African Forest Forum

A platform for stakeholders in African forestry

Strengthening public-private partnerships for promoting sustainable forest management in the Republic of Sudan

About AFF
Established in 2007 as a non-political, non-governmental, objective, independent and not for profit international organisation, the African Forest Forum (AFF) is an association of individuals with a commitment to the sustainable management, wise use and conservation of Africa's forest and tree resources for the socio-economic well-being of its peoples and for the stability and improvement of its environment.

AFF exists to voice the concerns of African forestry stakeholders, and to use science, indigenous knowledge, and experience to advocate for the increasing relevance of forests and trees outside forests to peoples' livelihoods, national economies and the stability of the environment.

In this regard, AFF provides independent analysis and advice to national, regional and international institutions and actors on how economic, food security and environmental issues can be addressed through the sustainable management of forests and trees outside forests. Operationally, AFF mobilises resources to address forestry and related issues that cut across countries and different African sub-regions with a view of enhancing the relevance and contribution of forests and trees outside forests to the livelihoods of the people of Africa and stability of their environment.

Vision
The leading forum that unites all stakeholders in African forestry

Mission
To contribute to the improvement of the livelihoods of the people of Africa and the environment they live in through the sustainable management and use of tree and forest resources on the African continent.

Correct citation: Nasoun, T. H. (2019). Strengthening public-private partnerships for promoting sustainable forest management in the Republic of Sudan. AFF Report. African Forest Forum, Nairobi.

Photo credits (L-R): Harry Mountain around Dougu Village in Western Sudan, South Darfur State (Fudol Yousuf Hamid via Wikimedia Commons); Typical dry northeastern part of Butana, Sudan (Bertramz via Wikimedia Commons); Small-scale farmer in Sudan © Abdullah Ampilan/Oxfam via Wikimedia Commons

African Forest Forum
P.O. Box 30677-00100 Nairobi GPO KENYA
Tel: 254 20 722 4203
Fax: +254 20 722 4001
E-mail:exec.sec@afforum.org
Website: www.afforum.org
Follow us on Twitter @ africanff
Like us on Facebook / African Forest Forum
Find us on LinkedIn / African Forest Forum (AFF)

Strengthening public-private partnerships for promoting sustainable forest management in the Republic of Sudan

Tageldin Hussein Nasroun, PhD

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACRONYMS AND ABBREVIATIONS

AFF	African Forest Forum
ARC	Agricultural Research Corporation
CFA	Central Forest Administration
FNC	Forest National Corporation
FRC	Forestry Research Centre
FRA	Forest Resource Assessment
FSR	Forestry Sector Review
GAPA's	Gum Arabic Producing Associations
GOS	Government of Sudan
GS	Growing Stock
NRC	National Railway Corporation
NWFP's	Non-Wood Forest Products
NEA	National Energy Administration
PPP	Public-Private Partnership
SMSEs	Small and Medium Scale Enterprises
SFM	Sustainable Forest Management
toe	Ton-oil equivalent

EXECUTIVE SUMMARY

After the independence of South Sudan taking about two thirds of the former 'united Sudan' forests and against a background of increasing human and livestock population pressure on forest resources, the forest situation in the Republic of Sudan (referred to in this document as Sudan) is pretty bad, and the country is now considered among the least forested countries in Africa. Against this background, and in spite of its important role in maintaining agricultural productivity and providing the firewood and charcoal needs for about 75% of the Sudan's population, and its potentials for meeting a significant part of industrial wood and non- wood forest products (NWFP's) for present and future needs, the forestry sector in the country has been seriously neglected and under- funded.

The Forest National Corporation (FNC) is the main steward of the Sudanese forestry sector. It is responsible of securing sustainable management of the forest resources in the context of the complicated political, economic, environmental and social conditions obtaining in the country. Because of the big expectations on the forestry sector, FNC is making good efforts to widen the scope of stakeholder participation in forestry development and management. The current forest policy and legislations encourage the private sector to own their own forests as individuals, families (farmers), communities, private cooperatives and private corporations. In this capacity they are considered part of the forestry sector.

Forestry research, extension, education and training are not given enough emphasis in the forestry development process. The present institutional set-up for forestry research is inadequate to support the work programme required in the sector given that more than 95% of the forests are natural degraded forests which require a considerably big rehabilitation programme. Forestry research is not capable of achieving its needed function of supporting the forestry sector to adopt mature technologies and mobilizing all resources, including human resources, required for this massive programme.

A number of NGO's have tested, on small scale, many technologies for reforestation and raised local awareness of the potential for tree growing. FNC is trying to create a coordinating agency through which extension advice can be provided to these NGO's and at the same time enabling the development programme to benefit from the results and experiences of these active groups in the community. NGO's, wherever possible can be active partners in development projects, not only by providing their experiences, but also in the organization and management of project activities.

The central government, represented by FNC, together with the private sector are engaged in the sawmilling industry which is the only major wood industry in Sudan. The private sector is handling secondary wood processing industries, like furniture and other mill work, which use the sawn timber and other wood products, in addition to small wood industries. The private sector, including local communities, use non- wood forest products (NWFP's) in various village or cottage and other small industries. These industries help in rural

development, provide employment opportunities for poor rural people and others. They also add value to forest products. Eighty percent of the locally produced sawn timber has been produced by government (FNC) sawmills, while 20% is produced by the private sector.

Charcoal production, based on traditional technology applied by the private sector, is characterized by low efficiency and high percentage of waste. There are pilot trials on charcoal that indicate possibilities for productivity improvement. Forests also provide a wide range of NWFP's for industry. Quality measures for NWFP's are lacking, except for gum arabic, which is the only NWFP which is processed in the Sudan by the private sector. It is either kibbled, changed to mechanical powder or spray dried powder. All our wood and NWFP's except gum arabic are marketed locally.

The success of FNC will largely depend on the effective use of its human resources. This is a central concern of personnel management, which is equally important as other functions of FNC such as research, extension, silviculture and others. The total number of professional staff is far below the requirement. However, the number of professional women increased from 30 in 1990 to 65 in 2013 (by 116%) while the number of men increased by 81% during the same period. Forest guards are too few and this is why deforestation has been taking place on large scale. Women at the professional level take active roles in decision making

After the independence of South Sudan in 2011, the remaining forest area for the Republic of Sudan is 18.73 million ha representing only 10% of its total land area. The forest areas under management at present are negligible compared to the total area of government reserved forests. The administration and management of forestry is based on a forest policy amended in 1986 and supported by ordinances/regulations. The forest policy aims at contributing to sustainable forest management (SFM) and eventually contributing to sustainable human development. A revision of 1986 policy was made in 2006 which is still awaiting approval from the Council of Ministers. These policies encourage the ownership of forests by private sector, communities and corporations with the aim of widening the scope of participation in forest protection and management.

The efforts made by FNC to encourage the private sector to participate in the production of forest raw material and the processing of forest products have been without much success. Gum arabic, however, was the exception since all the operations are in the hands of the private sector. Many Gum Arabic Producing Associations (GAPA's) were formed to maximize returns. The participation of stakeholders in GAPA's is excellent. Women represented 40% of the total membership of these associations which reached 1.5 million persons.

Although many women possess a wealth of knowledge about forest resources and the values which can be derived from them, they are generally excluded from decision and policy- making process at local and community levels. At professional levels, however, the proportion of women in FNC and its provincial administrations is more than 20% and they take active role in decision making.

One of the main obstacles towards SFM and in turn to sustainable agricultural development is the lack of coordination between the sub- sectors sharing the land. There is serious competition between crop producers and service providers like forestry. Agriculture is expanding at the cost of forests, and large-scale deforestation is taking place resulting in the spread of drought and desertification, loss of land productivity thereby threatening food security. The combined effect of agricultural encroachment, fuelwood harvesting, and overgrazing is a decimation of the forest area by almost 50% from 1960's to 2010, just before the independence of South Sudan.

The link between FNC and related agencies and institutions which are outside the normal forestry institutional framework (FNC) like forestry research, extension, education and others, is very weak and without any coordinating agency. Establishing this kind of coordination will help in exerting control by allocating responsibilities for the monitoring and evaluation of FNC performance by setting policy guidelines for forestry development.

The linkage between FNC and the private sector varies with the type of forest and tree resources ownership: individuals, farmers (families) and local communities. It is easy to coordinate with individual owners and local communities. This continues to improve considerably especially with local communities through extension activities, forest committees and GAPA's. These are trained by FNC staff for managing their own forests. Farmers, however, are not enthusiastic about collaborating with FNC as they are reluctant to establish shelter belts around their farms as indicated in the forest policy, in addition to the fact they take part in the deforestation process. However, many local communities began to manage their forests properly with the help of FNC staff and providing good services in their villages and improving livelihood.

The massive rehabilitation programme required for the revitalization of Sudan's degraded natural forests holds considerable potential to enhance their contribution to human welfare. However, this will need resources, and more important a strategy which will enjoy both public and political support. Such a strategy cannot be implemented effectively without proper organization, coordination and planning. It will also require a shift from traditional forest production to one a forestry approach that emphasizes social forestry and involves farmers, communities, NGO's and other private forest owners.

Increasing the area of the central forest reserves and large-scale plantations is considered the approach for addressing the current problems of over exploitation of the natural forests and contributing to their sustainable management and progressing toward the 20% target. It is difficult, however, to predict future trends for forest production in Sudan for the following reasons:

- No national forest inventory was carried out since 1995
- More than 95% of the remaining forest are natural degraded forest which need a massive rehabilitation programme to be productive.
- It is getting difficult for FNC to get enough funds locally or from foreign aid.

The level of contribution of farmers and local communities in reforestation, and SFM depends to a high degree on the extent to which they can be encouraged to undertake forest activities for their own good. Because the stumpage prices for wood extracted from forests do not cover their replacement costs, there was little incentive for private forest sector to invest in reforestation and SFM. Farmers prefer to concentrate on farming due to the higher prices of agricultural crops. Local communities, however are getting assistance from FNC through training and extension programmes as well as organizing them in committees and offering them subsidies.

Local communities are benefiting from FNC's support in improving their livelihoods; this is particularly true in gum arabic communities where many GAPA's were formed in order to maximize the farm gate returns to rural communities. Prices paid to gum producers increased from 15% to close to 40% of the exporting price. Women are earning good money from gum arabic and other NWFP's. There also are good models in Sinnar and Gadaref States where local communities have started to manage their own forests under technical supervision of FNC staff. They are earning good money and providing important services to their villages.

1. INTRODUCTION

1.1 Background

The forestry sector is critical in maintaining agricultural productivity, providing the firewood and charcoal needs for about 75% of Sudan's population and provision of industrial timber and other wood and non- wood forest products. However, the sector has been seriously neglected and underfunded. Reforestation and forest protection policies throughout the past decades have not produced the desired outputs needed to ensure that the forest capital is maintained at sustainable levels.

Against a background of rising human and livestock population pressure on the forest resources, the Forest National Corporation (FNC) has not played an effective role in forest conservation and management. This is due to lack of integration and coordination of land user activities that are dependent on forest resources in its plans and activities. This has led to environmental degradation and serious drop in land productivity, which in turn is threatening food security.

The split of the former Sudan into two countries, the Republic of Sudan (rereferred to in this report as Sudan) and South Sudan, resulted in most of the forest resources being retained in South Sudan. Natural forests that remained in the Sudan are mainly dry forests that are highly degraded and need urgent rehabilitation and sustainable management. The projected scenario is that, if no action is taken immediately, the 10 million ha of forests within the radius of 500-600 km of Khartoum will disappear in the few coming decades.

FNC, the main steward of the forestry sector in Sudan is facing many problems that have made it ineffective in implementing policies and legislation approved by the Council of Ministers, that are being violated at all levels and therefore raising an urgent need for reforms to that could enhance the law enforcement and policy implementation capacity of this institution. Another major handicap in the formulation of effective national forest development plans is the lack of recent survey data, hence the need for a comprehensive national forest resources inventory. This could be followed by comprehensive policy and legislative reforms to support the implementation of sustainable forest management (SFM) in the country.

The results of the International Forest Resource Assessment revealed that the forest cover in the 'former Sudan' decreased from more than 40% in 1950s to 10.3% of the area of the country (18.7 million ha) in 2015. This is mainly due to the horizontal expansion of agriculture and the illegal forest harvesting for biomass energy. This continuous depletion of forest cover resulted in many environmental problems and also contributed to an increase in poverty. This, in turn, led to many internal conflicts for the forest meagre resources, thereby threatening national security.

Forests in Sudan are classified according to different criteria. One way of classifying reserved forests in Sudan is based on the main object of their management as follows:

- Protective forests: for environmental protection, combating desertification and protecting agricultural land. They are in the dry northern Sudan and cover about 4.0 million ha, with only 125, 000 ha as reserved forests;
- Productive forests: for producing saw logs, poles, firewood and charcoal. These are under sustainable management and they cover only131,000 ha;
- Irrigated plantations which belong to public corporations and big agricultural schemes. They cover 3, 300 ha. They provide building poles and firewood for farmers and local communities;
- Montane forests: for watershed management with some parts for sustainable production. This type covers about 580 ha; and
- The remaining 6.4 million ha of the reserved forests are natural degraded forests distributed among the different states.

The total area of reserved forests in Sudan is 11 million ha which represent 5.9% of the total area of Sudan and about 60% of the total area of forests in Sudan. This situation calls for afforestation in an area equal to the present total forest area to fulfill the target stated in the current forest policy to attain and reserve 20% of the area of the Sudan. This is one of the major challenges facing the forestry sector in Sudan. Other challenges include:

- Finding adequate and sustainable sources of finance for forest development;
- Finding means of achieving integration with other sectors;
- Getting over land tenure problems;
- The rehabilitation and sustainable management of 98% of the country's degraded natural forests; and
- Mobilization of the private sector to get involved in the establishment of forest industries.

Sudan forests play important economic roles which are not appreciated, or correctly valued and such information used to inform decision makers. Forests contributes about 70% of the total energy consumption in Sudan. They also produce more than 52% of the gum arabic in the world markets, making this product one of the most important exports from Sudan. This in addition to many other non-wood forest products which provide food, medicine and additional income for local communities and improve their livelihood. They are also important potential raw materials for industries. Forests also provide 30 -70% of the animal feed during summer and the rainy seasons. They also meet all the requirements for hardwoods in the form of sawn timber, building poles, other small size round timber for local house construction, firewood and charcoal. Forestry sector also provides jobs for 15% of the labour force in rural areas, contributing to poverty alleviation. All these contributions are in addition to the important roles of forests in environmental protection and in maintaining agricultural productivity.

However, in spite of all these roles of forests, the Ministry of Finance estimates the contribution of forestry sector to the GDP as only 3.3%, based on the returns from the sales of forest products from reserved forests only. This is very much lower than the actual

contribution; for example, it does not take into consideration the cost of about 70% of the total energy consumption which is collected illegally from unreserved forests. Including the energy consumption takes the forestry sector contribution to the GDP close to 20%. This still excludes the environmental and social values of forests.

The forest area under management plans, at present, does not exceed 1% of the total area of reserved forests (6.4 million ha), which comes to about 64,000 ha only. This is due to complex political, economic, social and environmental conditions; in addition to lack of accurate information and recent data on the forest resource. The last comprehensive forest inventory was carried out in 1998. During 2017 and 2018 FNC got limited funds for starting a forest inventory. This was not enough to provide the information required for adequate planning of the forestry sector. More funds are needed to carry out a comprehensive inventory, which is difficult to get at present, given all the sanctions imposed on Sudan. A comprehensive forest inventory is indispensable for enabling FNC to make plans on how to achieve the strategic objective of the rehabilitation and sustainable management of 98% of the country's natural degraded forests. Achieving this strategy could result in conserving forest ecosystems and other natural resource, and also increasing land productivity. It could also encourage the establishment of sound integrated forest industries which could add value to the forest products.

1.2 Objectives of the study

The main objective of the study was to provide information to support catalysing of the emergence of organized private sector in forestry through promotion of promising public-private-partnership (PPP) approaches for sustainable forest management and enhanced livelihoods including gender considerations.

The study specific objectives were:

- To identify the key actors and gender groups' representation in primary forest production and secondary forest production including SMEs based on all forest types in the country;
- To collect information on actors in primary forest production including tree species, their productivity and use, distribution by area, age classes, and volume and plans for sustainable supply;
- To provide information on actors in secondary forest production, collect information on industry type, installed capacity, products lines/types, capacity utilization, production volumes in the last five years and raw material types and sources;
- To evaluate actors in primary and secondary forest production in terms of employment opportunities, policies, regulations and other factors facilitating and/or constraining the development of forest products industry including undertaking a SWOT analysis;
- To identify assess and identify gender specific inequalities;
- To assess and identify the factors inhibiting and or promoting the full and equal participation of marginalised groups;
- To assess and analyse gender-based control and access to required assets/resources including the specific opportunities, challenges and privileges of involvement and participation in the sector;

- To evaluate marketing and trade (domestic and international) in their products including volumes, production costs, revenues and prices of products traded in the last five years;
- To evaluate the relationship/linkages among actors in primary forest production on one hand and the relationship/linkages among actors in secondary forest production on the other hand and how this can be organized to contribute to the growth of a well-organized formal private sector in forestry;
- To evaluate the scope, within the country, for public-private-partnerships in forestry, including existing promising models/approaches that can enhance social inclusion, gender equitable practices and forest compatible sustainable livelihoods development in the different forest types and propose recommendations on way the forward;
- To provide past trends on production, trade and consumption on timber and non-timber products in the countries in the last five years. Also provide forecasts of future production, trade and consumption of the same; and
- To assess the contribution of these private forestry sector activities to local livelihoods and national economy.

1.2 Methodology

To fulfil the above objectives, a review of literature was conducted included technical reports from FNC, its regional administrations and international consultants. Some scientific papers and books on forest resources were also consulted for any relevant information to the current study. Three localities in two states with significant forest resources in Sudan were visited where meetings were held with local communities and forest or village committees as well as forestry staff (Annex1).

The key actors in primary and secondary forest production were identified and staff break down by gender group representation done. For actors in primary forest production, attempts were made to collect information on tree species, raised/ managed and distributed by area, age, classes and volume as well as management plans for sustainable supply of forest various products. The study was partly handicapped by the absence of a recent national forest resources inventory, inadequate data and information on the extent of deforestation and the current rate of fuelwood consumption.

The study also collected information on the main actors in secondary forest production and industry types, installed capacity, products lines, capacity utilization, production volumes and types of raw material intakes and sources. For both actors in primary and secondary forest production sectors, the following were addressed or done:

- Evaluation of employment opportunities;
- Policies, regulations and other factors facilitating and/ or constraining the development of forest products industry;
- Assessment and identification of gender specific inequalities;
- Assessment and identification of factors inhibiting and/or promoting the full and equal participation of marginalised groups; and

- Assessment and analysis of gender-based control and access to required assets/ resources including the specific opportunities, challenges and privileges of involvement and participation in the sector.

Attempts were also made to evaluate marketing and trade (domestic and international) indicating products volumes, production costs, revenues and prices of products traded. The relationship/ linkages among actors in both primary and secondary forest production and how they are organized to contribute to the growth of a well-organized formal private sector were evaluated. The scope of public private partnerships within the forestry sector including existing and promising models/ approaches that can enhance social inclusion, gender equitable practices and forest compatible sustainable livelihood development in the different forest types were evaluated.

The past forest products production, trade trends and consumption of timber and non-timber products in the country are presented. The future projections on the production of forest products, trade and consumption were done and the potential contribution of the private forestry sector activities to local livelihood and national economy assessed as well.

2. KEY ACTORS IN PRIMARY FOREST PRODUCTION

2.1 Forest National Corporation (FNC)

FNC is the main actor in the forest sector development in Sudan for it provides policy direction and regulatory functions to facilitate both public and private actors in the country. In its policy statement, FNC mandate is to enhance forest protection and management of forests resources in order to increase the forest reserve estate from 4% to 20% of the total area of Sudan. This is because the remaining forests in Sudan after the independence of South Sudan are very little making Sudan one of the least forested countries in Africa. Further, vast majority of the remaining forests are highly degraded and FNC faces an uphill task in its efforts to rehabilitate these forests and bringing them under sustainable management principles.

FNC relies on its generated revenues to finance its operations hence it is a self-financing entity with no budgetary allocation from the government. At present, the revenues generated from sale of forest products are not adequate to accomplish this massive task. To solve this problem and protect the forest, FNC has to increase the level of stumpage tax collection on fuelwood and timber harvesting operations, both outside and inside government owned forest reserves. FNC also has to efficiently play its stewardship to secure and ensure rational use of forest resources in Sudan within an environment of complex political, economic, environmental and social conditions.

On employment and gender presentation, the people directly employed in forestry and paid by FNC ranged between 4, 876 and 2,805 between the years 1990 and 2010 and the female representation increased from 5% in 1990 to 20% in 2010. The highest percentages of females are among professional foresters and forest workers. At present, professional women represent about 28% of all professionals, and are involved in planning, management and monitoring of forest activities (Mohammed, 2015).

2.1.1. Employment opportunities

The success of FNC largely depends on the effective use of its human resources. The efficient use of the employees is the central concern of personnel in management, functions that include silviculture, research and extension. FNC undertakes specific aspects of personnel management such as staff recruitment, performance appraisal and promotions in accordance to prevailing civil service legislations.

Table 1 shows the status of human resources in FNC between 1990 and 2013 that indicate that the number of women among the professional staff increased from 30 in 1990 to 65 in 2013 a jump of 116%, while the number of men increased by 81%. Despite such increase, one professional forester still looks after 60,000 ha which is too much. It was as well noted that forest guards work 24 hours for the same wage as official 8 hours per day because the number is far too few. Each guard looks after 35,000 ha against the recommended 700 ha., and this is one of the main factors contributing to large scale deforestation in the country. This has left more than 95% of the remaining forests reserves highly degraded and require a massive rehabilitation programme to be brought under sustainable management. At present, the revenues obtained from the forests are not enough to employ more staff and finance planned development projects.

Table 1. Human resources situation in FNC (1990-2013)

Category	1990	1995	2000	2005	2013
Professionals	138	186	174	219	315
Technicians	182	193	196	117	48
Rankers*	88	88	415	193	73
Other officials and workers	3891	4245	3520	2159	2433
Total	4299	4712	4305	2688	2869

**Rankers are the staff members who were gradually promoted from workers level to technical level. Source FNC, 2013. Annual Report*

According to the Forest Resource Assessment (FRA) country report of 2015, the female representation among the total number of FNC staff increased from 4.5% in 1990 to 22% in 2010 as can be seen from table 2. This means that during the same period the female employees increased by 218%.

Table 1: Gender representation in FNC employment (1990-2010)

Year	Total numbers	Number of females
1990	4,299	195
2000	4,305	487
2005	2,688	586
2010	2,869	620

*Source: FRA, 2015. Country Report-Sudan

2.1.2. Forest policy and legislations

The first national forest policy and its supporting legislations came into force in 1932 and brought all forest reserves and all land not used for cultivation under the control of the forest administration of that time. They also stipulated the percentage area to be reserved as forests in the old Sudan and provided guidelines for tree cutting inside and outside forest reserves. They clearly divided the responsibilities and functions on forest management between the central and provincial authorities. Since then, many policies and legislations have come up with changes in forest use and sizes of forest reserves. The latest policies and legislations were of 1986 to accommodate the growing concern about environmental protection and the newly emerging concept such as participatory forest management (PFM).

The 1986 forest policy was revised in 2006. Another proposal for restructuring FNC was also presented for approval. The1986 policy and the revised (2006) policy and legislations are all directed at the rehabilitation of natural forests and bringing them under sustainable management principles. The amount of work and resources required is massive, which cannot be accomplished by FNC alone without participation of other actors such as local communities and private sector investors. Therefore, the FNC should put in place policy and legal environment to accommodate these actors to own and manage specified forests with technical assistance from FNC and its regional departments.

FNC needs to embark on massive awareness creation campaigns and roll out effective extension services to support communities, individual and private sector investors for enhanced rehabilitation and adoption of sustainable forest management practices in the country. FNC also needs to facilitate a forest reservation process to move the country to the target of 20% forest/tree cover. Other proposed measures in the policy include the following:

- Promoting use of wood efficient technologies in charcoal production, use of improved cooking stoves and use of agricultural waste wood from agricultural schemes for domestic cooking;
- More effective protection for the existing forests by enforcing forest laws and increasing the level of stumpage tax collection both within and outside government forest reserves.
- Enhanced vegetation regeneration in woodlands using low-cost technologies such as direct seeding of abandoned mechanized agricultural farms;
- Provide incentives for communities and individuals to participate in forest establishment, protection and management.

- Promotion of agroforestry systems within agricultural landscapes through accelerated shelter belts planting around mechanized farms, irrigated farms and along canal banks. This will help in improving agricultural productivity which is becoming a serious problem in Sudan. The forest policy specifies 10% of rainfed mechanized farms and 5% of irrigated farms should be allocated to trees in the form of shelter belts;
- Development of new plantations with support from the Government of Sudan (GOS), donor agencies, NGO's and private sector actors such as irrigated plantations within irrigated agricultural schemes, rain-fed plantations on abandoned mechanized farming areas and industrial wood plantations for sawn wood and management of *Vachellia* (*Acacia) nilotica* in riverine forests.
- Improving industrial forest management through protection and sustainable management of existing forests, establishing new plantations for specific objectives, expanding the area of the forest reserve estate; providing spare parts for the existing old sawmills and logging equipment; improving new sawmilling capacity by introducing portable sawmills and improving transport access to all forest areas;
- To support such development requires development a long-term forest development programme and commitment of massive financial and human resources that will include capacity building of staff, better organizational structures and research capabilities. FNC capacity need to be strengthened to enhance its planning, monitoring and enforcement functions;
- For a country like Sudan where more than 95% of its forests are degraded forests, it requires a forestry research strategy that will promote science supported rehabilitation program based on cost effective forestry technologies and mobilizing of all partners to undertake the massive programme. Given the high reliance of local population on forest resources research activities should include sociological studies for proper understanding of peoples' perceptions and needs in order to develop effective working relationships with them; and
- Greater political commitment to forest protection and reforestation will be needed for adequate budgetary support and enforcement of forest policy and legislations.

2.1.3. Primary forest production

The natural savanna woodland in Sudan is becoming degraded as a result of overharvesting. It is estimated that 10 million ha that are within the radius of 500-600 km of Khartoum will disappear in the few coming decades if some form of management is not undertaken (World Bank, 1988). The forests and areas that are under effective management at present are negligible compared to the total area of government reserved forests. Sudan has 18.73 million ha of forests representing only 10% of the total land area according to African Land Cover Atlas of 2012.

Table 3 shows the areas of tree cover classes (ha) compared to agriculture and range land.

Table 2: Areas of tree cover classes compared to agriculture by state (ha)

State	AG	TCO	SCO	HCO
Blue Nile	1,275,917	1,582,755	553,158	338,253
El Gadaref	3,458,932	598,354	197,738	1,207,604
EL Gezira	2,075,149	68,536	16,991	335,004
Kassala	1,077,738	401,488	157,925	791,092
Khartoum	224,523	44.618	34,301	203,224
Northern	110,858	29,635	112,526	150,729
Northern Darfur	1,458,402	469,914	2,733,627	8,853,330
N. Kordufan	4,571,176	2,852,632	5,776,385	5,135,514
Red Sea	30,155	458,962	1,030,880	578,602
River Nile	227,937	22,408	72,130	507,062
Sinnar	2,458,947	480,173	504,186	400,492
Southern Darfur	2,122,492	3,157,458	4,722,374	4,034,753
S. Kordufan	1,963,585	7,174,761	4,134,598	675,395
Western Darfur	599,674	1,120,237	1,690,251	1,969,654
White Nile	2,054,539	271,251	494,257	802,049
Grand Total	23,710,025	18,733,182	22,231,327	25,982,720
Percentage	(12.6%)	(10.0%)	(11.8%)	(13.8%)

AG = Agriculture in terrestrial and aquatic/ regularly flooded areas TCO = Trees closed to open in terrestrial and aquatic/ regularly flooded areas SCO = Shrubs close to sparse in terrestrial and aquatic/ regularly flooded areas HCO = Herbaceous closed to sparse in terrestrial and aquatic/ regularly flooded land. Source: Land cover Atlas of Sudan.

Table 3 shows that Sudan has large areas of scrub land (SCO) that needs to be transformed into forests to get closer to the target of 20% of the area of Sudan in line with government policy of increasing government forest reserves to 20%. The table shows the figures for the different states. Figure 1 shows the locations of the different states in Sudan. In addition to the classes gives in table 3, 50.7% of the area of Sudan is bare soil and rocks, whereas urban areas (0.4%) and water bodies (0.7%) are very small.

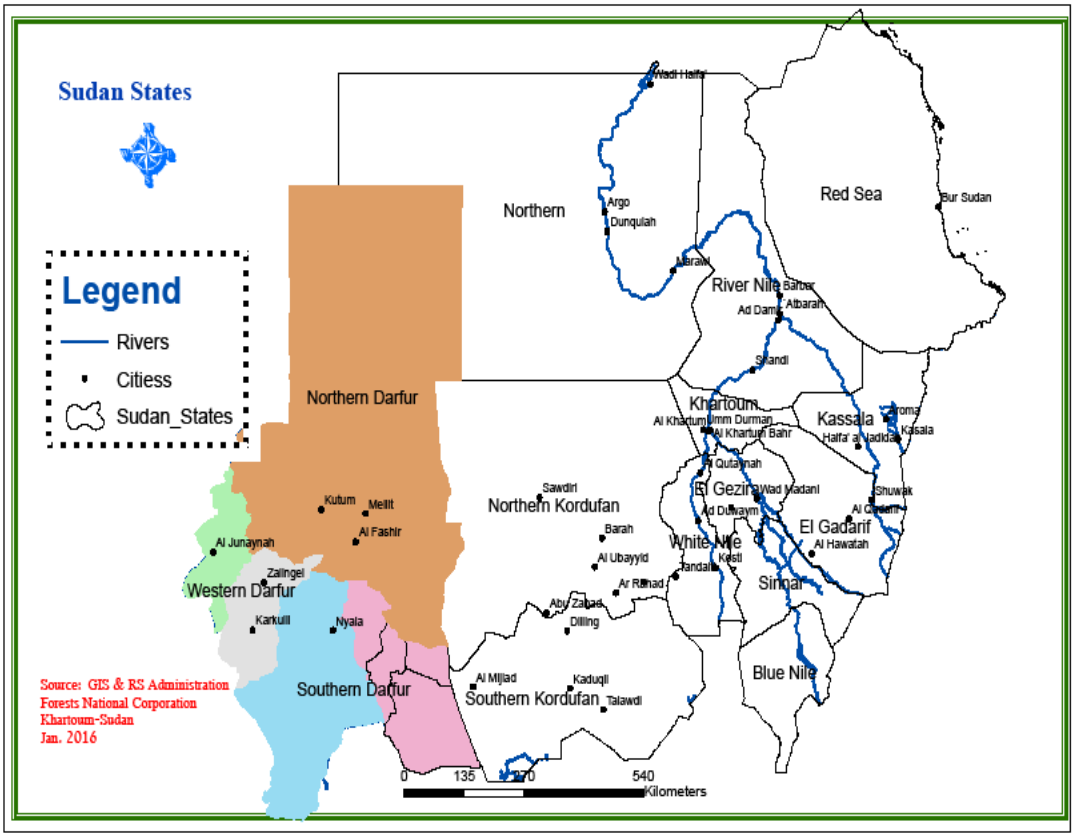

Figure 1: Map of Sudan showing the location of the different states.
Source: FNC, Forest Management Department.

Table 4 shows the areas of the different types of forests as classified in FRA, 2015, country report, Sudan. The table indicates that the primary forests represent about 7% of the total forest area in Sudan.

Table 3: Areas of forest type categories (1000'ha) between 1990 – 2015

Forest category	1990	2000	2005	2010	2015
Primary forest	1,650	1,528	1,467	1,406	1,345
Other naturally regenerated forests	16,497	14,654	13,626	12,726	11,731
Planted forests	5,424	5,639	5,854	5,940	6,121
Total	23,571	21,821	20,947	20,072	19,197

Source: FRA, 2015. Country Report-Sudan

The total area of the forest reserve estate is 6.94 million ha (gazetted forests) distributed between 610 forests in all states as shown in Table 5. This area represents only about 3.7% of the total area of Sudan which is far less than the target of 20%. Forest reservation has been hampered by various factors especially the complex layers of land ownership and lack of political will to sort it out to facilitate forest reservation. Due to the difficulty of forest reservation, FNC is encouraging and helping local communities and private sector to own forests and manage them under FNC technical guidance. This has brought in more players to be involved in mobilizing resources to support the massive programme of rehabilitation and sustainable management of Sudan's natural forests.

Table 4: The number and areas of reserved forests by state up to 2014

State	Number of forest reserves	Area of forests (ha)
Red sea	54	2,221
Sinnar	116	478,059
Gadaref	112	764,420
Kassala	48	103,158
River Nile	106	87,987
Northern	22	43,289
Blue Nile	20	6,900
Southern Kordufan	222	377,180
White Nile	145	373,873
Gezera	73	142,943
Northern Kordufan	116	303,546
Northern Darfur	7	3,136
Southern Darfur	46	3,990,878
Western Darfur	35	293,493
Total	**610**	**6,941,107**

Source: FRA, 2015. Country Report-Sudan

In fact, the disappearance of forest and woodland resources in Sudan will enhance desert encroachment, thereby negatively affecting the quality of life and food security of its people. Therefore, the management of natural woodlands will need to be subsidized by government, or the market price of wood products raised to levels which would cover the costs of operations.

An important requirement for forest sustainable management is reforestation and FNC has considerable experience in establishing large scale plantations both for industrial and non-industrial plantations purposes that already cover 200,000 ha. The industrial hardwood species cover about 60,000 ha, mostly of *Vachellia (Acacia) nilotica*, *Khaya senegalensis and* other minor species in small quantities. These species are the source of sawn timber for construction and railway sleepers. The industrial softwood species are mainly *Cupressus lusitanica* growing in Jebel Marra, western Sudan, that covers about 2,700 ha. Non-

industrial forest plantations consist chiefly of *Senegalia senegal, Azadirachta indica, Eucalyptus spp., Prosopis chilensis*, and others. These species cover about 140,000 ha and are grown for production of gum arabic, firewood, charcoal and as shelter belts. Table 6 shows the total planted areas between 2002 and 2007 as carried out by different sectors.

Table 5: Total planted areas (in ha) between 2002- 2007

Type of planting	2002	2003	2004	2005	2006	2007
Official planting	21,008	10,268	12,605	12,158	13,377	42,213
Private and communities	17,647	10,606	5,147	5750	42,294	55853
Institutions and agricultural schemes	n/a	3,068	n/a	1,063	395	3,976
Total	38,655	23,942	17,752	18,971	56,066	102,042

Table 7 shows the growing stock of the ten most important species in the Sudan. Many of these species are naturally occurring and others in plantations as mentioned above. The growing stock of these species represents only about 5% of the total growing stock of all species in Sudan. These are rough estimates and extrapolations since no national forest inventory was carried out in Sudan since 1995. FNC is planning to undertake national forest resources inventory once it gets sufficient funds and therefore it is difficult to get detailed distribution of species by age classes and volumes. The importance of these species is not based on areas or volumes of wood or non- wood products produced but based on usage.

Table 6: The growing stock (million m^3) of the ten most important native species-1990- 2015

Species name	Growing stock in the different years				
	1990	2000	2005	2010	2015
Balanites aegyptiaca	23.5543	22542	20.5114	20.0324	19.4125
Vachellia seyal	17.4828	16.7345	15.22243	14.86879	14.4087
Anogiessus leiocarpus	8.987	8.604017	7.826	7.64325	7.40675
Albizia amara	9.8648	9.597	8.5904	8.3898	8.1302
Senegalia senegal	3.52165	3.37216	3.0667	2.99508	2.902413
Vachellia tortilis	3.12455	2.98847	2.7209	2.6573	2.575138
Ziziphus spina- christi	1.87055	1.787312	1.6289	1.59086	1.541638
Khayasenegalensis	1.5884	1.51956	1.3832	1.3509	1.3091
Vachellia nilotica	0.6479	0.61583	0.5642	0.55102	0.53347
Isober linadoka	0.418	0.03826	0.0364	0.03555	0.03445
Total	70.6838	67.63825	61.5524	60.11505	58.2549
Total GS of all species	**1638**	**1600**	**1456**	**1422**	**1378**

Source: FRA, 2015. Country Report – Sudan

From information gathered from FNC regional forest administrations, some estimates of total production of the important wood and non- wood products produced in 2012 and 2013 are presented in Table 8.

Table 7: Total production of important wood and non-wood forest products

Item	Unit	Production	
		2012	2013
Firewood	1000 m^3	286	166
Charcoal	1000m^3	173	170
Sawn timber	1000m^3	2.4	1.3
Logs	1000m^3	9.8	-
Raw employment	1000m^3	68.9	-
Railway sleepers	1000m^3	6.0	-
Small size round wood	1000m^3	298	51.3
Bamboo	1000 pieces	1050	1,632
Tree leaves and products	1000 pieces	3,305	1,501
Forest fruits	tonnes	6,193	4,882
Honey	tonnes	57.3	74.1
Sana makka	tonnes	45.0	47.0
Gum arabic	tonnes	7,092	33,392
Other gums	tonnes	23,788	42,477

Source: FNC, 2015. Annual Report

2.1.4. Plans for Sustainable Production

The consumption of wood in Sudan by far exceeds the ability of the forest reserves to supply hence the result is the observed overharvesting and forest degradation. FNC has been undertaking forest rehabilitation and mobilization of local communities and other private sector actors to engage them in forest production in order to minimize the balance between demand and supply of forest products in the country. The following sections give highlights on some of the measures FNC have been undertaking in this regard.

Despite its important role in the management of diverse forest resources in the country FNC, has been seriously neglected and underfunded, and one of the underlying causes of the meagre budget allocations is lack of quantified socioeconomic data to demonstrate the socioeconomic importance of forest resources to the economic development of the various sectors of the country economy to guide decision making. The forest sector is poorly organized and appears to be of little economic value to both the government and local communities hence its least attention in budgetary allocation. This perception is made worse because most of the forest reserves are degraded and without any management plans, and the unreserved natural forests continue to be cleared for agriculture and other purposes; all contributing to shrink the visible contribution of these resources to livelihoods and national economy.

The formulation of a clear strategy for forest development in Sudan has always been confronted with enormous difficulties because of the absence of accurate scientific knowledge on the forest resources. Information on the forest situation in Sudan comes from some sporadic surveys carried out by different agencies and is often inconsistent and sometimes contradicting. A comprehensive national forest inventory is, therefore, an essential prerequisite for comprehensive planning of the forestry sector. A detailed proposal has already been prepared by FNC waiting for international help to fund the implementation of the project. Another requirement for forest planning is the reorganization of the management techniques, operations and restructuring FNC to ensure appropriate balance between the interests of the country as a whole and those of the regions and the local people in relation to the management and utilization of forest resources. The aim of reorganizing FNC is to achieve good governance that will involve the revision of the current policies and legislations in ways that lead to more effective management of these resources and, in addition to securing their enforcement.

2.1.4. Industrial wood

The country imports about 65% of its sawnwood requirements at a cost of between US $ 15 million and US$ 20 million per year; this could have been saved if proper management of local forest resources was done. Therefore, the major focus of the investment programme in commercial forestry is to reduce and possibly eliminate this foreign exchange cost to Government of Sudan (GOS). The industrial softwood species mainly *Cupressus lusitanica* grown at Jebel Marra, western Sudan, is not accessible at due to security reasons. The following are some of the constraints that face the development of commercial forestry in Sudan:

- The deplorable road infrastructure in the country hinders the delivery of logs to sawmills as well as sawnwood to key market outlets;
- The government set log prices is far below market value and need revision upwards to attract more investors into commercial forestry sector. Alternative forest reserves can be concessioned to private sector investors that could employ market prices in valuing of their forest resources;
- Regional government funding levels are inadequate to meet operating costs, and this is made worse by high operation costs and low selling prices that make forest sector a net drain on regional finances; and
- The area of forests under management plans and under sustainable production is not adequate to support many industries.

FRA, (2015) provide some estimate areas under Table 9 the different categories of forest by area (ha) for the years 1990-2015.

Table 8: The areas of the different categories of forests

Forest type	Growing forest areas in ha (1000')					
	m^3/ha	1990	2000	2005	2010	2015
Productive forests	80	2,900	3,500	4,743	4,821	5,038
Private forests	50	1,628	1,764	6,332	6,332	6,332
Protection area	90	3,254	3,254	3,254	4,709	4,709
Other natural forests	70	15,052	13,306	6,623	4221	3,631
Total		23,570	21,826	20,954	20,082	19,210

Source: FRA, 2015. Country Report-Sudan.

The first category gives sustainable production, including some of the area of natural forests in Blue Nile, Southern Darfur and Southern Kordufan States which can be subjected to sustainable management. The private forests include all gum gardens in different parts of Sudan.

2.1.6. Non-wood forest products and services

The role of forests in the provision of a wide range of NWFP´s for industry and other related services has been emphasized in local and international literature. Most of these products, like gum arabic, fruits, seeds and others provide the food industry with raw materials for oil, soft drinks, protein- rich foods and other products. In Sudan, the quality measures for most NWFP's are lacking except for gum arabic that undergoes basic grading, cleaning and preliminary processing by small local enterprises in an attempt to add value to the product. These processing operations involve small amounts of the gum production while the rest is exported in raw forms.

Gum arabic, and all other NWFP's are more amenable for sustainable harvesting and use than wood products. They tend to have greater environmental benefits including conservation of biodiversity if carefully managed (Nepstad and Schwartzman, 1992). Table 8 shows the total production of some important NWFP´s in the years 2012 and 2013 while Table 10 shows the private forests owned by gum farmers in different states.

Table 9: Private forests owned by gum farmers (ha) in different states

State	Number of societies	Membership	Forest area (ha)
Blue Nile	347	24,795	1,236,975
White Nile	036	02600	0230,717
Sinnar	088	06241	0322,243
Gadaref	035	02975	0692064
North Kordofan	142	18500	0,682321
South Kordofan	540	29700	1,035,690
West Kordofan	156	14,285	1,113,115

State	Number of societies	Membership	Forest area (ha)
Darfur Region	n. a	n. a	0,692,980
Total			6,006,114

The role played by forests in climate change is valuable in adaptation and mitigation approaches. It could also be negative when deforestation and forest degradation are not controlled. The contribution to greenhouse gas (GHG) emissions from deforestation and forest degradation is the highest compared to that of other sectors. The clearance of large areas within the savanna zone for agriculture has increased people's vulnerability to climate change. This is adversely reflected on carbon storage in Sudan forests. Table 11 shows the amount of carbon stored in the different parts of Sudan´s forests.

Table 10: Carbon storage in forests and other wooded land (million metric tonnes)

FRA 2015	Forest					Other wooded land				
Carbon source	1990	2000	2005	2010	2015	1990	2000	2005	2010	2015
Above ground biomass	1870	1790	1629	1591	1541	179	165	159	152	146
Below ground biomass	524	501	456	445	432	119	110	106	101	97
Carbon in litter	50	46	44	42	40	53	49	47	45	41
Soil carbon	825	764	733	703	672	885	821	788	756	724
Total	3268	3101	2862	2781	2724	1236	1145	1100	1055	1010

Source FRA, 2015. Country report-Sudan

2.2 Supporting institutions

With regard to institutional issues, forestry research, extension, education and training are part and parcel of the forestry sector, but they are not given due consideration as active partners in primary and secondary forest production. Forestry research aims at facilitating forestry development by providing technical information and technologies for use in forestry development process. Forestry research is critical in Sudan, where more than 95% of its natural forests are degraded and require science supported rehabilitation technologies and strategies for resource mobilization for massive rehabilitation programme (World Bank, 1988). However, the present institutional capacity of the forestry research is inadequate because it is grossly underfunded and understaffed. The Forestry Research Centre (FRC) is affiliated to the Agricultural Research Corporation where FRC is apparently not priority; so FRC receives meagre budgets and rarely new staff recruitments.

Some of the actions that the forestry extension programme should undertake are prioritized as follows:

- Create awareness among the people of the benefits of forests and trees in providing daily needs and protecting the environment and addressing the causes and consequences of deforestation;
- Provide information on legal, technical and institutional possibilities for village level and private afforestation;
- Encourage active participation, especially by farmers and livestock owners in planning, management and execution of rural forestry programmes and create a society-wide feeling of responsibility for the environment and protection of local forestry resources;
- Introduce simplified forestry education which will address major issues, like deforestation and desertification, at school, NGO´s and village administration levels; and
- Strengthen public-private sector relations for promoting SFM and livelihood development.

Forestry education in Sudan was started in 1946 with commissioning of a two-year diploma awarding in a forestry school that was within the national forest administration; however, the school was later shifted to the Ministry of Education and lastly to Khartoum Polytechnic Institute. The direct management and influence by the national forest administration on technical education in forestry in Sudan ended in 1995 when the Khartoum Polytechnic Institute was upgraded to Sudan University of Science and Technology (SUST).

Since 1946 there was no bachelor's degree being offered on forest education in Sudan. Students were sent to Edinburgh University (U.K) for B.Sc. degree in forestry. A few students were sent to Aberdeen University (U.K), Pakistan or Australia. In 1973, the first Forestry Department was established at the University of Khartoum in the Faculty of Agriculture. The Forestry Department was later upgraded to a Faculty of Forestry that awards B.Sc. (Honours) in forestry in five years. There are about eight forestry education centres in different universities in Sudan, including the College of Forestry and Range Science of Sudan University of Science and Technology. The core mission for higher education is to educate, train, undertake research and thereby contribute to the sustainable development for the welfare of society as a whole.

2.3 Private sector in forestry

The 1986 policy that was amended proposed in 2006 encouraged the ownership of forests by private sector, local communities and corporations to participate in forest management and making use of their products for their welfare. They also stressed the need for effective forest extension services to raise the awareness between the people and help them to manage their forests for their own good. This development encouraged local communities, local authorities and other private corporations to participate in forest operations by allowing them to own forests as means of self-employment and making rational use of their forests.

The private sector participates by managing the forests they own as individuals, families (farmers), communities, private cooperatives and others; and thereby should be considered as part of the forestry sector. The practice of state monopoly on forestry no longer exists.

The reduction in fuelwood supply and reforestation problems will depend to a very high degree on the extent to which farmers and local communities can be encouraged to undertake tree growing. Village communities, farmers and private forest owners can also participate in protecting and managing their forests and in establishing their own plantations. The extensive activities and training programmes carried out by FNC among local communities resulted in increased awareness among communities, especially gum producers, who felt the urgent need to form cooperative associations which will voice their problems in local, regional and national meetings. These associations encompass all producers' committees officially registered in the different states.

Because the stumpage prices for wood extracted from forests could not cover their replacement costs, there was little incentive for the private forest sector to invest in reforestation and undertake sustainable forest management practices for it doesn't make economic sense. Some FNC interventions were mostly to secure forest resources and to ensure that legislative and other policy actions were implemented. Until recently, the FNC interventions fell short of attracting investment from the private sector and communities into the forest sector. Measures such as increasing stumpage fees, use of incentives and offering subsidies to encourage tree planting could have been explored. Additionally, local communities were not given sufficient economic incentives and technical advice to seriously enter in sustainable management of forest resources. The FNC was advised to make interventions that should also target drivers of forest degradation by identifying and resolving broader economic conditions and factors that influence actors to participate in forest degrading activities (World Bank, 1986).

Due to recent good efforts made by FNC and its regional staff, the situation is rapidly changing for the better. Thanks to FNC that many local communities and private forest owners presently are able to sustainably manage their forests and earn good money for providing services to their villages and improve their livelihoods. This has been due to variety of incentives offered by FNC to communities that included subsidized seedlings and support to private nurseries to encourage community forestry. Community wood lots were also among the earliest attempts to create a set of economic and social incentives that would motivate rural communities to participate in tree planting, management and prevention of illegal cutting. The first community woodlots were established in the late 1980's by FNC with the support of FAO. These first experiences provided interesting lessons for the evolution of community-based management systems. Since then similar programmes were established in most parts of the country and now community forestry is practiced in many states. FNC continues to provide extension services, technical know- how and follow-up advisory visits to make sure that the system is progressing well and communities are benefiting from it (Mohammed, 2013).

Individual farmers, however, are not always responding favourably to these incentives and approaches because products like gum arabic or other forest products are not the main source of income for farmers, much as they provided employment during the summer months when alternatives were not available. The importance of gum arabic as an income generating source to farmers has been falling. For example, in early 1970's gum arabic

accounted for 50% of farmer's income but has gradually decreased to 10% by 2000s. Given the present high prices of sorghum, millet and sesame compared to gum, farmers are removing gum gardens to grow annual crops, a practice which is resulting in desertification and the depletion of gum trees (*S. Senegal*). Now the government is trying to restock the gum belt which stretches across Sudan between latitudes 10 and 14 N.

Many Gum Arabic Producer´s Associations (GAPA′s) were formed in order to maximize the farm gate returns to rural communities through the transfer of skills to improve tree tapping, value addition (by cleaning, grading and packing), collective delivery and marketing. The participation of stakeholders in GAPA′s is still active in gum production areas of the country. The total number of GAPA's in Sudan is 2,975, of which 2,216 are registered. The total membership is 1.5 million people, with 40% being women. Women are involved in seed collection, nursery work, planting, field inspection, tapping and gum collection. They work in groups in collection of gum and other non- wood forest products (Ramly, 2015).

These groups are encouraged to participate in forest management and practice sustainable utilization of NTFP in their areas of jurisdiction. The forest policy also stresses the need for effective forest extension services to raise the awareness of GAPAs members for better management of their forests.

2.4 Other actors

The solution to fuelwood and reforestation problems in Sudan will depend to a very high degree on the extent to which farmers and local communities can be encouraged to undertake tree growing. A number of NGO's like Green Desert, Sudan Council of Churches, CARE, among others, have collaborated with FNC in the promotion of tested technologies for reforestation and awareness creation on the importance of tree growing in the country's economy and in different environmental conditions. To harness the experiences, organizational capacities, and financial resources efforts of various actors, FNC needs to create a coordinating agency to facilitate scaling up of afforestation in Sudan. This is because no state actors such as NGO's are active partners in development projects, in spite of their vast experiences in forestry development and mobilization of local communities in production of seedlings and attitude changes in favour of forest conservation in Sudan. A number of projects involving collaboration between village forestry committees, FNC and NGO's have been successful and convinced village leaders of the potential benefits. This kind of collaboration resulted in the establishment of many community forests.

In the year 2010, FAO realized that a country like Sudan which is expected to be a bread basket for the rest of the world is rapidly losing land productivity in many of its areas. To address the problems, FAO initiated the "Sudan Productive Capacity Recovery Programme" with emphasis on stakeholder capacity building component. The programme was aimed at training trainers from the staff of the ministries responsible for agriculture and natural resources in four states, on methods of restoring land productivity. In all states the

composition of the trainees' groups were satisfactory gender wise (30% females on average), as well as with regards to participant's affiliation to the different fields of natural resources.

3. SECONDARY FOREST PRODUCTION

3.1 Forest products processing

Wood industries are characterized by rationalizing the use of raw material. They complement each other in the use of raw material as well as the use of manufactured products. Wood industries produce good quality products from cheap local materials most of which is wood waste, with both economic and environmental benefits.

FNC should embark on mobilization of private sector players to engage in processing wood and non- wood forest products, because the private sector in Sudan has been reluctant to invest in forest product processing because it considers it as a high-risk venture. Setting up of wood processing industries by the private sector will provide employment opportunities for poor rural people in value addition processing. The processing and distribution of forest products depends highly on the availability and sustainable supply of raw materials. Unfortunately, in Sudan most of the forests are degraded and need urgent rehabilitation and investment in sustainable management approaches before the country can think of establishing large scale wood processing industries.

Sawmilling and other small-scale industries based on sawn timber like furniture are the only wood industries in Sudan at present. FNC produces 80% of locally produced sawn timber from its sawmills and private sector players produce the balance, i.e. 20%. The FNC sawmills use logs of 30 cm and above and sell the smaller diameter to the private sawmills. Smaller diameters that cannot be sawed are sold as firewood. Most of FNC sawmills are very old and are operating under very poor conditions and low efficiency. The conversion factor is about 40% on average for local hardwoods. Some softwood logs are imported and sawn in Sudan with a conversion factor reaching 80% due to the good quality of the logs.

The furniture industry is totally private, and the workshops work at 20% of their installed capacities because most of them are still at the artisan level. Between 2002 and 2007 the total volume of sawn wood produced locally ranged between 3,049 and 5,057 m^3 annually (Mohammed, 2013). While in 2013 the total volume of sawn wood produced was 1,300m^3 because the National Railway Corporation (NRC) suddenly switched from using wooden sleepers to concrete sleepers. In 2015 they changed their mind and put a new order for wooden railway sleepers from FNC.

The total volume of sawn timber produced in 2014 was 4,248 m^3. The volume of sawlogs produced in the same year was 4,978 m^3, in addition to an approximately equal volume of logs which remained from the previous year. The produced sawn timber is used for furniture, railway sleepers, buildings and other uses. The furniture industry, however,

prefers imported softwoods which are easy to work with. Big companies which are well equipped with woodworking machines use local hardwood mainly *Khaya senegalensis* (mahogany) and *Vachellia* (*Acacia) nilotica* which is too heavy for furniture. Charcoal processing based on traditional technology applied by the private sector is characterized by low efficiency and therefore with considerable waste. The traditional charcoal production method, particularly earth kilns may have conversion rates which don't exceed 30%. However, there are pilot trials on charcoal production that indicate possibilities of improvement.

The role of forests in providing a wide range of NWFP's for industry and other related services has been emphasized locally and internationally but quality measures for NWFP's are lacking, except for gum arabic. This includes basic grading and cleaning operations mostly for export; supplies for local use are hardly graded. Sudan has not published NWFP quality requirements or standards to be observed by producers. The producers are usually farmers and pastoralists with good representation of women who gather non- wood products to supplement their basic diet and as raw materials for some small cottage industries. Gum arabic is the only non-wood forest product that is processed in Sudan. It is either ground into powder or spray dried before exporting it.

3.2 Forest products marketing and trade

Except for gum arabic and one or two minor (medicinal) NWFP's, all forest products are marketed locally. FNC and regional forest administrations produce round industrial wood, sawn timber, firewood charcoal, poles and other small size roundwood, and market all of them locally. They also carry out sawing and selling the sawn timber locally, mostly as railway sleepers and for furniture, carpentry work and building construction. The prices of woodfuel, poles and sawn timber are dependent on the cost of transport which is very high. In spite of this, very little is paid in the form of stumpage fees to the government. Only recently, FNC started to review the stumpage fees for roundwood, and it is gradually increasing it. An increase in stumpage prices should also encourage private investors to start plantations and charcoal producers to improve their production techniques to more efficient methods. Sudan also imports many wood products. As shown in Table12 there are large discrepancies between the local and international market prices.

Table 11: Comparison between prices (US$) of local and imported wood products in 2010

Types of wood products	Prices of local products	Prices of imported products
Industrial roundwood (per m^3)	130	767
Sawnwood (per m^3)	320	1,306
Pulp for paper/ ton	-	331
Paper and paper board/ton	-	700

Source: Mohammed, 2013

In accordance with its financial and operational policy, FNC tries to achieve its investment objectives by improving the quality of wood and non- wood forest products with the aim of maximizing the financial returns. However, FNC is facing many challenges and constraints in its endeavour to achieve these objectives. For example:

(a) Sawn timber produced in all sawmills is marketed through contracts made with the applicants such as the National Railway Corporation (NRC) for railway sleepers. Currently, FNC puts advertisements in newspapers in December every year for people to put their orders for sawn timber, so that sawing programme will be done in accordance with the orders received from its buyers. FNC is also looking for new markets for its sawn timber, as they are not sure whether or not the NRC will be a permanent or reliable customer.
(b) Lately, firewood demands in local markets have dropped significantly because many people are switching from the use of firewood to natural gas. Some of the firewood can be exported to the Gulf States but the Ministry of Commerce is hesitant to promote export of firewood and charcoal because of an existing export ban.
(c) Further, the Council of Ministers ordered FNC to stop cutting trees or get stumpage fees from the forest in spite of the fact that it is a self- financing corporation mostly from funds generated from sale of forest produce. This was in early 2015; however, the order was later reversed and now FNC is allowed to cut trees from managed forests.

Up to 2011, the export value of forest products from Sudan was more than the value of imported forest products, which indicates the positive effects of the forestry sector on the balance of payments. The situation is reversed now.

Except for gum Arabic, most of NWFPs are collected and marketed by local communities, mostly women. NWFPs are important for forest dwellers and local communities who use the products for livelihood support and social and cultural purposes. NWFPs are also important to urban customers, traders and products processors.

In the case of gum arabic, marketing is arranged by merchants who buy gum from producers at auctions, clean it, grade it, pack it and deliver it to exporters. Some of the constraints facing gum arabic marketing include: the low quality of marketing services; quality control and standards; and the share of Sudan in world market dropped from 80% to 52% due to lack of incentives to producers. Prices paid to producers were less than 15% of the export prices. In addition, taxes and fees imposed by federal and state governments are discouraging investments in gum arabic, as well as inadequate supporting finance. Further, increased agricultural crop prices are encouraging producers to favour crop cultivation, and abandon gum arabic production, thereby even clearing the trees for cropland.

Gum arabic is concentrated in remote areas and producers face severe transportation difficulties to marketing sites. Lack of storage facilities, and risk and uncertainty of markets and trade are other constraints to gum Arabic production and trade. The gum arabic is found mainly in the gum belt of the central part of the country (Fig. 2), and it still remains one of the main export commodities from Sudan and plays a significant role as a foreign

exchange earner. The total volumes and value of gum arabic exports for the last four decades are shown in Table 13.

Table 12: Gum arabic exports (1970-2010)

Decade	Export (tons)	Value (million US$)
1970-79	348120	356.5
1980-89	247902	504.7
1990-99	198477	387.3
2000-10	307818	454.7

Source: Mohammed, 2013

This means during these four decades the average amount of gum exported annually was about 27,558 tons at a value of about US$.42.6 million.

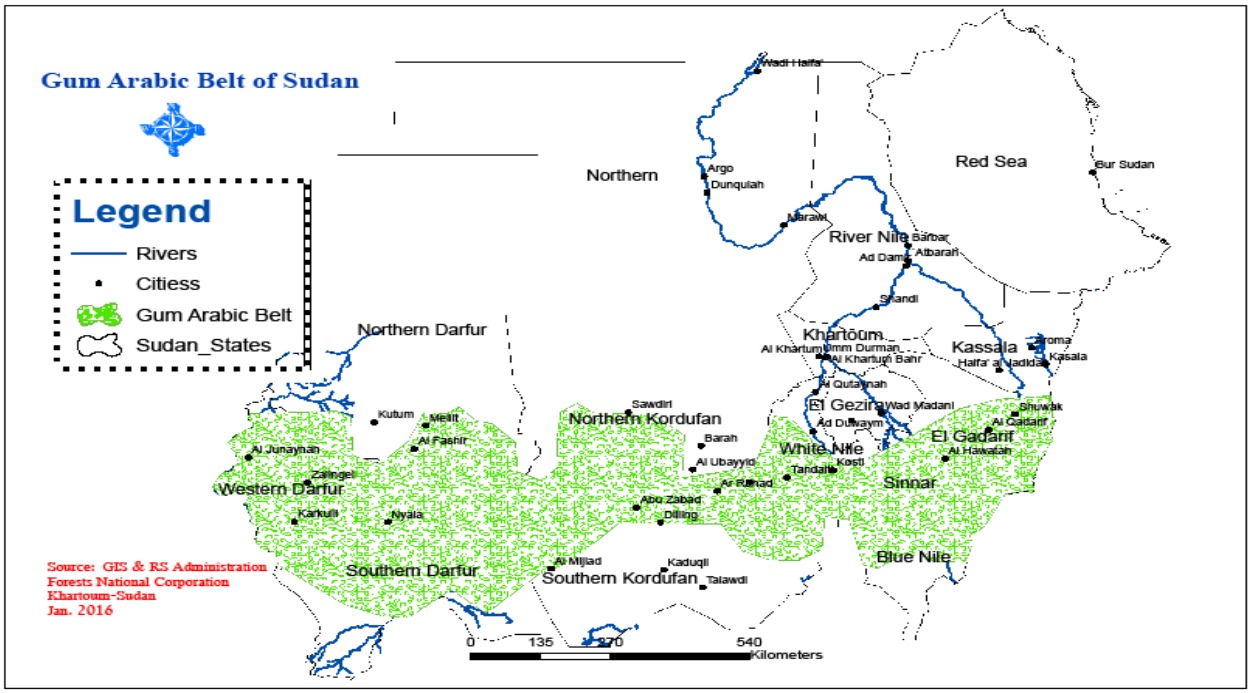

Figure 2. Gum arabic belt of Sudan. Source: FNC´s management section

Sudan's import of forest products is mainly of sawn softwoods and wood panel boards which are used mainly for furniture making. Imports also include paper and paper board, pulp, as well as ready-made furniture, doors and other building material. There is also considerable importation of NWFP's like bamboo, fruits, pods and others. The value of all legally imported wood products in 2010 amounted to US$. 477.9 million, while the value of exported NWFP's amounted to US$. 2.2 million (Mohammed, 2012).

4. GENDER ISSUES

In almost all communities worldwide, men and women have different responsibilities, needs and priorities, as well as knowledge of, access to and control over the local environment, and forests in particular. Like in most developing countries, men in Sudan view forests in terms of commercial possibilities, whereas women usually see them as a source for domestic needs. Changes in land and tree tenure are viewed by women according to their effect on possibilities for gathering food, fuelwood, fodder, medicinal plants and raw materials for small industries and on tree, plant and animal production for consumption or sale. Women are also custodians of biodiversity and wildlife as a major component in household food security for poor women (FAO, 1995).

Women are the main harvesters of many wood and non- wood forest products in Sudan: they are the primary collectors of firewood. This is a difficult task that involves walking long distances and carrying heavy loads. Men are generally engaged in large scale firewood collection, mostly for sale. While women are not prevented from doing so, men are not allowed or they have to pay stumpage fees. Like many developing countries rural women in Sudan depend on forests for many products and services and deforestation and environmental degradation will hit them hard (Joekes, 1997).

Although women possess a wealth of knowledge about forest resources and the values which can be derived from them, they are generally excluded from decision and policy-making process at local and community levels. At professional level, however, the proportion of women among professional foresters in FNC and its provincial administrations is reasonably high, and they take active role in decision making.

Up till recently, the local forestry committees formed were male dominated, thus the needs and priorities of the main forest user group, women, was either unheard and not taken into account adequately in forest decision making. This situation is changing now and there is an increasing tendency for gender to be taken into account when designing community forestry projects. But simply having female participation in the project does not necessarily mean that they will benefit from it. Too often women have been expected to volunteer their time for these projects, thus diverting their efforts from other often income- generation activities like collecting and selling forest products. Moreover, the fruits of their efforts often accrue to men of the village. To ensure project success it is important to adequately take account of the different roles, needs and priorities of men and women.

As seen in previous sections, the gender issue is well taken care of in gum arabic communities, where many GAPA's were formed and well organized with very significant role for women in the whole gum Arabic value chain. The total membership of the associations is 1.5 million people, with 40% women (Ramly, 2015). The only problem is that the prices paid to producers have been less than 15% of export price but this is improving now. Taxes and fees imposed by government, shortage of funds and higher crop prices will favour crop cultivation, thereby making farmers invest less on gum Arabic collection.

5. RELATIONSHIPS AND LINKAGES

5.1 Forestry and agriculture

A key element in the response of the international community to the challenges and opportunities facing world forests lies in the development of the concept of sustainable forest management and its relation to sustainable (human) development. This concept seeks to bring balance between environmental, economic, social and cultural dimensions of managing forests. The vast majority of our forests are situated close to poor rural communities. The revival of these forests and restoration of their productivity will enhance their productive, protective and social functions for the well- being of local communities and boosting national economy (Nasroun, 1983).

One of the main obstacles toward SFM, and in turn sustainable agricultural development, is the lack of coordination between the sub- sectors sharing land. There is serious competition between producers and service providers in both forestry and agriculture. Agriculture is expanding rapidly at the cost of forests, and large-scale deforestation is taking place resulting in the spread of drought and desertification and loss of land productivity that also lowers sustainable agricultural productivity. It is retarding rural development resulting in increased poverty and make livelihood difficult in rural communities.

For example, mechanized farming schemes have taken four million ha of former forest land, some of which have been abandoned after two or three years of continuous sorghum cropping. The steady deforestation that has occurred over the last four decades under the combined effects of agricultural encroachment, fuelwood harvesting, and overgrazing have reduced the forest area in Sudan by almost 50% between 1960 and 2010. FNC has been powerless to play an effective role in forest conservation and management in cases of competition from agricultural development that often led to severe environmental degradation and serious loss of land productivity, which in turn is threatening food security in a country which is supposed to be breadbasket for the rest of the world.

The 2006 forest policy indicates the need to integrate trees into agricultural programmes, especially on marginal land, by encouraging farmers to adopt agroforestry systems. It also states the need to establish shelter belts around mechanized rain- fed schemes to occupy10% of the area, and in irrigated agricultural schemes (trees to cover 5% of the area set aside). The forest policy should ideally be under the umbrella of an approved land- use policy/ plan (Pardo, 1986). A long- term national land-use plan is a basic requirement for the future development of the natural resources of Sudan. It is expected to addresses the problems of land tenure; and must be comprehensive. Its preparation should involve the active participation of all relevant agencies of government and it should outline a strategy for the integration of different forms of land management in GOS development plans. Under these plans, appropriate provisions should be made to include components for forestry conservation and projects involving land use, regardless of the type of project or the executing agency.

5.2 Linkages with supporting institutions

It is essential that all related agencies and institutions which are outside the normal forestry institutional framework (FNC) should be brought under some form of coordinating agency. This would help in exerting control by allocating responsibilities for the monitoring and evaluation of FNC performance by setting policy guidelines for forestry development activities. Unfortunately, this kind of linkage is absent. These institutions include: forestry research, forestry extension, education and training.

5.2.1. Forestry research

Forestry research, like any other field of research is aimed at facilitating forestry development by providing the necessary information on new techniques and technologies to be adopted in forestry development process. Forestry research results should provide the strongest arguments to convince people and change their attitudes in favour of forestry and integrated land-use patterns. This kind of information will stimulate people's interest in planting trees and promote the development of self-reliance with regards to the basic community needs. The major problems to be tackled by research in a fragile environment like in Sudan fall into the following categories: shortage of food, fodder, fuelwood, other wood products and environmental problems.

The present institutional set up for forestry research is inadequate to support the work programme required. The Forestry Research Centre (FRC) is a weak organization with facilities and budgets too meagre to enable it to function efficiently. FRC became a weak organization since it was annexed to Agricultural Research Corporation (ARC) in 1975. Before that it was part of CFA which later became FNC and was in a much better condition. It is recommended that FRC in Sudan should be brought back to be part of FNC. This will ensure that research programmes will serve the main client (FNC) and with possibility of increased financial support. According to ARC, like other agricultural unit, forestry is not a priority. In spite of its importance in the forestry sector, forestry research has no effective linkage with FNC.

5.2.2 Forestry extension

An effective extension programme is needed that will involve a significant change, in terms of orientation on the part of FNC from traditional forestry to social forestry concept which has already started. With assistance from FAO, FNC was strengthened to train extension specialists who are supporting efforts of Regional Forest Departments. The extension programme set was very effective in educating and training of staff and field workers and raising the awareness of rural communities about the importance and the values to be derived from forests. However, some states, where new community forests have been established recently are badly in need of extension services.

5.2.3. Forest education and training

The formal training of professional staff carried out in eight universities in Sudan is under the Ministry of Higher Education. As a result, information about the staff requirement of FNC and its regional administrations is not directly available to them, and the student numbers and size of annual intakes are often determined on an ad hoc basis without reference to employment possibilities. In all these institutions the ratio of female students varies between 30-50%. There is no formal technical training at present as the Forest Rangers College was up- graded to the College of Forestry and Range Sciences in Sudan University of Science and Technology, which awards a B.Sc. (Honours) in both Forestry Science and Range Science. Major constraints in all cases include the insufficiency of physical facilities, and shortage of equipment and funding.

Knowledge and advanced skills achieved by quality education and training are critical determinants of the country's economic growth and the standard of living, as learning outcomes are transformed into goods and services. In global economy knowledge capital is replacing physical capital as a source of wealth. The current status of forestry education in Sudan is unsatisfactory. Technical education and training is lacking. Efforts should be made to improve the quality of higher education by addressing problems like commercialization, privatization, political interference and falling management standards. Linkage with FNC is important to establish performance indicators to measure progress toward achieving national goals and satisfy the job market and contribution towards national welfare. Stronger forest industry education linkage is needed to revitalize and promote the needed practical training experience for higher education students which will help them in self-employment and encourage investment in forest industries.

The higher education system, including forest education does not produce graduates with the knowledge, skills and attitudes appropriate for successful living. Therefore, reforms and restructuring of higher education system has become an urgent priority. This should be complemented by improving general education, technical education and vocational training. FNC, however, has a centre for vocational training and on the job training for their staff and workers. A forest education advisory committee should be established comprising representatives from all associated agencies, including FNC to ensure that training curricula are appropriate to the country's needs. More support is needed for teaching and research facilities and forestry technical training must be revived.

Unfortunately, the linkage between forestry education institutions and FNC is also weak. A number of times memoranda of understanding were prepared between FNC, forestry departments in universities and forest research institutions for collaboration by making an advisory committee from the heads of these institutions. Every time a memorandum was signed between these institutions nothing happens because FNC senior staff were not enthusiastic about such cooperation. These linkages between complementary institutions like these should be mandatory and should be supported by legislations, if the need arises, and not left for the decision of one person or another.

5.3 Public-private-partnerships in forestry

It could be seen from the previous section that the linkage between FNC and supporting agencies- forestry research and education is very weak. The coordination between FNC, farmers and local communities is fair and getting better and better through extension activities and forest or village committees which are trained by FNC staff for managing their forests and planting crops with trees to share benefits in multiple agricultural systems. This may be considered the second-best model of public-private-partnership (PPP) in forestry after the GAPA´s model in gum arabic communities. The GAPA´s formed and supported by FNC proved to be the best approach for promoting a promising PPP with fair representation of women. Coordination with state governments is also taking place. The private sector is encouraged to participate actively in management of their own forests in accordance with the provisions contained in the 1986 forest policy.

Because of lack of resources, FNC is not able to implement large scale forestry programmes. This encouraged the mobilization of the rural communities in tree planting through appropriate community forests and agroforestry techniques. Farmers and agricultural corporations are obliged to plant shelter belts around their farms and along canal banks. A number of projects involving collaboration between village forestry committees, FNC and NGO's have been successful, and this has convinced village leaders of the potential benefits of this approach. This is another example/approach of PPP which should be encouraged and promoted by FNC. As mentioned in previous sections FNC has established many GAPA's in order to maximize the benefits to rural communities through the transfer of skills (Ramly, 2015). This is particularly true in case of gum communities.

It is becoming difficult to establish Central Government forest reserves because of the many land claims made by local people on forest reserves. To get over this problem, FNC started helping local communities and other private sector players to reserve forests for themselves and assist them to manage and make use of their forests.

One example is *Wad Annial Shaggat community forest reserve*, located south of Singa town, the capital of Sinnar State that own and manage a total of 67,000 ha; part of it was formerly privately owned and the rest was government land. The area was reserved for the seven villages located adjacent to the forest area with the help of the regional Forest Department of Sinnar State, a regional office of FNC. The area is distributed between the seven village communities that are allowed at this early stage to cultivate crops, some graze their animals, others tap and collect gum arabic from *Acacia Senegal* trees; while the rest are waiting for their trees to mature for use as firewood and for production of charcoal, they include *Vachellia (Acacia) seyal* var. *Seyal* and *Senegalia (Acacia) mellifera.*

Each of the seven village communities has its own forest committee, with all committees coordinated by a high-level board or council, with the Regional Director of Forestry as a member. Since forest production can be managed sustainably, and whereas crop production is dependent on sporadic rainfall, the communities with, the assistance of FNC, are planting gum trees and other trees for firewood. The first tapping and collection of gum

in 2015 earned the communities more than US$2.0 million, in spite of the fact that the trees were still young and that tapping was undertaken by unskilled communities. The only role for women at this stage was tapping gum trees and gum collection.

Based on these experiences, FNC is planning to launch a big extension programme to train local communities in management of their own forests in different parts of the country. FNC also issues certificates of ownership for these communities in case they want loans from banks. The Regional Director has requested permission from FNC to carry out an inventory programme to facilitate development of a management plan for community owned forests.

In Dindir area, the situation is different. A number of community forests are established along sides of Dindir River, which spreads its water, in flood time, over large areas. When the flood water recedes, communities broadcast tree seeds. These are excellent sites that facilitate fast growth of *V. nilotica* that is clear felled in short rotation for firewood, charcoal and local building poles. One example of this type of forests is *Salih village community forest*. It was reserved and established with the help of FNC, in collaboration with local NGO´s to help the villagers to establish forest stands. They have learned how to tend and manage their stand sustainably that enables them to sell their trees every 10 years and the land is re-seeded after harvests. Although they have realized two rotations, the community was able to build a school and a mosque for themselves, as well as introducing electricity to their village. This is in spite of the fact that the area of the forest is only about 10.5 ha. There are many of these small forest areas along the river and in depressions which hold rainwater for some time.

In Hawata area, Gadaref State, during the study, one community forest and a private forest were interviewed. According to the information provided by the chairman of the community forest committee, FNC assisted the community to reserve the forest of about 250 ha. The forest committee is the link with the FNC forestry staff and according to a tentative management plan the community is allowed to cut about 12.5 ha every year for 20 years. The forest is now well protected and the forestry staff will not give them permission to cut any new area before they make sure that the area felled in the previous year is regenerated. They sell their stock standing and make use of the returns in providing services to their village. With their first crop, they used the revenue in building an embankment to protect the village from river flood. They also built a school for their children in addition to a mosque.

The private forest visited in Hawata area covered 615 ha. About 35 ha are left for rainfed agriculture, while the remaining area was a natural forest with 75% *V seyal*, 15% *S mellifera,* 5% *S senegal* and 5% *V nilotica.* The owner works according to a work plan with the technical advice from FNC regional staff. He is allowed to cut 25 ha per year. He sells part of his produce as firewood, but most of it is converted and sold as charcoal. Regional forest division gets royalties from the produce. The owner earns about US$20,000 net each year from selling tree products while the revenue from agricultural crops fluctuates with rainfall.

6. FOREST PRODUCTS PAST TRENDS

6.1 Forest production

Early studies done in 1950's and 1960's showed that productive forest covered an estimated area of 45.5 million ha in the 'former Sudan'. A later revision indicated between 44.5 and 58.5 million ha. The growing stock for key production types were 1,280 million m^3 of fuelwood and building poles and 52 million m^3 of timber. The overall stocking based on these figures would be between 23 and 29m^3 ha^{-1} of productive forests, with actual values ranging from 150m^3 ha^{-1} in montane forests of southern regions to less than 1 ha^{-1} in the northern bushlands. From a woodfuel point of view, all woody biomass, including branch wood, is burnable irrespective of percentage tree cover.

However, there has not been any national forest inventory to verify the above data and other estimates that sometimes provide contradictory figures. The National Energy Administration (NEA) did commission a study by CFA (later became FNC) in 1972 that used Landsat imagery to revise previous estimates. Some growing stock inventory at low intensity was carried out in selected areas including Blue Nile, White Nile and Kassala Provinces. The average growing stock stem volume was found to be about 24 m^3 ha^{-1} and total above ground volume about 33 m^3 ha^{-1}. Preliminary data from these surveys indicated a total annual allowable cut of 15 million m^3 for the northern regions and 29 million m^3 for the southern regions. The available growing stock was not evenly distributed between north and south and between states within regions.

Afforestation and reforestation activities have been practiced in Sudan since 1911. The annual CFA afforestation programmes ranged between 2,000 and 2,520 ha during the period 1910-1950 to some 35,000 ha during 1990's and from 24,000 to 48,000 ha of forest plantations during the period 2000-2009, all depending on the availability of resources including foreign assistance (World Bank, 1988). The forests are valuable sources of many useful products other than wood. They range through fruits, shoots, medicinal plants, fibres, tanning compounds, gums, bee honey and many other NWFP's. Except for gum arabic, the value of these products has not been quantified. These products have been mostly consumed by the collectors. Although fruits are in demand in the markets, small quantities are traded.

Sudan used to produce 85% of the world's supply of gum arabic up to 1980's, either from privately owned gum gardens which form part of the traditional bush- fallow farming system on the sandy soils, or from natural stands of *S. senegal*. Production started to decline in the early 1980's as the high world prices set by Sudan encouraged users to seek synthetic substitutes, and low producer prices effectively removed production incentives. Production increased again in 1984 but this was a result of the drought and crop failure resulting in a need for some cash income for survival, rather than a long-term reversal of the production trend (World Bank, 1988).

6.2 Forest products consumption and marketing

The consumption of wood in the northern regions (Republic of Sudan) and the southern regions (South Sudan) have remained relatively constant. The north took nearly 78% of the total consumption, an estimated 53 million m^3 up to the year 2000. Due to difficulties of getting wood from southern regions, the north was obliged to rely on its meagre local resources. This was a big burden on the forest resources in the northern region which resulted in forest degradation. Table 14shows the estimated total consumption of wood between 1983 and 2000.

Table 13: Estimated consumption of wood products (million m^3) between 1983-2000

Product	1983	1985	1990	1995	2000
Woodfuel + charcoal	32.99	35.03	40.03	44.54	49.00
Poles	1.59	1.70	1.94	2.18	2.40
Industrial wood (saw logs)	0.71	0.77	0.96	1.18	1.43
Total	35.29	37.50	42.93	47.90	52.83

Source: World Bank, 1988

Industrial wood in the table represent saw logs only since all panel products and paper products were imported. Of the total woodfuel consumption, about 63% was used for charcoal production and 27% as firewood. The saw logs were, and are still mainly from *V. nilotica* plantations, which are sawn to supply mainly the NRC with railway sleepers and other uses. The prices of woodfuel, poles and sawn timber were very low compared to international prices and were mainly influenced by the cost of transport. Very little was paid in the form of stumpage fees to GOS.

Gum arabic is the most important NWFP which is in trade. Marketing is usually arranged by merchants who buy the product from producers at auctions. They clean, grade and pack the product and deliver it to the warehouses of the Gum Arabic Company which monopolized the export of gum arabic up to 2011. The price available to the producer was only 15% which increased gradually to 30-38% of the export price. Almost all the production was exported raw without any processing.

7. FOREST PRODUCTS FUTURE TRENDS

Forest products contribute a significant foundation for both local and national economies in Sudan, in addition to the environmental and social services provided by forests. Wood is a major source of energy in Sudan, providing 70-80% of the energy needs of the country. The high rate of population growth and urbanization in Sudan will contribute to the increase in demand for construction timber and wood energy. However, Sudan was left with mostly degraded forests after South Sudan got its independence taking with it about two thirds of the forest resources that were in the country. Therefore, Sudan degraded forests require massive rehabilitation programme and adoption of sustainable management practices.

Urgent forest rehabilitation will offer better opportunities for the development of forest-based industries from wood and non- wood products, including gums, fruits, seeds, fibre and others.

The development will include increasing the areas of central government forest reserves and plantation forests to minimize further degradation processes. However, the planted area in Sudan is rather small and has limited capacity to adequately and sustainably supply wood and non- wood products, in addition to supplying other important ecosystem services. Efforts to widen the scope of participation in forest development are progressing well, by for example preparing farmers, local communities, private forest owners and NGO's to participate in forest plantation investment and management. Forest policy and laws encourage private ownership of forests. The forest law requires 5% of irrigated agricultural schemes and 10% of mechanized rainfed schemes to be allocated to trees in the form of shelter belts or otherwise. This is making good progress. The land resource allocated for these plantations is estimated at about 2.4 million ha (Mohammed, 2013). A number of sugar companies and national agricultural schemes and corporations are implementing this programme to increase tree planting in their states. However, more efforts are needed for the improvement of economic incentives to promote investments in forest plantations in Sudan.

However, forest actors are facing the problem of limited inventory information, given that no forest inventory has been made on the forests in the country for nearly 20 years to verify the available contradicting data resulting from limited surveys made for specific purposes. FNC has prepared a comprehensive forest inventory project and is looking for donors to finance it. The implementation of this project is a first priority for FNC. Only after this will Sudan have accurate data from which it can make plans for the future. Future trends for wood production and consumption, as suggested by Mohammed, (2013) indicate a continuous decrease in the total growing stock (GS) from 1990 to 2030 as shown in Table 11. It also shows the big gap between the allowable cut and wood consumption indicating a serious overharvesting problem that could lead to continued forest degradation if the present situation is not improved.

Table 14: Trends of wood production and consumption (1990-2030)

Year	Total production (1000m3)	Allowable cut* (1000 m3)	Total consumption (1000 m3) **
1990	166,753	11,673	16,522
2005	173,236	12,127	19,000
2010	166,363	11,645	21,850
2015	156,157	10,931	25,128
2020	141,950	9,937	28,897
2025	103,116	7,218	33,232
2030	62,666	4,387	38,217

Source: Mohammed (2013)

** Allowable cut represents ha 7% of the growing stock.*

*** Consumption is expected to increase by 15% / year*

8. CONTRIBUTION OF PRIVATE FORESTRY SECTOR TO LOCAL LIVELIHOOD

The private sector includes: individual forest owners, families (farmers), communities, private corporations, NGO´s and others. The level of contribution of farmers and local communities in reforestation, forest protection and SFM will depend to a high degree on the extent to which they can be encouraged to undertake forest activities.

The extensive extension activities and training programmes carried out by FNC among local communities resulted in increased awareness among gum producers who felt the urgent need to form cooperative associations which voice their concerns. Many GAPA's were established with the aim being to maximize the farm gate returns to rural communities. The participation of stakeholders in GAPA's is outstanding, with 40% being women. Prices paid to producers were less than 15% of export price but gradually increased to more than 30%. Women are earning good money from gum arabic and other NWFP's.

The PPP models mentioned in Section 5.3 which are practiced in many parts of Sinnar State and Gadaref State are promising approaches, which should be adopted in different parts of the country. These approaches contribute effectively in the protection and sustainable management of community and other private forests, and with considerable positive impact on local people's livelihoods.

9. CONCLUSION AND WAY FORWARD

9.1 Conclusion

FNC with its regional forest administrations is the main steward of the forestry sector in Sudan. It carries the biggest burden regarding forestry development programmes. The forestry sector also includes supporting institutions: forestry research, extension, education and training, as well as a forest private sector. After the independence of South Sudan more than 95% of the remaining forests in Sudan are highly degraded forests which requires a big rehabilitation programme and adoption of SFM. The area of productive forests decreased from 52 million ha in the 1960's to less than one million ha in 2015.The contribution of Sudan from gum arabic to the world market dropped from 85% up to 1980's to 52% at present.

A national forest inventory is urgently needed before FNC can plan for the big task required for forest and land rehabilitation and development of SFM in the country. A long-term national land- use plan is a basic requirement for the future development of the natural resources in Sudan and it can provide for the integration of the different forms of land

management. FNC is a self- financing corporation with inadequate returns from its degraded forests, and with no financial support from central government; consequently, it is underfunded and understaffed. Despite these problems and the requirements of the big rehabilitation programme, FNC is making appreciable efforts to encourage and prepare the private sector, including local communities, to participate effectively in forest activities.

Forest policy and legislations need to be reviewed, updated and enforced, and to involve community participation, in order to secure better forest protection and for facilitation of forest reservation. The GAPA's established and supported by FNC have proved to be among the best models for promoting promising PPPs, and with good representation of women in these associations.

FNC is also helping local communities to form forest or village committees to manage their own forests and organize their effective participation in forest activities. This has already produced good results in many parts of Sinnar and Gadaref States.

Another good model is represented by the joint projects between FNC, NGO's and some farmers, carried out in some states, which convinced village leaders of the potential benefits of forests. However, better economic incentives and motivations, like increasing the stumpage prices, could promote effective participation of all stakeholders and encourage private investments in forestry.

At the professional level, women represent about 38% of the professional staff in the country, and they take active role in decision making. However, in some rural communities' women were expected to volunteer their time in local committees; ideally the roles, needs and priorities of both men and women should be considered. This is changing now.

The only major wood industry in Sudan is the sawmilling. The only major NWFP is gum Arabic, which is processed locally and with considerable exports. Some of the raw gum is either changed to mechanical powder (kibbled) or spray dried to improve and add value to the product before exporting, but most of the gum is exported raw. Sudan cannot expand further in wood industries without first rehabilitating its land and forests, as well as sustainably managing its natural forests.

Linkages between FNC and closely related agencies, like forestry research and forest education, have been very weak. Considerable efforts are being made to correct this situation. The needed forest research function should entail meaningful interactions with people and provide the strongest arguments to convince people and change their attitudes in favour of forestry and integrated land-use patterns. The coordination between FNC and crop agriculture is lacking, and this has resulted in irrational horizontal expansion of agriculture leading to rapid depletion of forest cover, desertification, and loss of land productivity; and consequently threatening food security.

The investment and business environments are constrained by low quality and inadequate infrastructure in the country.

9.2 The way forward

- It is essential to conserve the remaining area of Sudan forest which represents only 10% of the area of the country, most of them being degraded natural forests;
- Take serious steps to rehabilitate these forests and subject them to sustainable management;
- Achieve the target of reserving 20% of the area of Sudan, much as this is confronted with environmental, economic political and social constraints;
- Forest policy and regulatory frameworks must be reviewed and enforced for better protection, facilitation of forest reservation and supporting implementation of SFM;
- FNC can no longer monopolize forest activities; it should continue to organize local communities and farmers in forest committees and GAPA's and train them to take active role in forest activities, and move the country toward SFM;
- The PPP models working in many parts of Sinnar State and Gadaref State are ideal approaches. If these are implemented in different parts of the country, they could facilitate achieving the target of 20% reserved forest.
- Increase representation of women in forestry activities, including in most forest committees;
- Continue to increase awareness of people to forestry, especially to have deeper understanding of what forests provide from goods and services;
- Public-private-partnerships should be enhanced by effective extension programmes and economic incentives;
- Forestry and other land users should make their plans under the umbrella of a national land use plan for the purpose of integrating relevant sectors and for better forest protection and sustainable agricultural productivity;
- A national forest resource inventory be carried out to identify the locations, type and amount of forest resources within the country especially after the independence of South Sudan;
- Increase measures to protect and manage government forest land outside the reserves, which represent the bulk of government forests;
- The focus of the policy options on gum arabic should be more economic incentives to the land owners and workers by increasing their share of the benefits;
- FNC should continue to organize and support GAPA's and train the members; and
- The forest policy should not be based only on regulations but driven by society's demands and people's needs.

ACKNOWLEDGEMENT

This study was sponsored by AFF, to whom the supplier of this service would like to express his deepest appreciation for its financing and providing useful guidelines and clear terms of reference to guide it. Thanks also go to Prof Godwin Kowero and Prof Mahamane Larwanou for directing and supervising this work, Dr. Joshua Cheboiwo for useful comments on the first draft report, Dr. Doris Mutta for supervising final stages of the study, Ms. Barbara Owuor and Ms. Caroline Kajuju for taking care of the financial aspects of the work. Also thanks are extended to the Forest National Corporation in Sudan and its staff for providing a lot of information, including its annual reports; the Sinnar regional forest director and his deputy for introducing me to community and private forests and to meet and talk to forest committee members. Thanks also go to the director of forests in Hawata division, Gadaref State for the same reasons as their colleagues in Sinnar.

REFERENCES

Chrisly, L. 1988.Comments on forestry legislations in Sudan. FAO, Rome.

FAO. 1985.Restoring the balance: Women and forest resources. In Sontheirmer, Sally, (ed.) (1991) Women and the environment: A Reader: Crisis and development in the Third World. London: Earthscan Publications, Ltd.

FAO. 1995. How forestry can benefit from gender analysis. FAO, Rome.

FAO .2010 Global Forest Resources Assessment. FAO, Rome.

FAO. 2014. The land cover atlas of Sudan. FAO, Rome.

Irish Bilateral Aid Programme, 1989.Community forestry project in Sudan.

Mohammed, A.G. 2012. A strategy for forest development in Sudan. Annual Forest Conference, FNC, Khartoum, Sudan

Mohammed, A.G. 2013. Forest plantations and woodlots in Sudan. Forest National Corporation, Khartoum, Sudan.

Nasroun, T. H. 1983.The role of forestry in boosting national economy. Forest Annual Conference, Khartoum.

Nepstad, D.C. and Schwartzman, S. (ed.) 1992. Non-timber forest products from tropical forests: Evaluation and conservation and development strategy. *Adv. Econ. Bot.*9. New York Botanical Gardens.

Peters, C.M., Gentry, A.H. and Mendelsohn, R.O. 1989. Valuation of an Amazonian rainforest. *Nature.* 339 (29): 655-7.

Rado, R. 1986. Review of Sudan forest policy. FAO, Forestry Department, Rome.

Ramly, F. M.A. 2015.The role of Women in gum arabic production and marketing. NGARA Regional Workshop on Gum Production and Marketing, Nairobi, Kenya.

Twarog, S. 1999. Trade, Sustainable development and gender in the forestry sector. In: Trade, sustainable development and gender. UNCTAD/EDM/Misc.78. UNCTAD. pp.263-278.

World Bank. 1988. Forestry Sector Review- Sudan, Khartoum, Sudan.

APPENDIX 1: PLACES VISITED AND PERSONS MET

1. Forest National Corporation (FNC). They gave me access to their reports, the library and information through direct contacts with the persons below. They also arranged for my field trip with their regional staff.
2. Director General, Dr. Mohammed A. Elhadi. Tel: 00 249 911243948 em: elhadifnc@yahoo,com
3. Director of planning Department Salah Yousuf.
4. Assistant Director planning Department Samia Mandu
5. Musa Al Safouri, Regional Director of forests, Singa, Sinnar State .
    a. Tel: 00 249 912165968 em : Fnc,sennar@gmail,com
6. His deputy: Ayis Taha. The same address. They both took me around the community forests in their State.
7. Adam A. Adam: Chairman of Shaggat community forest Association, Wad Annial, Sinnar State.
8. His Deputy: Hatim, The same address. Both the chairman and his deputy briefed me about the largest community forest in the state. A multifunctional forest which serves 7 villages. Both can be contacted through the Regional director of forests who is a member of the association.
9. Abdelaziz.Sidahmed, Director of Dindir Forest Division, Sinnar State He accompanied me to a sustainably managed riverine forest, where we talked to the members of Abu Salih forest committee.: Tel 00 249 912718406 em abdelaziz@gmail.com
10. Members of Abu Salih community forest committee, Dindir, Sinnar State. They can be contacted through Abdelaziz above.
11. Mahammed Addaw, Director of Hawata Forest Division, Hawata, Gadaref State. He took me around to see a community forest and talk to the chairman of the forest committee mentioned below. Tel 00 249 912595814 – No email – contact through his Regional Director Fnc. gedarif@gmail.com.
12. Ramadan Abbaker Omer, Chairman of Gumor Shambat Community Forest Committee, Hawata, Gadaref State. He gave a briefing about their relations with forestry officials and the help they get for managing their forest and the benefits they get from it. Contact through Mohammed Addaw above,
13. Abdelwadoud Mustafa: a private natural forest owner in Hawata area, Gadaref State. He is earning good money from his forest but finding difficulty in replanting trees. An agreement with the forest department is being made whereby forestry department would help in resolving this problem.
14. Contact through Mohammed Addaw above.
15. Fatima Ramly, Forest regional division, El Obeid, North Kordofan State. She is a professional forester taking care of establishing forest committees and GAPA's. I got information from her through personal contact and from a report she wrote.

African Forest Forum

A platform for stakeholders in African forestry



For more information please contact:

The Executive Secretary
African Forest Forum
United Nations Avenue, Gigiri
P.O. Box 30677-00100, Nairobi, Kenya
Phone: +254 20 722 4000, Fax: +254 20 722 4001
Email: exec.sec@afforum.org; Website: www.afforum.org