

Public Private Partnership (PPP) in Forest Sector in Eastern Africa. Synthesis of Primary and Secondary Production Actors, and Trade

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Abstract

Kenya Forestry Research Institute (KEFRI) and partners with support from African Forest Forum undertook a study 2016 to evaluate the potential roles of the private sector in development of primary and secondary forest production in 10 countries in Eastern Africa. The main objective of the study was to provide information to support the emergence of organized private sector for sustainable forest management and enhanced livelihoods. The study involved literature reviews and some rapid reconnaissance surveys in key areas to facilitate updating of information and data especially in areas where gaps existed. Results indicate that primary forest production in Eastern Africa takes place in public natural forests, plantations, farm forests, community forests and private forests. These forests are facing heavy pressure from anthropogenic processes mostly conversion to agriculture, overgrazing, settlements and roundwood extractions. The indigenous forests and woodlands are the most extensive and produce wide range of products for various uses including timber and woodfuel among others. The public sector dominates ownership of indigenous forests and plantations forests whereas woodlands are owned largely by communities. In the last two decades private investors are entered into plantation forest sector with profit oriented motives, mostly in Uganda and Tanzania through issuance of leaseholds and permits. In the mix are private agricultural based enterprises such as tea estates, farmers, investment syndicates, social entrepreneurs and other entities that have also invested in plantation forests largely driven by the high demand for forest products and good returns to investment. Except for farm and private forests other types of forests are declining in either coverage and quality or both. Key plantation species include Eucalyptus, Pinus, *Cupressus lusitanica*, *Tectonia grandis* and *Gmelina arborea* among others. In the drier ecosystems are dominated by *Acacias*, *Balanites*, *commiphora*, *Anogiessus leiocarpus*, *Albizia amara*, and *Acacia senegal*. The wood based industries include saw mills, reconstituted wood, furniture making, transmission pole treatment plants, wood carving and charcoal production. Processing and value adding industries produce a wide range of such as sawnwood, fibre boards, particle boards, plywood, furniture, biomass energy, fuel pellets, handicrafts and wooden poles among others. The non-timber products produced in the region include myrrh, baobab fruits, tannins, tamarinds, Aloes, shea butter, plant tannins, medicinal plant parts, and gum arabic among others. The public forest resources in the region are managed by lead public forest such as Kenya Forest Service (KFS) in Kenya, Forest National Corporation (FNC) in Sudan, and Tanzania Forest Service (TFS) in Tanzania, National Forest Authority (NFA) and Rwanda National Natural Resources Authority (RNNRA) in Rwanda. The public agencies are mandate on management, protection regulation and facilitation of private and individual forest owners. The technical and management organization in primary production include individual farmers, tree growers associations, (TGAs), community groups, investment syndicates, companies, and wood based industries. Technical and commercial organizations in secondary forest production include saw millers, furniture and wood manufacturers associations. The countries have enacted policies and legislations that have good provisions that support various private sector investors in establishment of commercial plantations and wood based manufacturing industries. Most countries in the region are not self-sufficient in various forest products and have to import from outside the region mostly Asia and Europe. Therefore the region provides opportunities for private investors with desired financial capital and operational efficiency to enter into both primary and secondary forest production in order to enhance forest sector contribution to regions overall socio-economic development.

Keywords: Forest production, public private partnerships, technical and management organizations, trade in forest products.

1.0 Introduction

Forests in Eastern Africa in terms of ownership fall into four categories public forests, community forests, farm forests and private forests. These forests for various reasons are experiencing heavy pressure from various factors that include high extraction rates, agricultural expansion and illegal logging among others. The combined outcome

is loss of forest allied products and services through forest degradation and low productivity. Public sector forests are the main supplier of industrial and subsistence roundwood timber in most countries but currently face management and governance related challenges. To enhance overall forest production most countries have implemented policy and legal reforms to attract farmers, communities and private sector into primary forest production to enhance linkage to the already private sector dominated secondary processing and trade. The players targeted range from large corporate firms, communities and individuals including women and youth. The study was aimed at identifying and understanding the interactions between different players with diverse interests in forest resources, derived benefits and challenges in managing and accessing forest resources in selected countries in Eastern Africa. The promotion of private sector participation in the forestry is premised on the expectation that such development will significantly impacts on employment creation, income generation and poverty alleviation. The public private partnership (PPP) is an emerging investment approach that has become popular in large infrastructure projects with potentials in forest sector projects. The study focus was on identification and promotion of viable PPP models that are compatible with sustainable livelihood development and contribute to the country's socioeconomic development.

1.1 Background and justification of the study

The purpose of the study was to facilitate development of an organized private sector in forestry development through identification and promotion of promising PPPs approaches in the forest sector that is all-inclusive, sustainable and contribute to livelihoods including gender considerations.

1.2 Objectives of the Study

The main objective of the study was to provide information to support the emergence of organized private sector in forestry through promotion of promising (PPP) approaches for sustainable forest management and enhanced livelihoods including gender considerations in Eastern African countries of Kenya, Uganda, Rwanda, and Sudan and Tanzania.

1.3 Study methods

The study involved literature reviews of past works from various sources and some rapid reconnaissance surveys in key areas of the selected countries to facilitate updating of information and data especially in areas where gaps existed. The current paper relied on national reports from each of the participating countries.

1.4 Data analysis

The data and information were extracted from the national reports that were organized and those relevant to the synthesis were picked and used in various sections of the report. The key areas selected were the status and dynamics of primary and secondary forestry production, key investment areas, policies and legislations on public private sector partnerships, contribution of forest sector to economic growth and livelihoods and potential models of PPPs with promising future in the region.

2.0 Study Results

2.1 Actors in Forest Production

2.1.1 Actors in Primary Forest Production

The actors in primary forest production in the region range from individual producers, corporate producers and institutional producers. Smallholders produce operate mostly within an agricultural landscapes and constitute the largest primary forest producers that undertake different forms and scales of tree growing activities such as hedge trees, woodlots and agroforestry practices to produce sawlogs, poles and woodfuel materials. The smallholder sector challenges include land, labour, capital, and technical knowledge. Due to these challenges most of the smallholder production is dominated by subsistence purposes but have diversified into short rotation commercial pole and sawlog production within the last 10 years being attracted by high demand and good prices. The public agencies include government institutions mandated with managing the public forest estates and wildlife resources. These agencies are National Forest Authority (NFA) in Uganda, Kenya Forest Services (KFS) in Kenya, Tanzania Forest Services (TFS) in Tanzania, National Forest Corporation (NFC) in Sudan and Rwanda National Resources Authority (for forests) and Rwanda Development Board (for wildlife and protected areas) in Rwanda. The public forest agencies are mandated with the management of national forest reserves designated for production forests for the sustainable supply of forest products, nature reserves and other protected forests areas for biodiversity and water provisioning. The public agencies in many cases due various challenges such as inadequate funding, inadequate staffing and governance related issues have not been able to manage forests efficient for optimally production.

The private sector players include agricultural based enterprises such the tea estates that have diversified to tree growing for firewood production for curing tea and sawnwood for packaging tea with surplus being sold in

local markets. Tea estates are dominant in tea growing areas in Kenya, Uganda, Rwanda and Tanzania. Other commercial tree growers include investment syndicates, companies and social entrepreneurs that have leased land from the government in Uganda and communities Tanzania. In Kenya they have entered into contracts agreement with farmers and local authorities to grow tree on sharing agreements or outright lease of the land for commercial tree growing for specified rotation period. The actors include New Forests Company, Green Resources, Global Woods, Better Globe Forestry and KOMAZA among others that have established plantations in hundreds of hectares mostly in Kenya, Uganda and Tanzania.

2.2 Forest Resources in Eastern Africa

2.2.1 Forest cover in Eastern Africa

In the region the main forest cover types are natural forests, woodlands and bushlands, and plantations and farms forests. The dominant forest cover types are woodlands and bushlands mostly located in the fragile dryland ecological zones of Sudan, Tanzania, Kenya and Uganda (Table1). The dryland forests also host pastoral communities that are changing to marginal agricultural activities. These forests product diverse products such as poles, firewood, charcoal non timber forest products (NTFPs), among others. The natural forest reserves are mostly owned by national governments and are some of the most biologically diverse and sometimes endemic and endangered species of flora and fauna. These forests are facing anthropogenic pressures from human needs that have led to fragmentation and overexploitation. Therefore natural forests are likely to decrease in both land area and species diversity into the future. To counter such a process, many forest agencies have brought on board local communities and other interested parties into various forest co-management arrangements for enhanced livelihoods and long term sustainable management of forest resources in the region.

Farm forests are mostly trees grown within agricultural landscapes and constitute the largest primary forest producers practicing sustainable forest management in the region. Farm forests production objectives differ depending on scale and intensity with smallholder forests being subsistence in nature and medium more focused on commercial planting. The planting patterns also vary from hedge trees, woodlots and agroforestry practices to woodlots to produce sawlogs, poles and woodfuel materials. The farm forest sector challenges include inadequate land, capital, and technical knowledge hence dominance of subsistence purposes. However, the sector in the last 10 years has diversified into short rotation commercial pole and sawlog production attracted by high demand and good prices.

The plantation forests form the smallest forest category that has been undergoing rapid expansion in the region for the last few decades. The forest plantation sector has been dominated by the public sector agencies in the past but due to governance and resource scarcity facing the exchequer has led to inadequate management that has lowered productivity and quality. The reduced production from public plantation has created timber deficits that have translated into high timber prices that have attracted private sector players. The private players include tea estates, companies, syndicated investors, social entrepreneurs and small and large scale farmers. The private investors have employed various strategies that range from leasing land from government and private land owners to out grower profit sharing mechanisms. The forest sector players have established vast forest plantations in Kenya, Uganda and Tanzania has grown faster than public sector plantations within the last decade. The private sector investors deploy greater utilization models that include integrated utilization processing and value addition to minimize wastage in order to improve their operating profit margins.

The Public forest agencies in the region lack sufficient resources to adequately manage both natural and plantation forests and hence provide opportunities for some forms of public private partnerships to pool resources for sustainable management of forest resources. In Tanzania and Uganda private investors have established large swathes of commercial plantation forests that thrive on leveraging on efficiency in land use, efficient technologies and high demand for forest products. In Kenya private sector players are gearing for the potential opening up forestland concessions under PPP process. The ranges of public forest investors include churches, schools, communities and state agencies such as prison, universities and wildlife services.

Table 1: Forest cover by types in Eastern Africa

Country	Woodlands (Ha)	Natural forests (Ha)	Plantation forests (Ha)	Farm forests (Ha)	Private forests (Ha)
Kenya	26,560,000	1,220,000	107,000	10,385,000	90,000
Rwanda	240,000	125,000	74,644	-	11,737
Uganda	3,604,174	2,420,000	33,527	8,401,000	30,000
Sudan	11,731,000	1,345,000	6,121,000	-	6,332,000
Tanzania	48,702,000	250,000	554,500	20,000,000	44,220

NB: (-) in where no information was provided.

2.2.2 Plantation species preference

The countries in the region grow a wide range of exotic and indigenous species for both subsistence and commercial purposes. The species siting and mixes depend on many factors such as ecological attributes, land use

history, land owners objectives among other factors. The Eastern African region have diverse climate condition ranging from highlands to lowlands drylands where a variety of exotic and indigenous can be grown. Kenya has the widest range of species namely *Grevillea robusta*, *Eucalyptus grandis*, *E. saligna*, *E. camaldulensis*, *E. tereticornis*, various Eucalyptus hybrids, *Casuarina equisetifolia*, *Pinus patula*, *Cupressus lusitanica*, *Acacia mearnsii* among hundreds of minor species of both indigenous and exotic species depending on the climatic and utility preferences among others values by both public and private investors. In Uganda public and private commercial plantations are dominated by two exotic species for sawlogs, plywood and pole production purposes namely *Pinus caribaea* and *Eucalyptus grandis* but scattered pockets of *Pinus patula*, *P. oocarpa*, *Cupressus lusitanica*, *Araucaria spp.*, and *Asiatic Teak (Tectona grandis)* are also planted across the country. Some of the indigenous plantation species in the country include *Aningeria altissima*, *Antiaris toxicaria*, *Blighia unijugata*, *Maesopsis eminii*, *Markhamia lutea*, *Albizia coriaria* and *Milicia excelesia*. In Rwanda the dominant exotic genus is Eucalyptus the occupy 59% of planted species, others include *Pinus spp*, *Callitris*, **Acacia spp.**, *Cupressus* and *Grevillea spp.*, *Leucaena spp.*, *Calliandra calothyrsus*, *Alnus sp.* and *Sesbania sp.* In Tanzania the commercial plantation are dominated by pines species that include *Pinus patula*, *P. elliotii* and *P. caribaea*. Others include *Cupressus lusitanica* *E.Saligna* and *E. maidenii* and *Tectona grandis*. Miombo woodlands and high natural forests are key sources for hardwood timber for local consumption and exports the following being the most common in the order of abundance *Diplorhynchus condylocarpon*, *Combretum zeyheri*, *Brachystegia spiciformis*, *Combretum molle*, *Julbernardia globiflora*, *Brachystegia boehmii*, *Dichrostachys cinerea*, *Pseudolachnostylis maprouneiolia*, *Combretum sp*, *Grewia sp*, *Grewia bicolor*, *Commiphora Africana*, *Acacia sp*, *Commiphora sp*, *Markhamia obtusifolia*, *Uapaca kirkiana*, *Terminalia sericea*, *Brachystegia longifolia*, *Diplorhynchus mossambicensis* and *Dalbergia sp.* In Sudan the species managed for commercial production are mostly indigenous species mostly *Balanites aegyptiaca*, *Acacia seyal*, *Anogiessus leiocarpus*, *Albizia amara*, *Acacia Senegal*, *Acacia tortilis*, *Ziziphus spina-Christi*, *Khaya senegalensis*, *Acacia nilotica* and *Isobertina doka* in the order of importance. Some few pockets of *Pinus patula* and *Cupressus lusitanica* are located in high altitude forest reserves that are inaccessible due to insecurity. The rotational periods for planted trees range from 5 to 30 years depending on species, climatic conditions, end uses and market niche specifications. The shortest rotations observed are those for firewood and construction poles and the longest are for saw and peeler logs.

2.3 Forestry sector strength, Weaknesses, Opportunities and Threats

2.3.1 Strengths

Most of the countries in the region have put in place favourable policies and laws, have pool of qualified technical personnel; have diverse actors including government, development partners and private investors; and growing demand for diverse forest product driven by rising population and urbanisation. The ready markets for diverse forest products and reasonable returns are the main attraction to small and large scale private investors into forest sector in the region.

2.3.2 Weaknesses

There is a high rate of forest cover loss in public and community forests due to competition from other land uses such as agriculture and settlements. The public sector owned forests are poorly managed due to inadequate supervision and protection. The sector is also experiencing inadequacy of legal provisions and technical skills. In most countries issues related to governance such as lack of transparency and accountability, flouting of policies and laws, insufficient participation of key stakeholders in decision-making processes, and poor coordination between enforcement and management agencies has made levels of compliance with forest-related policies and laws generally low. The forest production sector is generally characterised by inadequate guidelines, standards, and regulations particularly for private forestry. Many countries have not enacted the desired regulations to operationalise existing legislations that has made it difficult to effectively enforce even the existing laws.

The private sector investors face several challenges that include inadequate information on markets, limited access to credit, finance, capital and technology; and shortage of business and technical skills. In some countries there is general scarcity of good quality planting material due failure to establish and maintain good tree seed sources that has led to importation of seeds at high costs and in some cases poor quality plantation lead to huge losses when materials are rejected by buyers.

The official records on contribution of forests to the GDPs has remained low making forestry less competitive as compared to other land uses or investments because valuation tools have not captured adequately the non-marketed services of forests.

Forest sector operational in general is largely an informal sector therefore determining size, product stock and products flows is difficult making information on the sector minimal to guide development of appropriate interventions and policy decision making to improve the sector.

Private sector investors in some cases have faced hostile reception from local communities who seek compensation and in some cases resort to arson thus driving away potential investors in plantation forests in community of national forest reserves.

2.3.3 Opportunities

There is a growing interest by the private sector on various forest based enterprises such as nursery operation, tree growing, processing and trade. Others include non-traditional products and services including ecotourism, carbon sequestration, water catchment services, and biodiversity products. Forest plantations for production of timber and poles offer attractive rates of return that compares very favourably with many other agricultural enterprises. There is also goodwill by governments and development partners to finance and provision of policy direction for forestry development. Some countries like Tanzania and Uganda has made available large tracts of land from the country's central forest reserves for leasing or concessions to private investors interested in development of forest plantations. The decision has been instrumental in attracting large of private investors' into turning around of degraded forests into productive use. The widening supply-demand gaps in many countries indicate that there will be ready market for timber, firewood and poles into the foreseeable future given increasing population and economy expansion at both national and regional levels. Kenya, Uganda, Rwanda and Tanzania are endowed with favourable climatic for fast growth of trees some attaining MAI of 75m³/ha/year making it global fastest achievements. The region have abundant skilled manpower trained in local premier forestry institutions at both diploma and degree levels that include Londiani Forestry college (Kenya), Nyabyeya Forestry College(Uganda), Lushoto Forestry College (Tanzania), Makerere University(Uganda), Sokoine University (Tanzania), University of Khartoum (Sudan) and Moi University (Kenya), among others.

2.3.4 Threats

The combination of population and economic growth do exert undue pressure on natural forest resources due to increased demands for its various products as wood fuel, construction materials, ecotourism and water provisioning that is likely to further degrade them. The widespread believe that forests reserves are potential areas for settlements and infrastructural development is still widely held by many people in the region. Some of the outcomes of the perception are legal and illegal conservation of forests agricultural land through cultivation, grazing and permanent settlements or dam construction or road bypasses or schools. Land and natural resources are some of the goodies that are often offered for political and economic reasons lend itself to various political interference and influence peddling and sophisticated networks that continue to extract various products from forests within the eye of powerless government agencies and communities adjacent to the forests. The long term nature of forest enterprises make financial institutions give a wide berth consequently mobilizing financial resources for investment in forest enterprises remain a challenge to many potential investors. Tree plantations are subjected to a number of social risks such as arson, and deliberate vandalism in situations where there are conflicts over land ownership and use.

Some agricultural policies such as subsidies on fuel and fertilizer and high prices to boast agricultural production leads to fast rate of conversion of forestlands to agricultural enterprises. Plantation monocultures tend to be more vulnerable to pest and disease attack and can frustrate the tremendous efforts and resources that have gone into establishment of commercial forest plantations in the region. The number of tree pest and diseases and rate of spread in some cases has been worrying because in some cases little is known on distribution, host range, population variability and magnitude, making it problematic to effectively control them. The region have not put in place structures to enhance traceability and transparent mechanism such as chains of custody hence cannot access international markets that require certified products.

2.3 Primary Production

The countries in the region produced various products from the local forests that included saw logs/peeler logs, various types of poles, charcoal and firewood. In terms forest ownership Tanzania lead with over 48 million hectares, Kenya (38,412,000), Sudan (18,197,000), Uganda (3,604,174) and Rwanda the least with only 240,746 hectares in the order (Table 2). The countries in the region still rely on firewood and their consumption estimates correlated with the available forest resources and population size for each country. Public and community forests provided the bulk of the stocks used for production of charcoal and firewood. Similarly, the available stocks for saw and peeler logs were mostly sourced from public plantation forests but private are the new frontiers to fill the shortfall in timber supplies in the regional demand centres. The private sector investors include leading wood based companies, syndicated private investors and large scale farmers that were attracted by lucrative business in trees based enterprises. In Eastern Africa private investors have invested in fast growing short rotation species mixes for various purposes have grown faster than public sector plantations especially in Tanzania and Uganda. The productivity of plantation forests highest in Kenya at 385m³/ha as compared to the rest of the countries in the region. The plantation stock levels that supply industrial roundwood indicate that Kenya and Uganda lead the rest. The study revealed that the private sector investors deployed integrated utilization processing and value addition to minimize wastage and improve their operating profit margins. In Kenya the private sector business model is largely a diversification strategy from core agricultural based business into profitable forest enterprises that takes both vertical and horizontal integration dimensions depending on the core business of the investors. In some countries like Kenya, large wood based companies been purchasing land for tree growing but shortage of land and

high prices caused by severe competition from agricultural enterprises and settlements. In Uganda and Tanzania the private have been able to lease land from public and community forest reserves to establish commercial plantation for own use and surplus for release to the local and export markets. In Sudan the cooperation between FNC and communities to jointly manage degraded forests on sharing is another model aimed at improving primary forest production. In Eastern Africa, the move to involve communities, individuals and private sector players in primary forest production is growing and likely to become a permanent feature that will leverage on efficiency in land use, efficient technologies and high demand for forest products to compete in local and regional timber markets.

Table 2: Forest size and primary productions for key products (m³/MT)

Country	Total Forests(Ha)	Productivity m ³ /ha	Sawlogs (m ³)	Poles (m ³)	Charcoal (m ³)	Firewood (m ³)
Kenya	38,412,000	385-503	7,363,414	3,0328,907	7,358,717	13,654,022
Rwanda	240,746	150-220	961,927	-	48,000	5,000,000
Uganda	3,604,174	68-290	3,250,000	1,531,000	16,684,000	38,858,000
Sudan	18,197,000	-	9,800	298,000	173,000	286,000
Tanzania	48,702,000	37.7-171	58,004	-	17,546939	51,000,000

NB: (-) in where it is non-existent or information not provided.

2.4 Secondary processing and manufacturing

Secondary processing and manufacturing of wood products involves transformation of roundwood into various products such as sawnwood, furniture and wooden interior fittings, paper and paperboards, plywoods, doors, carvings and windows. Except for saw milling, transmission pole treatment plants and industrial biomass energy production most woodwork activities are more of cottage industry than manufacturing (Table 5).

2.4.1 Sawmills

Sawmilling is the dominant forest industry in the region that is more developed in countries with vast plantations such as Tanzania, Kenya and Uganda. The sector is usually classified into three categories based on processing capacity into large, medium and small size-saw mills. However, in term of product lines sawmills are categorized into those which produce sawn timber (both treated and untreated), value added products and dry timber. Table 4 indicate that Kenya had the highest number of registered saw mills that number 633, Uganda (180) and Tanzania (520). Tanzania host the largest saw mills in the region with Sao Hill industries leading with capacity to produce 48,000m³ KVTC (45,000 m³) and TANWAT (20,000 m³). In Kenya the saw milling sector used employ about 300, 000 people in forest and wood processing operations, transportation and other supporting services. Similarly, in Tanzania and Uganda saw milling employ thousands people in logging, sawing and transport sectors. Kilombero Valley Teak company owns the largest teak-processing sawmill in the world (KVTC, 2015), which is integrated with a drying facility and processing plant. The range of products from saw mills include sawn timber, floorings, cornice, and panels. Most countries produced sawnwood for local markets except for Tanzania that realized surplus that was exported to Eastern and southern African countries. Saw mills deploy a wide range of machines from simple machines that include power saws and bench saws to gang or band saws and woodmizers. Large and medium scale saw mills deploy the most advanced technologies with high recoveries as compared to most small scale saw mills that are equipped with inefficient and wasteful technologies whose conversion efficiency ranges between 26-35%, thus about 70% of wood is wasted. Mobile power saw are the most inefficient with an estimated recovery rate of 25%.

2.4.2 Paper and Paper Products

Pan Africa Paper Mill (PPM) in Kenya is the largest in the region with installed capacity of 100,000MT of paper products and intake of 500,000 m³ of pulpwood and 250,000 m³ of firewood per year. The second mill is the Mufundi Paper Mill (MPM) in Tanzania with capacity of 46,000MT. The region depending on roundwood supply potential still have room for more industries to meet is growing need for paper and paper products. The region also have many small-scale paper manufacturing plants that utilize recycled paper and among other materials. In Kenya there were 13 paper products manufacturing mills that use recycled paper to produce various paper products key being Chandaria Industries located in Nairobi, and Highland Paper Mill located in Eldoret, and among others.

2.4.3 Reconstituted wood products

The reconstituted wood sector in the region is dominated by three Kenyan based industrial complexes the Rai Ply, Comply and Timsales that are involved in integrated wood processing consisting of saw milling, plywood and particle boards manufacturing. Other diversified products include chip boards, block board, hard boards, melamine, machined timber, furniture, flooring tiles, and MDF. The complexes have also expanded their operations into Tanzania, Uganda and Malawi. In Tanzania, Tanganyika Wattle Company (TANWAT) produces 40,000 pieces of plywood per year. In Uganda Nile Ply and few small sized plywood mills that utilize smallwoods are in operation mostly deploying inexpensive Chinese machinery and manual processing mostly for domestic markets.

2.4.4 Domestic and institutional firewood

Firewood is the leading forest product in terms of volumes consumed mostly for domestic and institutional (schools, hospitals) use that accounts for 94% or 34.3 million of roundwood extraction from forests and woodlands in Kenya. The countries in the region also heavily rely on firewood hence high consumption rates that will still grow even with promotion of cleaner energy sources due to cost and access to such alternatives.

2.4.5 Industrial firewood

In the regional key users of industrial firewood are textile, food and chemical processing industries and recently generation of electricity. Kenya reported a diversified industrial consumer that include tea sector that consist of 94 factories with annual intake of 1,592,000 m³ with an estimated value of USD 22 million. Tanzania and Uganda also have tea factory that use firewood in tea processing. Others industrial uses of firewood in the region include tobacco curing, textile and food industrial mostly in Kenya.

2.4.6 Production of charcoal

Charcoal production is the second largest consumer of roundwood in the region after firewood. Roundwood demand for charcoal production in Uganda, Sudan and Tanzania was estimated at 11 million, 49 million and 17.5 million m³ per year respectively. Kenya consumes an estimate of 16.5 million metric tonnes translating into 240,000 hectares per year. The charcoal production is dominated by small scale and irregular producers deep in the rural areas charcoal in the region is an important source of energy for cooking for most urban and rural households and highly traded commodity forest based commodity. Except in Kenya and Sudan where pockets of sustainable production of charcoal from *Acacia mearnsii* and various indigenous Acacias respectively most charcoal in the region are produced unsustainably from woodlands and bushlands of the ASALs. The charcoal production projection indicate progressive fall in supplies in major production areas in the region mostly attributed to decline in trees populations available from woodlands and farmlands. The forecast indicate that the charcoal market demand will remain unmade. Charcoal production in the region still remain a wasteful process with conversion efficiency of between 20% and 30% indicating over 70% of the wood materials are lost. The charcoal production and marketing is big business that employs thousands of people and generate high incomes to key players in the market value chain in Uganda, Sudan and Tanzania. In Kenya annual charcoal demand is estimated that 2.4 million and 2.3 million metric tonnes of charcoal being traded annually. The sector in Kenya is reported to earn USD 530 million per year and support directly 200,000 producers and indirectly 700,000 persons employed in the market value chains with an estimated 2 million dependents (Wamugunda, 2014; Cheboiwo and Mugo, 2012; ESDA, 2005). In Tanzania the annual charcoal demand is estimated 3.3 million tonnes valued of charcoal consumed is estimated at US\$500 million (Sawe, 2009).

2.4.7 Wood carving

Traditional wood carving has been an integral form of artistic expression and use among the communities in Eastern Africa especially among the Makonde and Zaramo of Tanzania and Kamba in Kenya. Kenya has the most established wood carving industry in the region that revolves around key production sites mostly Wamunyu in Machakos County and Ukamba Wood Carving Cooperative Society (UWCCS) in Mombasa Town. The wood carvers prefer specific tree species mostly indigenous species for carving such as *Dalbergia melanoxylon*, *Terminalia brownie*, *Azalia quanzenis*, *Jacaranda mimosifolia* and *Combretum schumannii*. The sector in Kenya is estimated to employ about 60,000 people with an estimated export value of US\$20 million (Choge, 2002; Cunningham et al, 2007). The major market destination for Kenyan wood carvings is mostly the U.S., United Kingdom (U.K.), Sweden and Norway. Currently, the wood carving sector is facing several challenges that include shortage of quality wood, ban on harvesting in natural forests, green consumerisms in western countries, and competition from other countries that has seen production and its export markets shrink by 75% (Hamilton, 1996) that may likely have worsened into the future.

2.4.8 Construction poles

In the region construction poles are used in a variety of activities such as low cost construction works such as scaffolding in high-rise buildings and construction of mud houses and kiosks. Construction poles also form the bulk of the materials used in expanding slum areas in major towns. Construction poles are bulky and low value end products that tend to be supplied from adjacent areas to consumption centres. Construction poles are mostly produced from farms from various species such as Eucalyptus, Pines, Cypress and many indigenous species. In the coastal region of Kenya *Casuarina equisetifolia* poles are in high demanded for construction and renovation of *makuti* buildings popular with tourists. The demand for poles has been on the increase due to vibrant construction activities taking place in many towns that require poles for scaffolding and props. In Kenya the annual supply of poles is estimated at 3,028,907m³ (MEWNR, 2013).

2.4.9 Transmission poles

The use of wooden poles to transmit power and telecommunication has long history that has supported growing and processing transmission mostly in Kenya, Uganda and Tanzania. The sector has witnessed fast growth in the land decade with expanded power generation and distribution. For example in Kenya, 2004 there were only 2 treatment plants in the country capable of processing 160,000 power transmission poles per year that grew to 55

by 2015 with capacity to process 2 million poles per year (Cheboiwo, 2016). The wooden transmission poles sector is valued at USD 64 million (KES 6.4 billion) spread across tree growers, logging, treatment plants and transportation. However, the utilization capacity has remained low due massive expansion of processing capacity that has created severe competition and stagnant national demand capacity of 600,000 pieces per year. Others include unpredictability of tendering process of key Kenya Power and (KPLC) and Rural Electrification Authority (REA) that make it difficult for manufacturing plants to synchronize acquisition of semi-processed poles and import of treatment chemicals from overseas suppliers. Similarly the sector has grown from one each Uganda and Tanzania in 1999 to 5 and 12 by 2016 with production capacity of 475,000 and 520,000 respectively mostly for domestic use and surplus for export to Kenya.

2.4.9 Furniture and joinery

Furniture and joinery are some of the most vibrant enterprises owing to the fast growing construction sector and increasing urban population as well as improved affluence linked to growth of the economy. The sector is characterized by hundreds of micro, small- scale units and few medium scale units located in rural and urban areas as formal and informal businesses. The furniture making is a labour-intensive, low-startup costs and it can be operated both in rural and urban areas (Indufor 2011). The less stringent and enabling characteristics of the industry make it a potential employer of most youths who leave primary and secondary schools and that find themselves jobless thereafter. Softwood and hardwood timber are commonly used mostly sourced from Cypress, pines, Eucalyptus and Mahogany. Due to shortage and high cost of premium timber some furniture makers have resorted low cost and poor quality timber sourced from mango (*Mangifera indica*), Eucalyptus, *Grevillae robusta* and even Avacado (*Persea americana*) that were never used for furniture in past, are now common in the market. In Kenya furniture and joinery is report to rely on hard work and ingenious use of resources to survive and is estimated to consume 262442 m³ of timber per year with coffins taking up 184,800m³ (Githiomi, 2010). The sector supports about 160,000 people in the forestry and manufacturing sectors of the economy. The sector is highly diversified with different types of machines in use ranging from imported to locally fabricated wood lathe, bench/handsaws and clamps among other tools and equipment. The sector supplies the needs of the local people and limited exports. In Kenya the furniture businesses are concentrated in Jogoo Road, Ngong Road and Industrial Area. In Tanzania furniture business are organized in clusters within Dar es Salaam such Keko, Manzese, Kinondoni-Biafra and Kinondoni Moroko. These clusters engage between 10 people in Manzese to close to 1000 in Keko. In these clusters, some work as producers of furniture while others are sellers or brokers of furniture. The product lines are so diverse. They include home and office furniture, parts of furniture and of recent is the upcoming, metal furniture. In Uganda NAFA (2009) report indicate that there are many groups of individuals involved in furniture and joinery with clusters in Ndeeba and Bwaise in Kampala city. This section of the industry plays a critical role of supplying low-cost furniture products while providing employment opportunities to marginalised groups, particularly youths and women. There is however a number of medium sized firms employing relatively advanced technology to produce high-class furniture. These include Hwang Sung Furniture Company, Elimu Furniture Company, Lotus Arts, Kaava Furniture Company, and Master Wood Furniture Company (Kizito, 2009). The annual furniture sales in Kenya is estimated at US\$496 million with an estimated annual growth rate of 10% and import and export values of USD 66 million and 22 million respectively (World Banks, 2014). The same study estimates that the East African furniture market is valued at US\$1.2 billion whereas the regional trade is worth paltry US\$298 million per year. Therefore the sector needs urgent reforms to address quantity and quality material supplies, appropriate technologies, skilled manpower and incentives to attract investments.

2.4.10 Non-Timber Forest Products (NTFPs)

The region due to diversity of forest resources and ecological ranges produce a wide range of non-wood forest rattan & bamboo, aromatic oils, bee products, herbal medicine, wild coffee, mushrooms, wild fruits, gums, tannins, Prunus bark and resins. These products are harvested and processed by small-scale harvesters and offers opportunities for improving livelihoods for rural communities living close to forest resources. NTFPs are easily accessible, require little capital investment for collection, processing and marketing, while their production is relatively less destructive compared to timber. In the dryland woodlands some of the key NTFPs include myrrh, baobab fruits, tamarinds, Aloes and shea butter. Generally, major actors in NTFP extraction are the communities living around forests who harvest the products individually or as a community depending on local arrangements. In Kenya Prunus bark annual bark export potential is estimated at USD 17 million and gum arabic exports from Sudan and Kenya is estimated at 30,781 MT and 3,000MT valued at USD 454 million and 14 million respectively. The beekeeping sub-sector is another potential employer. In Tanzania the sector generates about US\$ 19 million per annum and employs some 2 million people but holds greater potential given that the country has only exploited 3.5% of its production potential (MNRT, 2001). Tannin production from *Acacia mearnsii* is another important activity that supports 3 factories in Kenya and 2 in Tanzania with estimated annual outputs of 46 MT and 2810 MT respectively. The tannin production in Kenya fell from 25,000 MT in 1998 to 5340 MT by 2003 and paltry 46MT by 2015 despite the growing demand from vibrant leather industry demand estimated at 10,000MT. The country imports bulk of it tannin from Tanzania.

2.5 Organization and linkage among actors

In general the forest sectors actors are largely disaggregated with limited vertical and horizontal integration except for some few corporate players in the primary sector that have pursued a strategy of vertical integration. Most of the primary associations are at infancy stages still being supported by government and bilateral agencies. The main objectives of such associations are to influence policy and legislation, support members in technical issues, marketing and sharing experiences amongst members. However, most actors in the forest production sector operate on an individual basis and do not belong to trade associations. Some actors are engaged in informal networks and contractual arrangements. In Sudan the Gum Producers Association is an umbrella association representing over 1344 with 99096 members managing forest estimated at over 6 million hectares in the largest producer group in the region.

In Kenya two apex tree growers associations Farm Forestry Smallholder Producers Association of Kenya (FF-SPAK) for smallholder and Kenya Forest Growers Association (KEFGA) large scale tree growers. KEFGA is better organized with well-structured national office bearers and its members pay registration and annual subscription fees based on forest woodlots size. Charcoal Producers Associations (CPAs) another umbrella body that brings together charcoal producers that is the outcome of the subsidiary legislation the Charcoal Rules 2009 to promote sustainable charcoal production in the country. Timber Manufacturers Association (TMA) formed in 1981 is another umbrella group that represent the interests of saw millers countrywide. Kenya Wood Preservers Association (KWPA) is a membership organization that draws members from wood treatment plant owners and suppliers of treatment chemicals whose objective is to promote the preservation of wood in the country to international standards for longevity in use, convenient to use and attractive to customers. The KFS under Forest Act 2005 has entered into participatory Forest Management (PFM) agreements with registered 97 Community Forest Association (CFAs) countrywide to manage 1,000,000 hectares but sharing of benefits remain a contentious issue.

In Uganda, the Uganda Forestry Working Group (UFWG) is a network of CSOs, academic and research institutions with the mission of promoting the development of the forestry sector and stimulating forestry stakeholders to respond to sector changes and challenges. Uganda Timber Growers Association (UTGA) formed in 2006 is comprised of individuals and firms engaged in development of industrial in the country. The association was formed in 2006 and now boasts of wide membership including small, medium and big planters across Uganda. Tanzania has the widest range of organized players in the primary forest production that include Federation of Small-Medium Forest producers (SHVIMITA), Sao Hill Forest Industries Association (SAFIA), Northern Forest Industries Association (NOFIA) and Tanzania Private Sector Development whose members range from individual investors in forestry sector to large, medium and small scale companies. The forest based companies include Mufundi Paper Mills (MPM, Fibre Bard Africa Ltd (FAL), Tanganyika Wattle Company (TANWAT), New Forest Company (NFC), Kilombero Valley Teak Company (KVTC) and Saohill Industries Ltd(SHI). Smallholder tree growers associations include 150 tree growers associations (TGAs) most still at formation stages with the supported of the Private Forestry Proqramme (PFP). KVTC supports tree out-grower schemes through supply of quality seedlings, fertilizer and purchase of logs. In the furniture sector apex body is the Tanzania Wood Working Federation that represents all wood furniture makes more active in Dar es Salaam with minimal presence in the regions. In the wood carving sector the Makonde Handicrafts in Dar es Salaam represent wood artisans and handcart sellers in Mwenge and Kinodoni district of Dar es Salaam with smaller groups in Lindi, Mtawara, Morogoro and Ruvuma. The collaboration between community and government under joint forest management (JFM) and participatory forest management (PFM) is one of the largest in the region covering 1,052 villages and covers forest area of 5,392,095 hectares. Under JFM and PFM communities the government and communities under Forest Act 2002 enter into agreement to co-manage specified forests. Except for GAPAs other linkages within the forestry sector is weak especially NFC, forestry education institutions and forest research institutions. Every time a memorandum was signed between these institutions nothing such cooperation still remains weak. It is proposed that such critical linkages should be mandatory and supported legislations but not left to the whims of individual employees of the institutions.

2.6 Gender and forest production

The study acknowledges the fact that men, women and youth have different gender-based responsibilities, needs and priorities, as well as knowledge of, access to and control over the local environment and forests in particular. In Sudan women are involved in gathering of food, fuelwood, fodder, medicinal plants and raw materials for small industries. Men are generally engaged in large scale firewood collection and charcoal production mostly for sale. In general, women are excluded from decision and policy-making process at local and community levels. However, at professional level, we have seen the proportion of women among professional foresters in FNC and its provincial administrations is reasonably high and they take active role in decision making.

In Kenya, traditional customs and conventional policies and legislations guide gender related land control and access to forest resources on day today basis. Therefore participation of women in forestry cannot be complete

without reference to prevailing land tenure systems, and women's rights to access, use and ownership of land. Although existing policies and legislations are not primarily discriminatory with regards to women owning land but World Bank Report (2007) shows women owned only 1.5% of all titled land in the country that attests to the property relationship between men and women mostly shaped by traditional customs and marital arrangements despite the fact that 30.9% of households in the country are female-headed (CBS, 2006). In most cases land asset ownership in rural areas is transferred through males in the family tree. Therefore Women currently face natural resource and asset vulnerabilities because their access rights are still dominantly related to kinship and marital relationships. However, women participation in employment opportunities in primary and secondary production are only limited by few factors such as time available outside family commitment and strenuous menial challenging jobs such as logging and heavy machine operations. However, women dominate in some key primary production activities such tree nurseries and forest products market value chain such wholesaling and retailing in both urban and rural areas of such products as firewood, charcoal and NTFPs related SMEs.

In Uganda the Land Act (1998) provides for non-discrimination against women but gender disparities in land ownership persists as only 7% of the land in Uganda owned by women (Mukasa *et al.*, 2012). This is because most land in Uganda is acquired through inheritance, which favours men over women. In addition under most land tenure systems, women's rights to land are largely limited to usufruct rights. This is a barrier to women's participation in production forestry since most of them do not own land and have to first seek for consent from their spouses if they want to plant/sell trees. Women's limited control over productive resources also affects their access to credit facilities that are crucial for investment in tree planting. It is generally believed that forestry is a male domain because men do most of the work in tree planting activities in terms of clearing land, acquiring seedlings, planting, weeding and management. However, despite beliefs that women lack physical strength and courage required for most non-managerial forestry jobs, women constitute a significant proportion of the work force in the forestry sector (Mukasa *et al.*, 2012).

In Rwanda, forests resources decrease often severely increases women's labor, especially with regard to the time required to gather firewood and the cost of purchasing it hence negatively impacting household nutrition. The country policies and legislations promote equality of men and women in all socioeconomic activities including forestry. Despite the equality a study NISR showed that there is inequality of gender participating in agriculture, fishing and forestry, where male represent about 82% compared to women (61%).

The Tanzanian report point gender inequalities in forest products use that show that men are more dominant in production of charcoal and bee products while women dominate firewood collection (MNRT, 2014). In forest-related institutions female employees are fewer than men especially at the managerial levels. The same id replicated enrolment in forestry training and higher learning institutions. However, in recent years, there has been a remarkable improvement in women enrolment particularly in higher learning institutions. For example in Tanzania, Sokoine University of Agriculture (SUA), female enrolment into BSc Forestry constituted 25%, 29% and 22% in 2013/2014, 2014/15 and 2015/2016 respectively compared to men and to 7% enrolment reported in 2013. In tree growing associations (TGAs) on average, women make about 35.7% while men take up the remaining 63.4% of all TGAs members (MNRT, 2011). However, women involvement in TGAs leadership which consists of a chairperson (0%), secretary (18%), and treasurer (82%) (Vainio-Mattila, 2011). Therefore the roles of gender in forestry evolve over time in response to changing circumstances, needs and interests and as forests grow, shrink, change and shift, so gender roles and relations also undergo constant renegotiation.

2.7 Policies and legislations in relation to PPPs in forest sector

Public Private Partnership (PPP) is an arrangement whereby the private entities invest, manage and assume service delivery in public sector property for a significant period of time and in return, receives benefits/financial remunerations according to agreed terms. PPPs are therefore a cooperative venture built on the expertise of each partner that best meets clearly defined public needs through the most appropriate allocation of resources, risks and rewards. Eastern Africa countries have enacted policies and legislations that support PPP implementation in the forest sector. However, the political, policy and legislative frameworks are more favourable to high cost infrastructure development such as petroleum pipelines, ports, roads, tourism, housing, railways and water and sanitation. However, the forest sector have put in place some policies and laws that relate to some variants of the PPP. In Kenya the supporting instruments include the multi-sectoral PPP policy 2013, PPP Act of 2013, National Forest Policy 2016 and Forest Conservation and Management Act 2016. The Forest Act 2016 sets out conditions for forest concessions and management agreements for private sector players and proposes development of subsidiary legislation to operationalize the concessions. The 6th principle of the Draft Forest Policy 2016 states that the government will encourage private sector participation in the establishment and management of forest plantations on public and community land through granting of concessions on a competitive basis. However, no such concession has taken place so far. In Tanzania the main PPPs type in the forest sector is investment in existing public assets that is well supported by the Forest Policy (1998) and the Forest Act (2002) through participatory Forest Management (PFM) and concession arrangements. In Uganda the PPP engagements are supported by

various instruments that include framework policy (2010), the Public Private Partnerships Act (2015) and guidelines on Public Private Partnerships for Local Governments. The Forest Policy (2001) emphasizes the important roles the private sector will in developing and managing commercial forestry plantations in the country. The key areas for PPP consideration include forest management and utilization. In general, most countries in the region have policies and legislation in place to support PPPs in the forest sector. However, the study confirmed that despite some countries having favourable policies and legislative framework to support PPPs all the countries studied had no forestland concession in operation due to lack of specific legislation on forest concession in place. However, land leases for plantation development are in place in Uganda and Tanzania.

2.8 Potential Forest PPPs sector

In Kenya, existing forest sector PPPs are more focussed on corporate social responsibility (CSR) activities such as provision of financial support for awareness creation and rehabilitation of degraded forests and putting up of electric fences to keep wild animals away from farms to reduce people and animal conflicts mostly in the country's key water towers. Some CSR initiatives include construction and maintenance of electric fences to protect Mount Kenya, Arabuko Sokoke forests in Kilifi and Eburu forest of East Mau Forest block. Some variants of PPPs include private sector support to rehabilitation of key water towers through putting up governance structures and mobilization of finances through innovative mechanisms such as the marathons [popular sport in the country. Key among them are Aberdare Forest ecosystem (Ndakaini Dam Marathon), Mau Forest Complex (Mau Forest Marathon) and Cherangany Hills (Cherangany Forest Marathon) the number is growing. The private sector players include telecom, insurance, financial, tourism, and banks country among others. The awareness campaigns have enhanced the visibility of key water towers to greater public and activities have enhanced forests conservation

In Sudan Forest National Corporation (FNC) has been working closely with farmers and local communities in rehabilitation of degraded forests. This is because it is unable to implement large scale forestry programmes due to inadequate human and financial resources. Some of the successful collaboration includes Wad Annial Shagat community forest reserve in Sinnar State that covers an estimated 67,000 ha where village communities are allowed to cultivate crops, graze their animals, tap and collect gum arabic from *Acacia senegal* trees. In Hawata area, 250 hectares has brought under community 20 year management plan where they are allowed to cut about 12.5 ha every year for sale to invest in village services such as construction of embankment to protect the village from river flood, schools and mosques. In Hawata area covers 615 ha mostly *Acacia seyal*, *Acacia mellifera*, *Acacia senegal* and *Acacia nilotica* jointly managed by a private investor in accordance to approved work plan with the technical advice from FNC regional staff. The owner is allowed to cut 25 ha per year. For sale as firewood, and conversion to charcoal and the revenue generated is shared with the regional forest office as royalties.

In Rwanda, the government is making efforts to build public-private partnerships to complement its efforts in forest protection and conservation, forest establishment and management, processing, value addition and trade with the aim of ensuring the long-term and sustainable supply of forest products and services. Presently, the private sector participation is biased to forest based industries, small scale processing, manufacturing and trade with limited participation in primary production. The National Forestry Strategy clearly emphasizes public private investment in forestry through 7 out of 14 principles that guide the implementation of the strategy. These principles include sustainable forest management (SFM), commercialization of forestry operation, stakeholder involvement and partnerships and private sector involvement in forest management and processing of forest products, leaving the public sector only the regulatory function, research and quality assurance.

In Uganda, some of the many variants of PPPs currently operating in the forestry sector include initiative between the Government of Uganda (GoU) and Forests Absorbing Carbon Emissions (FACE) that involve rehabilitation of 10,000 ha of degraded forest areas in Kibale and 25,000 ha in Mt Elgon National Parks. Another is the World Bank Biocarbon Fund and the Government of Uganda in conservation of the Rwoho CFR in Mbarara District in collaboration with local communities. The International Small Group and Tree Planting Programme (TIST) is a joint initiative of the Institute for Environmental Innovation (I4EI) and Clean Air Action Corporation (CAAC) that operate in three sites (Bushenyi, Kabale and Kanungu) to empower small groups of subsistence farmers to rehabilitated degraded forests and tree planting and sustainable agriculture. Under PFM framework several communities are engaged in a Collaborative Forest Management (CFM) arrangements with NFA to manage Central Forest Reserve (CFR) in which rights, responsibilities and returns for the communities include access to forest products such as firewood, medicinal extracts, herbs, ropes, building poles, vegetables, etc. CFM arrangement is being implemented in Budongo, Bugoma, Mabira, Echuya, Kasyoha-Kitomi, and Sango Bay forests. The Saw Log Production Grant Scheme (SPGS) is a joint initiative between the Government of Uganda (GoU) and EU that is involved in building capacity of private tree growers in commercial tree growing in CFRs. So far some 44,166 ha have been established to the required standards and extra 30 000ha are targeted. Tree growers are provided with technical knowledge and financial assistance (rebates) that are critical to the success of plantation development. Another variant of PPP being implemented by NFA and private sector players, in line with policy statement 3 and 5 of the Uganda to lease parts of the central forest reserves for private plantation

development under fast maturing species particularly Pine and Eucalyptus.

In Tanzania, PFM and joint forest management (JFM) is anchored in the Forest Act of 2002, which provides a clear legal basis for communities, groups or individuals across mainland Tanzania to own, manage or co-manage forests under a wide range of conditions. The co-management of forests between government and communities is not popular most communities because of lack of clear-cut cost-benefit sharing mechanism between the parties. The principle of fair, social inclusion community welfare and arrangements are not provided for in the law (Simula and Kaduvage, 2005) but some of them that hold good potential include: JFM between central government and TGAs. TGAs are new but upcoming players in the forest sector; JFM between village governments and TGAs or between Community groups and TGAs and out-grower arrangements between tree farmers or TGAs, and wood based companies. The leasehold agreement between community groups and private companies are the most successful PPP variants in Tanzania where the two parties enter into an agreement where the government retains the guarantor status for such agreement. Many international investor syndicates, companies and individuals have entered into leasehold arrangement that has put hundreds of hectares under forest venture in the country. Under the leasehold schemes Green resources has established 12,000 hectares of plantation forest in Iringa Province. In the same region Mufindi Pulp and Paper Mill has established 3,000 hectares with between 30-40,000 land reserve available for future plantations. Others include Kilombero Valley Teak Company (KVTC) with 8,162 hectares of teak plantation and TANWAT (14,000Ha). These arrangements look more likely to improve social inclusion, address gender aspects and enhance the livelihood of the communities especially when they operate within the boundaries of bylaws set by communities themselves. Forest Policy (2009) and Forest Act (2002) provides for forestland concessions whereby the private entity is granted exclusive rights to provide, operate and maintain forests over for a long period of time in accordance with performance requirements set by the government but the public sector retains ownership of forestland while the private entity retains ownership plantations established during contract period. In Tanzania there is no forest concession in operation (Ngaga, 2011) and if one was operational, mechanisms for monitoring forest concession are not available (PFP, 2015). However, land leases and permit instruments are in use for plantation development in Uganda and Tanzania that has seen many international investor syndicates, companies and individuals establish hundreds of hectares of private plantations. In Tanzania, Green Resources Mufindi Pulp and Paper Mill, Kilombero Valley Teak Company (8,162 and TANWAT among other investors have established 44,222 Ha and in Uganda Green Resources, New Forests, Global Woods and Nile Ply among others have established 44,166 ha of plantation in public forest reserves.

2.9 Present and projected wood production and demand

According to projection for the countries in the region, the supply and demand for various forest products indicate growing deficits in the next 20 years and into the into the future. Table 3 show that supply and demand projection clearly indicate that the all the countries will face cute shortage of forest products in the near future. Therefore there is need to intensify productivity in public forest plantations and as well bring on board the private and farm forestry sector into the national wood supply grid. The nascent private sector and farm forestry are the only potential sector that may realize some significant growth in both land areas and production but such expansion will be checked by the severe competition from agriculture and settlements. Another promising option is private sector through leasing or concession of public forest reserves to private sector investors to establish plantations and put in place integrated utilization procedures. The private sector profit driven investment in primary production will enhance plantation productivity and processing operational efficiency that will put more wood into the market than under public sector mismanagement.

Table 3: Wood production and consumption in m³

Product	Kenya	Uganda	Tanzania	Sudan	Rwanda
Production 2015	31,953,470	51,652,000	89,350,000	10,931,000	5,432,000
Production Projection 2030	61,021,000	73,386,000	89560,000	4,387,000	7,603,000
Consumption 2015	43,289,150	2,693,000	40,140,000	25,128,000	3,244,000
Consumption Projection 2030	65,058,400	10,434,000	71,102,000	38,217,000	5,248,000

2.10 Economic importance of forestry

In the region forest resources are some of the most important natural assets that produce a wide range of ecological, economic, social and cultural products and services for multiple stakeholders. Forestry sector contribution to the national GDP varies between the countries in Eastern Africa that range from 10.6% in Rwanda, 3.6% in Kenya, and 4.5% in Uganda (Table 4). In the region, it is estimated that over 90% of households depend on biomass energy most of which is in the form of firewood and charcoal derived from these forests. In Uganda, forests offer many opportunities for poverty alleviation, economic development and environmental improvement for estimates put the annual turnover of businesses in the forestry sector such as charcoal, poles, timber, furniture, crafts, firewood, fruits and seedlings at over \$100 million and employs over 1million persons (UBOS, 2010). In Kenya, the forest sector is estimated to employ over 1 million persons in firewood, charcoal, saw milling and wood carvings market

value chains. The forest sector turnover for various sectors is estimated as follows: Charcoal market value chain is valued at \$530 million) employs 700,000 people; Saw milling employs over 300,000 persons and its outputs is currently valued at \$37 million; market for furniture is valued at \$496 million while employing over 160,000 persons; Wood carving employ 50,000 persons and is valued at \$220 million; transmission poles sector is valued at \$69 million, industrial firewood for tea processing is valued at \$22 million and gums and resins exports are valued at \$0.36 million. The country is the largest market for furniture, paper and paper products and wood panels from Asia and Europe. Therefore the deficit in both primary production and manufactured wood products provides huge opportunities for investors in primary production and secondary production sectors include trade in various forest products. In Rwanda the firewood and charcoal market value chain support 50,000 households approximately 2.8% of the entire population and its annual estimated value is USD 2.6 billion (BEST, 2009). Studies show that tree growers earned 22% of the consumer prices, charcoal burners (7%), transporters (10%), wholesalers/retailers (13%). In Kigali it is estimated that more than 30,000 families are dependent on charcoal business. The tourism and ecological potential of forests are also estimated to be high in terms tourist attractions, hydroelectric potential, and support to agriculture and carbon sequestration. In Sudan the contribution of gum arabic to the world market stand at 52% at present and forest sector contributes annual 10% to the country's GDP (Nour H.O A.(2014). Tanzania is an important player in forest production and trade in the region. The forestry sectors through its various commodities production to consumption market value chains annual support employment opportunities for over one million persons. The forestry sector contribution to GDP is estimated at 13% which is relatively high in the region.

Table 4: Forest sector contribution to the GDP and employment

Product	Kenya	Uganda	Tanzania	Sudan	Rwanda
Employment	1,000,000	1,000,000	1,373,000	-	100,000
Value USD	785,440,000	-	-	-	2.6 billion
GDP	3.6	4.5	13	10	10.6

NB: (-) in where no information was provided.

2.11 Trade in forest products

Most of the countries in the region are net importers of tree products mostly manufactured paper and paper boards and plywood, among others products. Kenya despite being the most industrialized in terms of the number of wood based industries in the region remain a net importer of various products that include timber, paper and paper products, wood based panels. The exports included paper and paper products, wood based panels and pulp and recovered paper. For example in 2014, Kenya imported 47 million metric tons (MT) of wood based panels and exported 3.5 million metric tons of the same. In the period 2010-2015 the value of imports was USD 1.8 billion as compared to USD 350 million worth of exports (Cheboiwo and Kiprop, 2016). The trend in imports on average is on the upward trends whereas exports are on downward trends indicating the country's balance of trade in forest products is negative. The exporters of forest products to Kenya include China, South Africa, Malaysia, Tanzania, Turkey, Germany, Thailand, India, USA and Sweden among many others countries. Kenya exports various wood products which include cork, wood carving, paper, wattle bark extract etc. These include Sudan, Democratic Republic of Congo, Rwanda, South Africa, Uganda, Tanzania, Ethiopia, Cameroon, Zimbabwe and Western Sahara. Kenya also exports to other parts of the world namely Israel, Italy, England, Belgium, Norway and China. Tanzania is one of the key exporters of various tree products in the region mostly to Europe and Asia that has been declining as compared fast growing exports to Eastern and Southern Africa countries. The range of products exported from Tanzania include roundwood, paper and paper board products and wood articles. However, sawnwood exports fell from 280,564m³ in 2012 to 166,878 in 2014 and value from USD 12.6 million to 10.5 million in the same period. Similar trend was also observed for honey (Table 5). In Sudans the major export commodity was gum arabic that on average was 30,781MT with a value of \$45.4 million.

Table 5: Forest product trade and values in USD in 2016

Product	Kenya	Uganda	Tanzania	Sudan	Rwanda
Quantity imports	-	6906m ³		-	6,000m ³
Value of imports*	241,336,181	-	51,500,000	20,000,000	-
Quantity export	-	-	58.67m ³	30,781MT#	-
Value of exports	40,841,099	-	63,820,000	45,400,000	-
Sawnwood exports	-	-	166,878m ³		452m ³
Value of exports	-	-	10,500,000		-
Sawnwood imports	38,506m ³	-	-	-	-
Value of imports	28,900,000	-	-	-	
Honey export	-	-	0.85MT	-	-
Value of exports	-	-	203,573	-	-

#Gum arabic NB: (-) in where non information was provided.

3.0 Conclusions and recommendations

3.1 Conclusions

The most productive forests in the region are located in the high and medium potential agricultural zones that fall under private and public ownerships but the largest category of forests the woodlands are located ASALs mostly owned by communities and local governments.

The key actors in both primary and secondary forest production in the region are many and in some cases unique to the respective countries. The actors include public agencies, private sector firms, community organizations, TGAs, CBOs and NGOs, social investors, development partners, transporters and traders of forest products, financing institutions, providers of inputs and services, the media, forest users/groups, politicians, and other forest land users. Interests of such groups/entities have to be taken into account in plans in order to adequately address their needs and in ways that could make forestry sector operate effectively and efficiently.

Secondary forest production are dominated by private actors that include saw millers, manufacturers of reconstituted wood, charcoal, furniture, non-timber product, wooden transmission poles, paper and paper products. In the region the secondary production and manufacturing sectors face numerous challenges ranging from inadequate roundwood supplies, inefficient technologies for better conversion, high transaction costs, lack of specialized skills, high cost of credit facilities, inadequate transport infrastructure and unfavourable policy and legal environment.

In the regional technical and organizational still at infancy stages and is dominated by farm forest producers with grassroots and apex associations. The sectors still need lots of support to transform primary small-scale producers into stronger, united and more vibrant associations that will serve members better in lobbying for better policies and legal environment.

The secondary production is dominated by saw milling associations that draws it membership from saw millers. Smaller groups include furniture makes wood carvers and wooden pole preservers association that represents the interests of respective members. The links between primary and secondary forest producers in the region is still weak and need good will from the government and development partners to foster stronger linkage to enable them reinforce each other and unified approach in engaging governments.

In the region most countries have made strides in policy and legislation to empower women and vulnerable groups in ownership, access and management of land and natural resources. However, the good policies and laws are hindered by strong cultural and traditional norms that many communities still have in relation to land and associated resources such forests.

The countries in the region especially Kenya, Uganda and Tanzania have put in place favourable policies and legislation to support PPPs investment in the forest sector. In Sudan inadequate policies and laws on PPP have restricted participation to individuals and village groups that are covered by PFM mostly in joint forest management operations. The variants of PPPs in the region range from joint forest management projects between public agencies and various investors and actors. The instruments include leasehold arrangements, out grower schemes, crop sharing contracts, market linkages and joint forest management. The most attractive PPP models to private sector players is the public forestland concessions for establishment of forest plantations. However, no project has been initiated in the region because the supporting legislative framework is still lacking.

The forest sector in the region has potential to significantly contribute to the national economy and social development through job creation and income generation if some few handicaps are adequately addressed.

3.2 Recommendations

The information on primary and secondary forest production is imprecise estimations and need for comprehensive inventory and data collection to provide critical information to guide forestry policy. More focused research on

production, consumption, wood-based trade and overall contribution of forestry to rural livelihood and the country's economy is needed.

The forest sector actors in the at both primary and secondary production are poorly organized and need some support in terms of capacity building and facilitation to enable them deliver services to their members and front a unified voice to government and other stakeholders on their needs.

Production and consumption trends in the region indicate that forest product supplies for major forest products fall short of the growing demand hence the need for increased investment to enhance primary and secondary forest productivity, increased value addition and efficient infrastructure to serve both local and export markets.

The public forest plantation sector that still largely in the hands of public sector agencies need to be opened up to many players through concession and lease agreements to inject more professionalism into primary forest production management and to enhance competition for greater productivity.

The saw milling, charcoal processing, reconstituted wood industries and furniture making need support to consolidate their businesses, upgrade their technologies and improve their operational management to achieve competitive operational scale for increased quality and quantities of products.

In Sudan, the forest sector need some policy and legal reforms to enhance economic benefits to land owners and workers to motivate them to increase rehabilitation and management of forest resources. Public agencies like FNC in Sudan and respective countries should continue to organize and support NTFP producers like GAPA's among others through capacity building of its members in production, value addition and marketing operations.

The furniture sector is currently dominated by artisanal operators that are not able to sustain high production to meet the tastes for various consumer niches for wood-based products. The government need to create conducive fiscal policies to facilitate financing and capacity building on modern mass production, upgrading equipment and machinery for large-scale manufacturing to increase overall outputs, productivity, sales, exports, and value addition. Given the vast market opportunities in the Eastern Africa countries the regional countries should position themselves to capture local market share relative to overseas furniture producers.

Despite the good political and enabling policy and legal environment to facilitate the growth of the private sector, more reforms are needed to remove the remaining hurdles that constrain the pace of establishment and participation of the private sector in forestry sector development in the region.

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5.0 REFERENCES

- BEST -Biomass Energy Strategy Rwanda, 2009
- Cheboiwo, J.K. (2014). The status of the pole sector: Production, processing and trade in transmission poles in East Africa in Miti, *The Tree Business Magazine for Africa*, Issue No. 21 January-March 2014 pp 5-8
- Cheboiwo, J.K. and Langat, D (2007). Smallholder Tree Growers Income Opportunities from Farm Forestry Products in Western Kenya: Forestry Research in Environmental Conservation, Improved Livelihoods and Economic Development, Muchiri et al (eds), *Proceedings of the 3rd KEFRI Scientific Conference 6-9th November, 2006 KEFRI Hqts, Muguga, Kenya*
- Choge, SK. 2002. Study of Economic aspects of the Wood Carving Industry in Kenya: Implications for policy development to make the industry more sustainable, MSc. Thesis, University of Natal South Africa.
- Cunningham, T., L. German, M. Chikakula, F. Paumgarten, C. Barr, K. Obidzinski, T. Yatich, M. van Noordwijk, R. deKoning, H. Purnomo and A. Puntodewo (2007). *Toward a Strategy for Sustainable Trade and Management of Forest Products and Services in the COMESA Region*, COMESA Secretariat, Ben Bella Road Box 30051, Lusaka, Zambia and CIFOR, P.O. Box 0113 BOCBD, Bogor 16000, Indonesia
- ESDA (2005). *National Charcoal Survey Summary Report*, Nairobi, Kenya
- Githiomi, J. (2010). A Forest of Activities: An Overview of the wood industry in Kenya, in Mite, *The Tree Business Magazine for Africa*, Issue No.6 April-June 2010, pp 6-7
- Hamilton, A (1996). Kenya's Wood Carving Face Uncertain Future. *The World Wide for Nature*. <http://www.panda.org/news/features/8-96/story1.htm>
- Kilimo Trust (2011). *Eucalyptus Hybrid Clones in East Africa; Meeting the Demand for Wood through Clonal Forestry Technology*. Occasional Paper No.1
- Kizito S. (2009). Consumer satisfaction with solid wood furniture produced by small scale enterprises in Uganda. MSc. Dissertation, Makerere University
- MEWNR (2013). *Analysis of Demand and Supply of wood products in Kenya*, Ministry of Environment, Water and Natural Resources, WANLEY Consultancy Services, Nairobi, Kenya

- MF&W&MFA (2008). *Miti Mingi Maisha Bora – Support to Forest Sector Reform in Kenya, Implementation Phase (2009 – 2014), Programme Document, Final Draft*. September 2008.
- MNRT. 2015. National Forest Resources Monitoring and Assessment (NAFORMA). Main Findings. Tanzania Forest Services Agency in collaboration with the Government of Finland and Food and Agriculture Organization (FAO) of the United Nations and the Tanzania Ministry of Natural Resources and Tourism.
- Muga M O, Githiomi, J K, and Chikamai, B N (2014). Classification of Kenyan Wood Carving Macroscopic Properties. *International Journal of Applied Science and Technology*: Vol.4 (3)167-178
- Mukasa, C., Tibazalika, A., Mango, A. and Muloki, H.N. (2012). Gender and forestry in Uganda: Policy, legal and institutional frameworks. Working Paper 89. CIFOR, Bogor, Indonesia.
- Muthike, G., Kanali, C. and Shitanda, D. (2013). Comparative Analysis of on-farm timber conversion systems in Kenya. *Journal of Horticulture and Forestry* Vol. 5(6):75-80
- National Forestry Authority [NFA] (2003). *National Biomass Study Technical Report*, Ministry of Water, Lands and Environment, Republic of Uganda, Kampala.
- Ndegwa G. M. 2010. woodfuel value chains in Kenya and Rwanda; Economic analysis of the market oriented woodfuel sector. Cologne University of Applied Sciences Institute for echnology and Resources Management in the Tropics and Subtropics (ITT)
- Ngaga, Y.M. 2011. An analytical study of public forest plantations in Tanzania. African Forest Forum, Nairobi, Kenya. 82pp
- Ngugi, JN and Bwisa, H. (2013). Factors Influencing Growth of Group Owned Small and Medium Enterprises: A Case of One Village One Product Enterprises, Jomo Kenyatta University of Agriculture and Technology, Juja, Kenya
- PPF. 2015a. Identification and selection of national and local service providers of forestry training and assessment of their training and capacity needs. Prepared by FORCONSULT. 55pp
- PPF. 2015b. Annual Progress Report (2014/2015). The Tanzania Ministry of Natural Resources and Tourism and Ministry of Foreign Affairs of Finland. 82pp
- Uganda Bureau of Statistics [UBOS] (2010). Statistical Abstracts. Ministry of Finance Planning and Economic Development, Republic of Uganda.
- Uganda Tree Growers' Association [UTGA] (2015). Annual Report.
- Wamukunda, G. (2014). Charcoal Regulations for Improved Land use Management in the Dryland Forests of Kenya: An Examination of the Forest (Charcoal) Rules 2009. In W, Ayiamba, D. Mbithi, E. Nahama, J. Kagombe, L. Njuguna, L.W. Njuguna, J. Laigong and J. Mwanzia (eds) Proceedings of the 2nd National Participatory Management Conference: Enhancing Participatory Forest Management under Devolved Governance Structures, 15th -16th July 2014, KEFRI Hqts, Muguga, Kenya.
- Wasike, S. 2010. Is it time to lift the logging ban: Reasons behind it, the effect and way forward, Mite "The Tree Business Magazine" for Africa, pp 5-7.
- World Bank (2015). Furniture Industry in Kenya: Situation Analysis and Strategy, theWorld Bank 1818H Street NW, Washington, DC 2043, USA
- World Bank, 2011. Estimates based on sources and methods described in "The Changing Wealth of Nations: Measuring Sustainable Development in the New Millennium"
- Nour, H.O.A. 2013. Gum Arabic in Sudan: Production and Socioeconomics aspects, FAO, Rome.