- Charcoal…….c- Sawn timber…….

d- Building materials……..e- Others (specific)…….

10- How do you extract forest products in the area?

a- Free access……b- through license……c- Cheating……

d- Others (specific)……..

11- Are these products sufficient to meet your needs and interests?

a- yes……b- No……

12- Mention the positive economic behaviors of people around Jalhak forest?

a- Legal and rational logging and cutting of trees…….

b- Legal and rational grazing…….

13- Mention the negative behavior of people around Jalhak forest?

a- Illegal logging and cutting of trees…….

b- Overgrazing……..

c- Agricultural expansion on forest land……..

d- Using the large amount of wood for smoking fish……..

e- Shifting Cultivation……

f- Others (specific)…….

14- Mention the positive social behaviors of people around Jalhak forest?

a- Supporting social services such as Clinks, Mosques and Churches……..

b- Generating of additional income forest products…….

c- Shifting cultivation practices restricts intensity of land use and reducing the rate of environmental degradation…….

D-Creation of job opportunities for local people……. … e- the role of forest in decreasing poverty……..

f- Social felling of some species through traditions and beliefs and taboos…….

g- Others (specify)…….

15- Mention the negative social behaviors of people around Jalhak forest?

a- Removal of some trees because they attract birds, pests and rodents……..

b- Removal of some trees due to some beliefs, traditions and taboos…….

c- Over exploitation of some trees due to social using by women such as smoking(Dokhan) or other uses……..

d- Over exploitation of some tree to avoid pests attack (smoking)……

e- Others (specify)……

16- What are the direct benefits you gained from Jalhak forest?

a- Grazing……..b- Fuel wood…….

c- Fodder……

d- Building materials……..e- Seeds……f- Others (specific)……

17- What are the indirect benefits you gained from Jalhak forest?

a- watershed protection……..

b- Improvement of crop production……..

c- Income generation……

d- Job opportunities……

e- Recreation……..

f- Conservation……

g- Gum…….

h- Others (specify)……

18- Do you willing to grow trees in your home?

a- Yes…….b- No……

19- If the answer is yes, what are the species you prefer?

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20- Is there any community forest near your village?

a- Yes……b- No…….

20.1 If the answer is yes, what are the types of trees you prefer?

……

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22 What are your perceptions of Jalhak forest regarding forest resources, forest laws and policy and forest administration?

- Forest resources are important?.....

- Forest policy and law is effective?.....

- Forest administration is good?.....

23- Is there any extensional services in the area?

a- yes …….b- No……

23.1 If the answer is yes, specify the types of the extensional methods and tools used in the study area?

……

……

……

24- What are the constraints that confronting Jalhak forest?

……

……

……

25- What is your suggestion to improve Jalhak forest management?

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APPENDIX (2)

The CHECKLIST

Title: The Influence of Some Socio-economic Factors on Forest Degradation in Jalhak Forest Reserved in South Sudan

This checklist has been designed to collect information concerning the influence of some socio-economic aspects on forest depletion in Jalhak forest reserved in South Sudan (Officials & semi-officials).

The information will be utilized in the research thesis for the degree of Ph.D. Sudan University of Science and Technology. So those of direct or indirect relationship and co-operation of the officials & semi-officials. Please answer the following questionnaire as accurately. Where actual data are not available, please use your own estimation, your answers will be strictly confidential and will not be used for any purpose other than research.

1- Personal details:

a- name…….b- Gender……..c- age……..

b- County…….d-Village……

2- Marital status:

a- Married…….b- single……

c- Widowed……d- Divorced…….

3- Educational level:

a-Illiterate…….b-Primary…….c-Secondary…….

d- Other……..

4- What are the economic activities around Jalhak forest?

a- agriculture…….b- Fishing……..

c- Livestock……d- Grazing…….

e- Bee keeping…….f- Labor……..

g- Forest products trading……

5- Are the rural people practice agriculture around or inside the Jalhak forest?

…….

…….

6- Mention the positive economic behaviors of people around Jalhak forest?

……

……

7- Mention the positive social behaviors of people around Jalhak forest?

a- supporting social services such as schools, Clinks, Mosques and Churches…….

b- Shifting cultivation practice restricts is intensity of land use and reducing the rate of environmental degradation……

c- Generation of additional income from forest products……

d- Certain of job opportunities for local people…….

e- Social felling of some species through traditions and beliefs and taboos……

8- Mention the negative social behaviors of people around Jalhak forest?

a- Remove of trees because they attract birds, pests……

b- Removal of some trees due to some beliefs, radiations and taboos……

9- What are the indirect benefits you gained from Jalhak forest?

a- Watershed production…….

b- Important of crop production……..

c- Wind reduction…….

d- Income generation…….

e- Job opportunities ……

f- Gum …….

g- Others (specify)……

10- Is there any extensional services in the area?

a- Yes……..b- No…….

11- If there answer is yes, specify the types of the extension methods and tools used in the area?

……

12- What are the constraints that confronting Jalhak forest?

…….

13- What is your suggestion to improve Jalhak forest management?

……

……

List of Common Trees:

Acacia nilotica

Acacia senegal

Acacia seyal

Adansonia digitata

Afzelia africana

Alibiza lebbek

Balanites aegyptica

Boocerus euryycerus

Borassus aethoipum

Bridellia scleroneueseta

Cassia acutifolia

Celtis zenkri

Chryopbllum albidum

Daniellia oliveri

Doocerllia eurycerus

Eucalyptus spp

Holoptelea grandis

Holoptelea grands

Hyphaen thepacia

Isoberlina doka

Juniperus procure

Khaya senegalensis

Midbraedendron excels

Podocarpus milanjianus

Prosopsis africana

Zizphus spinavharsti