



A PLATFORM FOR STAKEHOLDERS IN AFRICAN FORESTRY

FOREST PLANTATIONS AND WOODLOTS IN UGANDA



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FOREST PLANTATIONS AND WOODLOTS IN UGANDA

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ACRONYMS

CBO	Community Based Organisation
CDM	Clean Development Mechanism
CFM	Collaborative Forest Management
CFR	Central Forest Reserve
CSO	Civil Society Organisation
DFD	District Forestry Department
DFO	District Forestry Office
DFS	District Forestry Services
EIA	Environmental Impact Assessment
EU	European Union
FBE	Forest Based Enterprise
FD	Forestry Department
FIEFCO	Farm Income Enhancement and Forest Conservation Project
FMP	Forest Management Plan
FSSD	Forestry Support Services Department
GDP	Gross Domestic Product
GoU	Government of Uganda
ISSMI	Integrated Stock Survey and Management Inventory
LFR	Local Forest Reserve
LG	Local Government
MDG	Millennium Development Goal
MoFPED	Ministry of Finance, Planning and Economic Development
MoU	Memorandum of Understanding
MTTI	Ministry of Tourism, Trade and Industry
MWE	Ministry of Water and Environment
NAADS	National Agricultural Advisory Services
NaFORRI	National Forestry Resources Research Institute
NDP	National Development Plan
NEMA	National Environment Management Authority
NFA	National Forestry Authority
NFP	National Forest Plan
NFTPA	National Forestry and Tree Planting Act
NGO	Non-Government Organisation
NORAD	Norwegian Agency for Development Cooperation
NP	National Park
ODA	Overseas Development Agency
PA	Protected Area
PAF	Poverty Alleviation Fund
PFO	Private Forest Owner
PFOA	Private Forest Owners Association
REDD	Reduced Emissions from Deforestation and Forest Degradation
SPGS	Sawlog Production Grant Scheme
TMF	Tropical Moist Forest
UBOS	Uganda Bureau of Statistics
UGX	Uganda Shilling
UTGA	Uganda Tree Growers Association
UWA	Uganda Wildlife Authority
WB	World Bank
WR	Wildlife Reserve

PREFACE

The forest resources in the Eastern African countries of Sudan, Ethiopia, Kenya, Rwanda, Burundi, Uganda and Tanzania are disappearing fast and the quality of the forest left standing is gradually degrading. There is uncontrolled deforestation in every country. Wood biomass energy is becoming scarce and expensive and the safety net attributes of forest ecosystems for local livelihoods are being lost fast. Imported finished forest products are assuming an ever increasing and persistent occurrence on the local markets. This phenomenon exacts a considerable draw on the already scarce foreign exchange currency reserves. It also contributes to diminishing value addition activities in secondary and tertiary wood processing as well as loss of both artisan and industrial wood-based income and employment. Poor public forest plantation resource management has therefore constrained the attainment of sustainable forest management (SFM) in the sub-region.

A fragile natural resources base results in precarious livelihoods, which in turn leads to slow and inequitable economic growth. The population of the sub-region is also growing very rapidly which is not matched with the slow growing economies. Tackling poverty partly requires an increase in income per capita and this must be coupled with rapid enhancement of the natural resources base. Investments in forest plantations can contribute to the enhancement of local livelihood and the environment.

Based on the above situation, there is urgent need to:

- Stem the shortage of wood supplies for industrial and energy needs currently experienced in the sub-region;
- Recover initial investments in the already established public forest plantations;
- Improve revenue generation from the existing forest resources for further investment in new forest plantations as a way of contributing to socio-economic development;
- Save foreign currency being spent on importation of timber and timber products;
- Reduce the exploitation pressure on natural forests;
- Create rural employment in tree planting and plantation forestry as a way to contributing to improvement of local livelihoods; and,
- Contribute to provision of environmental services, especially through carbon sequestration, using trees on farms and forest plantations.

To attain these, an in-depth study to characterise, and document information on the current status, challenges, opportunities and options for future management of forest plantations was commissioned for each of the countries in the sub-region.

This study is therefore part of the regional effort. The following outputs are expected from the studies:

- Improved understanding of national and sub-regional demand and supply of forest plantation industrial round-wood;
- Economic viability of managing forest plantations established; and,
- Better governance structures for managing forest plantations identified.

Executive Summary

Main findings

1. Uganda has a total land area of about 241 550 km², most of which is covered by subsistence farmland and grasslands. The country had a population of 30.7 million people by mid-year 2009 and growing at an annual rate of 3.2%. The total forested area of the country is about 3.6 million ha which is 15% of the total land area. In terms of ownership, only 36% of the forests are owned by the government and the rest (64%) is under private ownership.
2. Between 1990 and 2005, the average annual rate of deforestation was 1.8%. The highest loss was registered on private land where there is very little planned management. The causes of loss of forest cover continue to be over-harvesting of forest products, mainly timber and charcoal, land clearance for agriculture, overgrazing, urbanisation, and industrial development. The rapid growth of population also exerts a lot of pressure on the forest resources.
3. The history of forest plantations in Uganda can be traced as far back as the colonial times. But for a long time, because of the large areas of natural forest in the country, plantations were seen not to be so important until the issue of biodiversity conservation took centre stage. Government depended on development partners to support forestry development, including plantations.
4. The change in government policy in 2003 to allow the private sector to play a big role in forest development helped to turn around the rather poor and mismanaged forest plantations. The National Forestry Authority (NFA) developed a Plantation Strategy in 2005 in which they set aside 200 000 ha of land in priority Central Forest Reserves (CFRs) for plantation development (50 000 ha by NFA and 150 000 ha by private sector).
5. The Saw log Production Grant Scheme (SPGS) started as a joint initiative between the Government of Uganda and the European Union (EU), and was later joined by the Government of Norway, was used to advocate, empower and build capacity of private tree growers. During the first phase of the project (Oct. 2004-June 2009), SPGS triggered a major interest in commercial tree planting in Uganda, with some 11 000 ha being established to the required standards. The funding of the second phase (Sept. 2010-2013) has a planting target of 30 000ha. The SPGS provides technical knowledge and financial assistance (rebates) of up to UGX 850 000/ha (US\$ 340) of planted trees, mainly pines and eucalyptus which are the species most planted by commercial plantation developers. The SPGS grants plus the availability of land in CFRs for rent on a 50-year long permit are very good incentives which have been critical to the success of plantation development so far witnessed.
6. The NFA and the private sector, through the SPGS, have been the major tree plantation developers during the last five years. By the end of 2010, the country had total of 62 230 ha of plantation forests. NFA had a total of 14 140 ha (23%) while the private sector owned 48 090 (77%). The annual rate of planting is 13 000 ha (public 2 000 ha and private 11 000 ha).
7. Some of the major challenges faced by the plantation developers include: lack of locally available good seed, so they depend on expensive imports from Australia, Brazil, and South Africa; limited experience, low skills and technology in management; the poor state of the rural road network in the country, inadequate financial support from government and inadequate research support.
8. The growing stock in forest plantations is estimated to be 2 350 330 m³, based on the yield model for *Pinus caribaea* and *Eucalyptus grandis*. The private sector has 80% of this growing stock.
9. There is a big market for saw logs, chips, transmission, building and fencing poles, and fire-wood, and the market will continue to expand as the country's gross domestic product (GDP) and population rise. There is also a good institution – Uganda Tree Growers' Association (UTGA) - whose main objectives include purchase of improved seed and other forestry inputs; lobbying government for a better investment climate; exchange and sharing of information and experiences on tree growing and advocacy for better land tenure security.
10. The extent and impacts of out-grower schemes and woodlots is not well documented in Uganda, however the SPGS started a Community Support Project in 2005, which has resulted in planting a total of 1 239 ha, with a tree survival rate of 80%. The Farm Income Enhancement and

Forest Conservation (FIEFCO) project is also assisting farmers with tree growing and claims to have a total of 20 000 ha under trees by communities spread over 33 districts.

11. While Government funding to forestry has been declining, private financing has been observed to rise since 2001 and is expected to continue rising due to the country wide campaign and advocacy for private forestry. There is expected funding from global grants and agreements of 'Willingness to Pay for Pollution' and 'Willingness to Plant Trees' as part of the reduced emissions from deforestation and forest degradation (REDD) mechanisms and carbon sequestration campaigns in Uganda. Also payment for environmental services (PES) derived from the forestry sector is likely to grow in importance as the country appreciates the contribution of forestry to other sectors such as, energy, agriculture and tourism. It has also been proposed to operationalise the Forest (Tree) Fund/Trust.

12. The country has many graduates from the various training institutions. Unfortunately, most of these graduates have not had training in the required skills of commercial plantation forestry. They can, however, be retooled in the required skills. Training is needed in the following areas: technical skills relating to plantation establishment and maintenance, fire protection, nursery operations, plantation monitoring (inventory), and pests and diseases. Also, there is need for planning on both the administrative and operational levels. Business skills (management), contract management, labour management and computer skills are also lacking. Currently, SPGS is the main unit providing short courses to plantation owners but they are stretched beyond capacity.

13. It is a big challenge to get data on supply and demand of forest products. The problem starts from the forests where the Forest Rangers and their supervisors fail to transmit information about what has been sold and in what quantities. During 2010, a total of 43 581 000 m³ was removed from the forests. Wood fuel accounted for nearly 91% while 8 % was industrial round wood. Wood is the major source of rural energy in the country, and will remain so in the near future.

14. There is no data on Non-Wood Forest Products (NWFPs). However, it is well known that they play a big role in sustaining the wellbeing of most rural people in the country. Some of the more promising NWFPs are medicinal plants, ecotourism, honey, mushrooms, shea butter, gums/resins, rattan, wild foods and handicrafts. Although some of them are already commercialised, it has not yet been captured in national statistics.

15. The demand for timber has been greatly increased in the past decade to satisfy the growing economy, not least the construction boom. The vast majority of the timber produced in Uganda is processed and consumed in Uganda. According to NFA estimates and projections, by 2030 the annual demand for sawn timber will be about 879 500 m³, which equals c. 1 832 300 m³ of round wood. It is projected that the country will meet its demand for sawn wood from plantations by the year 2028.

17. The prices of sawn wood, especially for timber species with a large turnover, such as pine, eucalyptus, and Kirundu, went up in the last quarter of 2010 due to the Uganda National Roads Authority's (UNRA) enforcement of maximum tonnage carried by trucks, and they seem to be once more on the upward trend or have remained steady at a high level. The valuable timbers are rare and are costly to buy whereas the light construction timbers are readily available.

18. During the last five years, Uganda has been a net exporter of industrial wood from natural forests. This may be explained by re-exports of round wood imports, using Uganda as a transit country. Such illegalities distort information because the same wood may be recorded both as imports and exports. The country is also a net importer of plantation industrial round wood, hardwood sawn wood, and paper and paper boards.

19. Markets for timber in Uganda fall into two broad categories: commercial markets (mainly Kampala City, and the municipalities of Entebbe, Masaka, Jinja, Mbale, Mbarara, Gulu, Arua, Kabale, Fort Portal, Soroti and Tororo); *ad hoc* and spot markets (local markets and towns near forests). The record of timber trade is still a challenge since a bigger section of the trade is informal in addition to being illegal. It is estimated that the records capture just one quarter of the amount being traded in the market.

20. The three main timber markets in the suburbs of Kampala were visited, namely: the Ndeeba, Bwaise and Kireka trading centres. It is suggested that these three markets represent about 50% of total timber consumption in Kampala. It is hard to get accurate information on actual amounts

being supplied and sold by the retailers (fear of the tax implications and may be due to the presence of illegal timber in their premises). Figures are quoted in terms of lorry loads.

21. Generally, the quantities of supplied timber are dwindling, especially pines and cypress. However, eucalyptus boards are increasing on the market, a sign of its acceptance as a construction timber. The general hardwoods are coming in from more distant districts in the west, south west and the Lake Victoria islands.

22. Before the reforms in the forestry sector of 2003, the then Forestry Department was getting 40% of all revenue collected from the forests and the central government took 60%. When the NFA was created, it was given all royalties and licences accruing from the CFRs, which left the District Forest Services (DFS) with very low revenue from the Local Forest Reserves (LFRs). It was a big drop in income and incentive to monitor the illegal activities in the forests. The NFA revised the stumpage fee setting a higher reserve price for all timber species. It also introduced a bidding system which improved the revenue from the forest estate, both in quantity and transparency.

23. The forest based industries are owned by the private sector, with the big ones owned by foreign companies. Sawmilling consists of both pit sawing and mobile sawmilling with one stationary mill. Pit sawyers provide the majority of sawn wood found on the market. The sawmill industry can be characterised as having low technological standards (cheap mobile sawmills and lack of skilled personnel), resulting in wasteful harvesting techniques, low recovery rates (20-35%), and low quality sawn timber. There is poor storage, and no quality grading of the sawn timber by timber dealers and secondary processors resulting in low value products. There are few dry kilns in operation in the country; those that exist are owned by big furniture manufacturers. There are five pole treating plants in the country and the demand for treated transmission poles is increasing internally as the government intensifies the rural electrification programme with support from development partners.

24. The mature forest plantations are almost all cut down and there is going to be a period of severe log shortage up to the year 2018 when commercial thinning will be cut. The quality of softwood logs is not so good due to poor maintenance of the crop (no pruning and thinning), while others have suffered from fires.

25. The contribution of forests to GDP is estimated to be 6%. However, it could be higher when the non-monetary contributions from woody biomass as the main energy source for the country are considered, plus their contribution to ecosystem services (soil and water management, carbon sequestration). Total revenue collection from forest products peaked at US\$ 7 578 000 during 2008/09, but it is now going down because of the shortage of mature forest plantations. Government estimates that the sector employs about 1 million people. One hundred thousand of these are employed in the formal sector. The biggest number of those employed is found in firewood and charcoal production, household firewood production and commercial and industrial firewood production.

26. During the development of forest plantations, environmental laws and guidelines must be adhered to, viz.: the National Environmental Statute (1995) and Act, and the National Environmental Regulations (2000). It is advisable to carry out a simple Environmental Impact Assessment (EIA) of the area where the plantation is going to be developed. Forest plantations produce high volumes of utilisable products, intensively grown in plantations, take considerable pressure off natural forests, which supply such products in much more extensive ways. This compensatory benefit of plantations works when there is an effective mechanism in place for protecting the natural forest areas.

Recommendations/way forward

The following recommendations as away forward arise from this study:

1. Forest plantation situation

- As the demand for forest products increases due to the increasing population, there is an urgent need to improve the management of the forests by upgrading the technologies in forest production, harvesting and processing; and,
- Production of tree seed and planting materials need urgent attention.

2. Out-grower schemes

- The SPGS should continue with this approach with communities since there is a big demand for it and it has shown good success. There is a need for the big plantation owners to realise the importance of courting the surrounding communities as they develop their big plantations.

3. Forest and tree tenure

- Government should reassure prospective plantation developers about the security of the land they rented in CFRs. This is because of the issue of encroachers which is scaring away prospective investors.

4. Financing and human resources

- Government should continue to improve the investment climate in the country by developing comprehensive national forestry financing strategies like the proposed forest/tree fund which will create mechanisms and conditions for expanding and diversify the financial basis for forest plantations and woodlots;
- The sector has to urgently address the governance issues that are causing development partners to stop funding forestry development programmes; and,
- Government should build up human resource capacity (technical, vocational and managerial) for forest plantations. There should also be improvement of extension services to support woodlots establishment by individuals and communities. A public-private partnership to promote research and development should be instituted soon.

5. Incentives for plantation establishment by public/private sector and out-growers/ other woodlots

- Government should have a clear plantation development strategy which will reassure investors about the security of their land tenure and also tax exemptions.

6. Supply and demand of forest products

- Action on recommendations 1 and 2 will increase wood supply in the long run;
- There is urgent need to improve on data collection, storage and dissemination, especially data about demand and supply of all forest products including NWFPs;
- The import/export timber trade should be monitored well to reduce the illegal smuggling of products across borders; and,
- Government should promote alternative sources of energy and reduce the dependence of the population on woody biomass given the fast growing population.

7. Forest royalties and other revenue

- It is important to regularly review the level of charges for the round wood and sawn timber to reflect realistic market prices;
- The NFA headquarters staffs need to regularly supervise their field staff in an effort to reduce corruption and illegal activities; and,
- Forest practices need to be improved. The loss of revenue through carelessness (e.g. abandoning short logs, and use of destructive logging techniques) should be eliminated or minimised. Bonus systems can be introduced to reward those that excel in the collection of revenue.

8. Processing of produce

- As forest plantations mature, forest industries - e.g. sawmills, fibre and particle board and plywood mills - need to be planned and set up to take advantage of the abundant raw materials; and,
- The available labour is low in skills, so there is a need for training to upgrade skills, as recommended under 4 above.

9. Socio-economic and environmental contributions of forests

- The contribution of forests to national development in terms of income, provision of products, employment and environmental services should be highlighted more through valuations of forests.

1. INTRODUCTION

Uganda is a landlocked country in the eastern region of Africa. It has a total land area of about 241,550 km², most of which is covered by subsistence farmland and grasslands. The country had a population of 30.7 million people by 2009 mid-year (UBOS, 2009) and growing at an annual rate of 3.2%. The population is greatly dependent on agricultural related production for a living which is exerting a lot of pressure on forest resources. The total forested area of the country is about 3.6 million ha, which is 15% of the total land area. In terms of ownership, only 36% of the forests are owned by government and the rest (64%) is under private ownership. The country is blessed with reliable rainfall and good soils which makes it a good environment for agricultural and forestry production and development. *Table 1* gives the basic information about the country.

Table 1. Basic information about Uganda. Source: UBOS, 2009.

Physical	
➤ Location	4°12'N & 1°29'S/29°34'E & 35°35'S
➤ Altitude range	620 – 5 110 metres
➤ Total area	241 550 km ²
➤ Of which land	199 807 km ²
➤ Of which water	41 743 km ²
➤ Temperature range (averages)	15-31°C
➤ Rainfall range	735 – 1 863 mm/year
➤ Percentage of forest cover (2005)	15%
Economy (2008/2009)	
➤ Per capita GDP at constant (2002) market prices	UGX 646 500 (US\$ 360)
➤ GDP growth rate at constant (2002) market price	7%
➤ Contribution of agriculture (including forestry) to GDP at constant (2002) market price	15.1%
➤ Contribution of forestry to GDP at constant (2002) market price	2.6%
Population	
➤ Total population (2009)	30.7 million
➤ Percentage of females (2002)	51%
➤ Percentage of urban (2009 mid-year)	14.8%
➤ Percentage of people below the poverty line (2005/06)	31.1%
➤ Population growth rate	3.2%

Table 2 shows the management of land cover including forests in the country. A total land area of 1.9 million ha constitutes the country's Permanent Forest Estate (PFE) covering Central Forest Reserves (CFRs), Local Forest Reserves (LFRs), and forested areas in National Parks (NPs) and Wildlife Reserves (WRs) (Ministry of Water, Lands and Environment, 2001). In NPs and WRs, the main functions of the forests are ecological and biodiversity protection. The forests also play an important role of bolstering ecotourism, especially in terms of chimpanzee and gorilla ecotourism (Ministry of Water and Environment, 2011). The majority of CFRs covering a total area of 1.1 million ha fall under the category of ecological and biodiversity importance (for protection of steep slopes, water catchments, river banks, lake shores and wetlands).

Table 2. Management of land cover (including forests) in Uganda. Source: NFA (2009)

Land Cover	Local Governments (LFRs)	NFA (CFRs)	UWA (NPs & WRs)	Joint NFA & UWA	Private	Total (ha)
Plantations, Hardwoods	335	4 863	52	-	9 536	14 786
Plantations, Softwoods	19	14 091	2 430	-	2 201	18 741
THF-Normal	123	246 860	249 192	23 468	81 312	600 955
THF - Low Stocked	120	36 715	1 810	-	153 049	191 694

Woodlands	614	325 422	389 664	7 279	2 055 019	2 777 998
Bush lands	413	188 332	316 994	11 417	2 451 519	2 968 675
Grasslands	202	179 469	765 652	44 233	3 074 026	4 063 582
Wetlands	296	9 073	33 966	2 196	707 511	753 042
Subsistence farmlands	2 725	161 514	60 857	741	8 621 755	8 847 592
Commercial Farmlands	6	2 977	928	56	102 662	106 629
Built up areas	118	1 084	2 263	0	93 807	97 272
Water	24	889	14 744	149	3 690 684	3 706 490
Impediments	0	1 145	729	116	5 814	7 804
Total Area of category	4 995	1 172 434	1 839 281	89 655	21 048 895	24 155 260
Forest Cover in Category	1 211	627 951	643 148	30 747	2 301 117	3 604 174
% of total forest area	0.03	17	18	0.85	64	100

The CFRs that fall in the category of *industrial forest plantations* cover a total of 151 200 ha. This means that for plantation development in CFRs, there is a limit on how much can be established.

As shown in *Table 2*, the category *forests and trees on private and communal land* form 64% of the total forest cover in the country. According to the National Forestry and Tree Planting Act, 2003 (NFTPA), Private Forest Owners (PFOs) are responsible for managing their forests as long as the forests are registered. Unfortunately, very little planned management is taking place in private forests. Recently, the government with support from the African Development Bank and the Nordic Fund has embarked on assisting the PFOs to plan for and manage their forests, especially those located in watersheds. In addition, some non-governmental organisations (NGOs), notably the Uganda Forestry Working Group, have been supporting PFOs to develop forest-based enterprises (FBEs) as an incentive towards planned management of their forests (Ministry of Water and Environment, 2011).

Uganda's forests have suffered a lot from deforestation and degradation. Over a period of 15 years (1990-2005), the average annual rate of deforestation was 1.8%. The forest cover decreased from 4.9 million ha (24%) in 1990 to 3.6 million ha (15%) in 2005. The highest loss was registered on private forests (NFA, 2006). The causes of loss of forest cover continue to be over-harvesting of forest products, mainly timber and charcoal, forest clearance for agriculture, overgrazing, urbanisation, and industrial development. The rapid population growth, averaging 3.2% annually, also exerts a lot of pressure on the forest resources in terms of demand for forest products and land loss to encroachers.

Objectives of the Study

The objectives of the study are contained in the Terms of Reference for the consultancy. Under the guidance of the Lead Consultant, the National Consultant shall undertake the activities listed below with respect to AFF's work on "Rehabilitation of Public Forest Plantations" in Uganda.

The purpose of study was to analyse and report on the following specific tasks:

1. Undertake a study of the current public and private forest plantations situation, specifically with respect to the distribution and location of these plantations, species planted and sources of seedlings and seeds, age distribution of tree species, their management and quality of stands, and other features.

2. Undertake market surveys to determine supply scenarios and demand projections for 2015, 2020, 2025, and 2030 of plantation wood volumes and trends (by tree species, private and public sources), including prices of local and imported timber and wood products and sources of such products.
3. Evaluate the current revenue collection systems, revenues collected annually during the last 5-10 years, licensing/concession procedures, forest and tree tenure, management arrangements and pricing mechanisms for round wood and industrial forest products.
4. Provide income and employment data during the last 5-10 years and estimate the potential for income generation and employment creation for 2015, 2020, 2025, and 2030.
5. Evaluate and propose incentives that could favour rapid forest plantation establishment by public and private sectors, and out-grower's schemes by individual farmers. In this case, consideration should also be given to:
 - Availability of appropriate land;
 - Availability of quality germplasm;
 - Financing for plantation forestry;
 - Private sector readiness in plantation forestry;
 - Policy and environmental issues, including land and forest and tree tenure issues, biodiversity considerations, and legislation and governance issues; and,
 - Potential for additional revenues from carbon trade.
6. Provide options for establishment, expansion and improved management of public and private forest plantations, including ways to overcome existing and potential constraints.
7. Evaluate the processing of industrial round wood from the plantations in the individual countries, ownership, its current and potential capacity, wood raw material supply (sources, types, and adequacy), product lines and quality of produce, potential for future investment in the sub-sector, constraints facing the sub-sector, future of the processing industry, growth and constraints, among other key considerations.
8. Make a presentation, based on this work, in a workshop that will be organised by the AFF.

Scope and Coverage

The study is focusing on forest plantations and woodlots in the country.

Approach to the Study

A desk study was done, followed by interview of key stakeholders (forest owners, govt officials). A market study on sawn wood to determine demand and supply was also done.

Structure of the Report

The rest of the report is structured as follows:

- Chapter 2 is on forest plantation situation and covers the timber species grown, establishment and maintenance activities, forest health and growth, yield and rotation age;
- Chapter 3 presents the out-grower schemes and other woodlots, their extent and impacts. It covers also the factors shaping the growth of out-growers and other woodlots;
- Chapter 4 covers forest and tree tenure issues. It presents forest ownership, impacts of forest/tree tenure on poverty alleviation and suggests improvements of the tenure system in place now;
- Chapter 5 is on financial and human resources for plantation and outgrowers/woodlots. It details the current financing mechanisms available for forestry development both government and others, it also discusses potential financing mechanisms. In this chapter, the human resources situation is detailed looking at the different levels of training in the sector, their skills and how they be better trained for forest plantation development;

- Chapter 6 covers the available incentives for plantation establishment by public/private sector and out growers and their impacts and effectiveness;
- Chapter 7 deals with the supply and demand of forest products. It discusses the current supply and demand. The market survey results are also discussed here;
- Chapter 8 discusses forest royalties and other revenues. The current systems are presented and suggestions are made to improve on revenue collection;
- Chapter 9 deals with the processing of forest products. It looks at what is available for forest industries in terms of raw material supply and quality. It also highlights the constraints facing the sub-sector;
- Chapter 10 highlights the socio-economic and environmental contribution of forests; and,
- Chapter 11 gives the conclusions and way forward.

2. FOREST PLANTATIONS SITUATION

2.1 Historical background

The history of forest plantations in Uganda can be traced back to colonial times. The earliest plantations of exotic trees were started in the then Kigezi District in the late 1940s by colonial administrators who found the weather cool and therefore good for growing exotic tree species. *Cupressus lusitanica* was the first species to be tried. When it did very well, the local government of this area was encouraged to upscale it. The development of plantations then spread in similar cool climates of Lendu (West Nile District) and Kikumiro (Fort Portal District). The central Government Forest Department then started establishing more plantations in the woodland and grassland parts of the gazetted CFRs. Uganda was then endowed with a big resource of natural forests (tropical moist forests), which for a long time were the main source of timber and other wood products. At that time, the forestry sector was focused on the management of forests for the profitable production of timber products. Over time, this paradigm changed and forestry policies have been redefined to capture also other uses of forests in a more sustainable and environmentally sound manner. This came as a result of a forecast of a huge deficit of forest products.

Plantation development by the Forest Department was mainly funded by development partners, mainly Norway, and a total of 13 000 ha had been established by the early 1970s, after which the country went through nearly 20 years of political instability. This period brought mismanagement of the forest estate, and many of the young plantations were not pruned, thinned or even protected from fires. Little establishment of new plantations continued and by 1984, there were forest plantations scattered all over the country with poor plantation management regimes.

In the mid 1980s, a World Bank (WB) loan was secured to rehabilitate the forest sector. One component, the peri-urban plantations, helped to establish eucalypts plantations around major urban centres to cater for increased demand for fuelwood and poles. These brought the total of plantation area to an estimated 20 000 ha of tree plantations countrywide (70% conifer, 30% hardwood). Towards the year 2000, only 6 000 ha of intact softwood plantations were available (Jacovelli and Carvalho, 1999). This clearly shows that much as there were clear signals that there would be a timber demand deficit, there were no efforts to reverse the situation. More so, there was a huge investment that had earlier been put to conservation strategies but it did not yield much since the forest estate continuously decreased despite the effort. To save the situation, the forest sector was reformed, and in 2003 a new National Forestry and Tree Planting Act was passed based on a new Forest Policy (2001). The policy emphasised the inclusion of the private sector as the major player in the development of plantation forestry in Uganda.

2.1.1 The private sector in Uganda's forestry

In 2004, the forestry sector in Uganda received funding from the European Union (EU) through a newly established programme, the Saw log Production Grant Scheme (SPGS). This was started as a joint initiative between the Government of Uganda and EU. The scheme was used to advocate, empower and build capacity of private tree growers. The efforts towards plantation development in the country have been with the Government of Uganda through the National Forestry Authority (NFA), and its development partners. In the first phase of the project (Oct. 2004-June 2009), SPGS triggered a major interest in commercial tree planting in Uganda, with some 11 000 ha being

established to the required standards. The Government of Norway also joined in the funding of the second phase of SPGS (Sept. 2010-2013) and has already supported the establishment of 6 000 ha of timber plantations. This phase has an ambitious target of establishing 30 000 ha of plantations by the end of the project. SPGS has been a key mover in commercial plantation development by providing technical training about tree growing right from establishment through tending and management. In addition, it provides a grant of UGX 850 000/ha (US\$ 340) for growers in the category of 25-500 ha, and UGX 600 000/ha (US\$ 240) for growers in the category of 501-3 000 ha. The money from these grants is only paid out after site visits by SPGS project staff to check against agreed standards. The payment is made over a 3-year period.

The project is providing and supplying over 700 000 tree seedlings to many community groups with a forecasted expansion to over 3 million by 2012. It is also creating awareness among the next generation of Ugandan Foresters through its training and exposure to commercial forestry and forestry business. To ensure sustainability and consolidation of programme initiatives, it has successfully advocated the establishment of an organisation of private tree growers in the country, the Uganda Timber Growers' Association (UTGA) that will lobby for funding subsidies for private forestry plantation developers.

The other factor that attracted private investors into commercial tree planting has been the availability of long-term tree planting permits in specific CFRs around the country.

2.2 Location, areas and species composition

NFA and the private sector, through the SPGS, have been the major developers of tree plantations during the last five years. According to NFA records, by the end of 2010, the country had a total of 62 230 ha of plantation forests (NFA, 2010). Public and private sectors owned 14 140 ha (23%) and 48 090 ha (77%) respectively. Initially, as an incentive to promote private sector tree growing, CFRs were allocated to individuals or companies to develop tree plantations. There was reluctance on part of the developers to buy or use their own land for tree growing. However, from 2007, the government suspended land allocation in CFRs. The growing of trees on private land then started to pick up. It is difficult to document exactly the areas under trees by private tree growers who are not in CFRs unless they are big or registered with SPGS or UTGA. The annual rate of planting is 13 000 ha (public 2 000 ha and private 11 000 ha). *Table 3* gives a summary of ownership, age and acreage of forest plantations on CFRs.

Table 3. Ownership, age class, and area of trees in forest plantations. Source: NFA, 2010.

Ownership	Age class					Total (ha)
	1-5	6-10	11-15	16-20	21-25	
Government	7 076	4 564	1 629	809	63	14 140
Private	33 922	6 133	5 833	1 958	244	48 090
Total	40 998	10 697	7 461	2 767	307	62 230

The following private companies are classified as big:

New Forest Company; they have concentrated their planting at Namwasa and Luwunga CFRs and by the end of 2009 they had planted a total of 3 546 ha, which has increased to 7 320 ha as of now (2011). The company has also planted a total of 2 710 ha on private land, which brings their total to date to **10 030 ha**.

Green Resources Ltd.; they are planting in two CFRs - Bukaleba and Kachung - and by the end of 2009 they had planted a total of 3 727 ha, which has reached a total of **5 791 ha** as of now (2011).

Global Woods; they are planting in Kikonda CFR. By the end of 2010, they had planted a total of **2 600 ha**.

Nileply Ltd.; they are planting in South Busoga and have so far planted **1 500 ha**.

There are, in addition, several local companies that are classified as small to medium.

Figure 1 shows the age distribution of the plantations on CFRs and private land, which indicates that 80% of the trees are 9 years or younger. It clearly shows the problem the country is facing in terms of satisfying the demand for sawn wood.

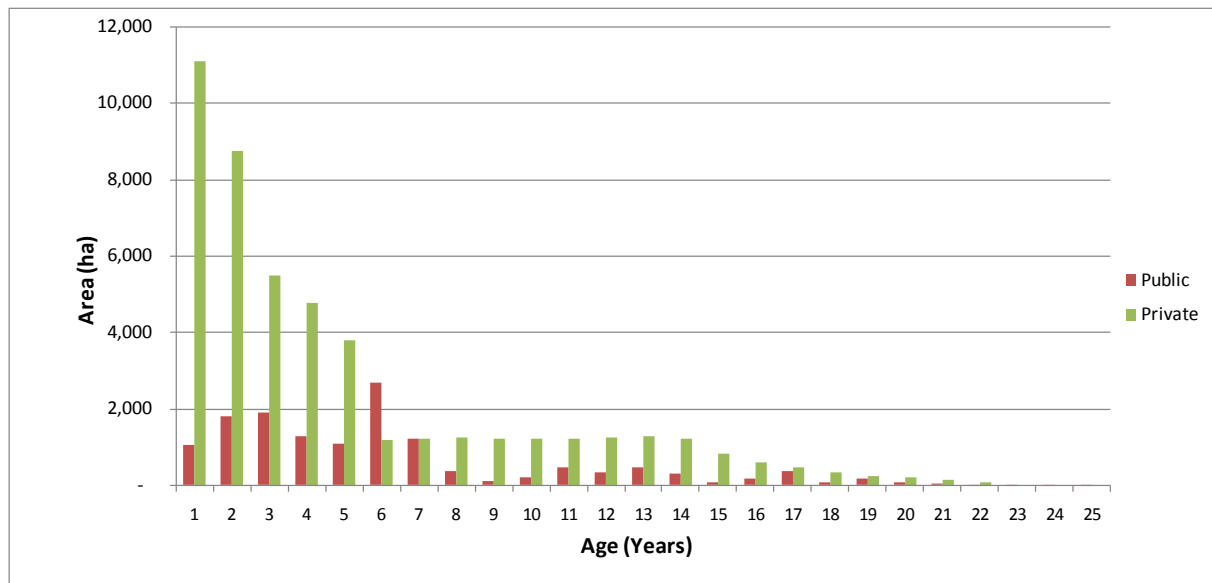


Figure 1. Age distribution of trees in forest plantations in CFRs and Private land (NFA records 2010).

2.2.1 Common timber species grown in Uganda

There are many tree species, both indigenous and exotic, that are grown in Uganda. The majority of tree farmers base their choices of species to plant on utilisation potential. Currently, most commercial private timber growers plant two species, namely, *Pinus caribaea* (mostly var. *hondurensis*) and *Eucalyptus grandis*. *P. caribaea* is used mainly for saw log and plywood production. Eucalyptus on the other hand is mainly grown for domestic and industrial fuel wood. There is also a big potential market for saw logs from eucalyptus, already roofing timber especially purlins and rafters are very much in use. These dominate most plantation areas established in the country. In specific areas, other species such as Musizi (*Maesopsis eminii*), *Pinus patula*, *P. oocarpa*, *Cupressus lusitanica*, *Araucaria spp.*, *Terminalia spp.* and Teak (*Tectona grandis*) have been planted, although the total area of these species is relatively small at present as compared to the *Pines* and *Eucalypts*. By the end of 2010, *Pinus caribaea* made up a total of 54% of private plantations, followed by Eucalyptus at 17%.

Also in government plantations by far the most common species is *Pinus caribaea* (75%), followed by *P. patula* (8%) and *P. oocarpa* (6.5%). There are also small areas of *Cupressus lusitanica*, *Eucalyptus grandis*, *Tectona grandis* and *Maesopsis eminii*, and insignificant areas of a range of other species.

Table 4 shows the regions of the country where the main species for plantations can be found. There are also other species, such as *Eucalyptus* hybrid clones, *Cedrela odorata* and *Pinus tecunumanii* that have shown promise in trials that could become important in the future. Uganda is characterised by versatile micro climates. This implies that species that are site specific can be found scattered and spread over the whole country.

Table 4. Common plantation species' site suitability locations in Uganda (adapted from SPGS, 2009).

Species	Notes	Suitable in Uganda	Not suitable
<i>Eucalyptus grandis</i>	<ul style="list-style-type: none"> ➤ First introduced around 1912. ➤ Commonly planted for fuel wood and poles and important source of income for small farmers since it is easy to raise from seed, coppices vigorously when cut with rotations of 8-15 years. ➤ Cool moist, cool wet areas (18-220) and Rainfall: 1 250-1 500 mm. 	Central and Mid Eastern, Western and Midwest, West Nile	Cattle corridor and North eastern parts (Karamoja sub-region)
<i>Pinus caribaea</i>	<ul style="list-style-type: none"> ➤ It copes well with shallower soils on lower elevation sites and performs well on fairly dry sites. ➤ <i>P.c. var. hondurensis</i> is easy to raise from improved seed for commercial planting with rotations of 18-25 years ➤ Warm wet, hot wet conditions (22-240). ➤ Rainfall: >1 250 mm. 	Central, Western, Northern, Southern	North Eastern parts (Karamoja sub-region)
<i>Maesopsis eminii</i>	<ul style="list-style-type: none"> ➤ Fast growing indigenous species for timber production and general purpose hardwood timber although not easy to grow in plantations. ➤ Prefers moderately fertile, deep and well drained soils for it is a natural pioneer species in the Tropical High Forest - around Lake Victoria's shore, Albertine Rift. ➤ Cool, moist, wet and or slightly warm (18-240) with rainfall: <1 200 mm. 	Lake shore basins	Northern and Eastern
Clonal <i>Eucalyptus</i>	<ul style="list-style-type: none"> ➤ Hybrid clones of <i>E. grandis</i> x <i>E. camuldulensis</i> (GC) and <i>E. grandis</i> x <i>E. urophylla</i> (GU) were imported from South Africa in 2002/2003, trial plots of provenances were established in different parts of the country. ➤ The clones have shown tremendous potential to expand the plantable area for eucalypts in Uganda. ➤ For drier and hotter sites. 	Central, Western, Northern, Southern, West Nile	North eastern parts (Karamoja sub region)

Appendix 1 shows the site conditions of the major plantation areas in the country. It shows that, generally speaking, the growth conditions are favourable for most trees. The areas are relatively easy to access.

2.2.2 Distribution of forest plantations

Initially, when plantations were clear felled, replanting started. As encroachers started invading CFRs, planting was encouraged as a preventive measure, so each plantation manager started planting with whatever seedlings they could get. This resulted in poor management because the units were very small and not economical. NFA developed a Plantation Strategy in 2005 and they set aside 200 000 ha of land in priority CFRs for plantation development (50 000 ha by NFA and 150 000 ha by the private sector). NFA itself had planned to plant 2 500 ha per year and, according to available NFA records, they have managed to plant 13 500 ha as of 2010.

NFA plantation establishment is concentrated in what they have termed core Plantation Management Areas: viz. Mafuga, Mbarara (Rwoho/Bugamba), Lendu, Katugo, Opit/Abera, Mwenge and South Busoga. The distribution of forest plantations in CFRs is shown in Figure 2. The private developers in the CFRs are also encouraged to develop their plantations in clusters in consideration of future sawmills and other wood industries establishment. This is very important for the small growers with total area of less than 500 ha..



Figure 2. Distribution of forest plantations in the Central Forest Reserves. Source: NFA (2009).

2.2.3 Encroachment and excisions

Forest encroachment is a big problem in the CFRs. Encroachment is for rural settlements, agriculture, and urban expansion. According to NFA records, it increased from 180 000 people in 2005 to over 300 000 in 2006, mainly due to the Executive Order by the President of Uganda in 2005, that encroachers should not be touched. Forest encroachers have affected the development of forest plantations in that they reduce available land for afforestation projects and also once evicted they become malicious by setting fires to plantations thus frustrating the investors. According to NFA records, a total of 32 900 ha in various CFRs have been encroached. There is little encroachment on actual forest plantations except in a few incidents where encroachers have cut down young trees in South Busoga and about 50 ha were affected.

2.3 Plantation management

As mentioned already, commercial plantation forestry was not very much a big activity until trees from the tropical high forests decreased considerably due to policy changes towards promoting biodiversity conservation. The Uganda Forest Department (UFD) staff of the Ministry of Water and Environment did not have many skills in commercial forestry plantations management. When it was realised that a big shortage of round wood was bound to occur, interest was developed towards commercial plantation forestry. Much of the plantation management in Uganda today is based on the recommendations that have taken root in the country as a result of the SPGS's initiatives.

The SPGS staff have published a book *"Tree planting Guidelines for Uganda"* which covers most of the information needed for successful commercial tree planting.

2.3.1 Establishment

Seed sources

Tree plantation developers obtain their seed from several sources that are basically determined by the level of investment. These sources include natural populations, individually outstanding trees from natural stands, individually outstanding trees from plantations and seed production areas where the poor trees in a stand have been removed and the best trees are left to interbreed. There are some sources of seed in localised areas of forests scattered in the country initially established with seed collected from natural populations in Central America, Brazil, the Caribbean region and Australia. In addition, the Uganda Gatsby Trust has provenance trials for *Eucalyptus* clones, a project being hosted by the National Forestry Resources Research Institute (NaFORRI), which provides fast growing cloned seedlings on a pilot scale. However, they are small and cannot supply the rapid growth of commercial plantation development in the country. In general, there is a scarcity of good quality seed in the country due to previous experiences of poorly developed tree seed stands. This implies that for commercial tree growing, it was recommended that seed, especially for the coniferous species, be imported so as to develop quality plantations. Indeed, the best seeds for pine are being imported from Australia and Brazil, the former are more expensive compared to the latter source.

Tree nurseries and management

The first commercial tree nurseries were established in the early 1960s by the former UFD to raise seedlings for major plantations. They were modest with limited technological development and remained so until 2004 when, through SPGS, the demand for seedlings started to pick up very fast. It was at this time that the private sector and the NFA started to develop large tree plantations that the demand for quality tree seedlings rapidly increased. Currently, the development of tree nurseries is a lucrative business. It is, however, commonly hindered by poor practices and the future direction of these tree nurseries is not clear. Although some of the traditional tree nurseries have improved on their local practices, none has shifted from the old labour intensive operations. They still use polyethylene bags, topsoil and employ manual methods of watering and under-cutting (root pruning). The National Tree Seed Centre is one of the biggest seedling producers in the country. According to available records, an average of 15 million tree/fruit seedlings are raised annually for NFA plantings and also sold to the private tree planters. The big private planters also run their own nurseries and may have surplus to give to surrounding communities. Some of the big

private plantation owners have also started raising clonal eucalyptus seedlings for their own planting. There are difficulties in balancing soil ratios and seeds are raised in different soil conditions causing differences in germination rates and growth uniformity. To manage replication of quality planting material, the SPGS has listed and recommended some tree nursery developers for tree farmers to obtain planting material so as maintain a consistent good quality tree estate. In Uganda, even though most of the commercial tree planters are still small, those now planting more than 500 000 seedlings per year are experiencing limitations of their traditional nursery system.

Land preparation

Pitting is done manually in most plantations in Uganda. Much as some tree farmers have no guidance on how to do pitting well, the SPGS has invested resources to avail the farmers with the knowledge on how to perform these tasks professionally. Several farmers are often trained to do lining using strings and pitting consequently. A pit of about 45 by 45 cm is recommended. The top soil is replaced, and with a planting trowel, a small hole is dug in the centre of the planting pit. The hole must be deep enough to accommodate the whole root plug and part of the stem of the seedling.

Spacing

The following is the spacing for common plantation trees in the country and is very dependent on end use. *Table 5* shows spacing specifications issued by both SPGS and NFA.

Table 5. Spacing schedules. Sources: NFA (2006) and SPGS (2009).

Species/SPGS	Spacing (m)	Stocking (SPH) Trees/ha	Comments
Pines	2.7x2.7	1372	Traditional spacing
	3.0x2.5	1333	With seed which is not highly improved
	3.0x3.0	1111	With highly improved seed for saw logs
Eucalyptus	3.0x2.0	1667	In case of good market for early thinning or for a purely fuel wood regime
	3.0x2.5	1333	For saw logs and large poles
	3.0x3.0	1111	For saw logs where no market for thinning exists
Musizi	3.0x3.0	1111	
	4.0x3.0	833	
Species/NFA			
Conifers	3.0x3.0	1111	
Eucalypts	2.0x2.0	2500	Requires heavy thinning for poles
<i>Terminalia/M.eminii</i>	3.5x3.5	816	
Musizi	4.0x4.0	625	

Planting

In Uganda, the seedling pot is often held by a plastic sleeve that should be removed from the seedling, and disposed of correctly. The seedling is placed upright in the hole, but deep enough to cover the root plug and some of the stem. The soil is replaced into the hole around the roots, making sure that the seedling and roots remain in a vertical position. The replaced soil around the seedling is firmed with ones' hands, pushing down and in but not with too much force.

Beating up and annual replanting rate

Depending on planting practices, especially timing, there is not much failure of seedlings to warrant huge beating up deficits. The SPGS recommended practices result in limited need for beating up. The operation carried out to replace any seedlings that may have died (or are struggling) immediately after planting. Since beating up is expensive, it is recommended that it be done when the survival percentage is less than 90%. It is common practice in Uganda that backlogs are replanted the following season much as this practice is not recommended as it invariably leads to enormous variation in growth rates between the trees planted at the two different time periods.

However, several large investment and commercial tree planters do beating-up soon after planting especially for Eucalyptus that has very fast growth rates.

Replanting backlogs

During the period 2004-2010, 9 525 ha were replanted in harvested areas and 2 800 ha in other CFRs. There is no other data or details on the replanting backlogs.

2.3.2 Weeding

Based on the recommended practices by the SPGS, weeding is done to control competition for resources between tree and other plants on the site. Poor weeding control in several micro climates in Uganda has caused plantation failures as the weeds grow very fast although seasonally. There are several weed control methods and choice is based on the type of weeds, level of investment and type of tree species. Commonly, weed control activities are tendered out to companies under agreed contractual terms of a chosen method of weed control. There are three main categories of weeding: chemical, mechanical and manual. Due to financial challenges and fast growth of weeds, there are often many weeding backlogs that tree growers cannot meet in a single season. *Table 6* gives the summary of the common weed control methods in tree plantations.

Table 6. Weed control methods in tree plantations in Uganda. Source: SPGS, 2009.

Method	Notes
Chemical weed control	The major herbicide used is Glyphosate (Mamba or Round up) (Glyphosate is the active ingredient). About 4 to 6 litres/ha depending on type of weed. Glyphosate kills any green plant material so it is safer to use it in the pre-plant situation. Need a well trained spray team. When using Glyphosate in the post-plant situation, it is essential to prevent it from coming into contact with the planted trees. The trees should be protected using buckets, cones or shields. Good storage of the chemical and proper disposal of used chemical containers is also important.
Mechanical weeding	Not yet common in Uganda.
Manual weeding	Commonest in Uganda and most small-scale plantations. It involves reliance on man-power, which uses simple tools such as hoes, slashers and pangas to remove any competing vegetation. Manual weeding can be carried out in a number of ways: Slashing: This is normally a full cover operation whereby the entire area is slashed or a spot operation where the weeds are only high in certain areas. Climber cutting: to remove climbers from young trees. Needs a spot weed around the tree, thereby exposing the tree and creating a gap between the weeds being slashed and the trees. Hoeing: Hoeing can be three different kinds: Spot hoeing. The area immediately around the tree is hoed and the rest is left, slashed or sprayed with herbicide. It is recommended to weed a circular area of a minimum 1 m diameter (i.e. 0.5 m radius) around each tree. Line hoeing. The tree line is hoed, usually 1 m wide and the inter-row is left, slashed or sprayed with herbicide. Full cover hoeing. The entire area is hoed. This method must not be done on erodible, steep slopes as there is no vegetation to prevent erosion.

There is no data on weeding backlogs. Those projects with separate funding like the World Bank and Carbon funds got weeded, but the backlogs are with the other plantations that depended on donor support for maintenance which was suspended due to unresolved governance issues within NFA. The situation is exacerbated by the dwindling NFA capacity to make its own revenue from the almost finished mature plantation trees to sell. The private companies and individuals are weeding their plantations as scheduled although the farmers in the low income category are experiencing hardships unless they are registered with SPGS.

2.3.3 Pruning

In plantations ready to be pruned, manual pruning is the most appropriate alternative. Much as there are guidelines, site conditions that determine growth rates are important datum for decision making, there is no clear information on the pruning regimes of the indigenous species although several farmers only prune when they feel they need to utilise the pruning or if they feel that they need to use the under story of the tree area. The NFA and SPGS both have developed pruning guidelines which are not so different, but given that SPGS is giving more technical support to the commercial tree planters, their schedule has been quoted as indicated in *Table 7*. Due to limited funding for NFA, only 2 100 ha of plantation were pruned leaving a pruning backlog of 1 600 ha. It was difficult to get information from private plantations. However, the big private companies have done required pruning.

Table 7. Pruning schedule. Source: SPGS, 2009.

Pruning schedule	Pruning Height (m)	Age, years		Stems/ha	Comments
		Pines	Eucalypts		
1st	2	3 to 4	1 to 2	1 111	This 'access' pruning is essential
2nd	4	5 to 7	3 to 4	700	
3rd	7	8 to 10	5 to 6	500	Some growers stop here
4th	10	11 to 13	7 to 9	300	Higher pruning is costly

2.3.4 Thinning

Thinning is an important part of proper plantation management and, when followed properly, the final quality of logs is very good in terms of volume and form. One of the problems, especially of the first thinning, is that there is no market for them. There is no wood processing industry that can utilise it at the moment. Available records from NFA for 2010 showed that there was a thinning backlog of 1 530 ha. There was no thinning done due to financial constraints. *Table 8* shows the recommended thinning schedules in Uganda.

Table 8. Thinning Schedules for Eucalyptus and pines. Sources: NFA (2006) & SPGS (2009).

Species	Thinning	Age (years)	Remaining stems	Comment
SPGS				
Pinus spp.	1st	4 - 6	700	
	2nd	6 - 9	500	
	3rd	9 - 10	300	
Eucalyptus spp.	1st	1 - 2	700	
	2nd	3 - 4	500	
	3rd	5 - 7	300	
NFA				
Pinus spp.	1st	4 - 6	700-800	Commercial thinning
	2nd	10 -12	400	
Eucalyptus spp.	1st	2 - 3	750	
	2nd	4- 5	455	
	3rd	6 - 8	300	

2.3.5 Forest health

Fire protection is carried out every dry season. The most severe dry season is December to March. The external boundary should be clean hoed during the dry season. Controlled burning around the plantation should be carried out at the beginning of the dry season. Funds allowing, a simple fire tower should be constructed at one of the highest points and should be manned during the dry season. People surrounding the plantation should be sensitised about the dangers associated with fires, especially the far reaching damage and losses that come with forest fires, and how to handle them. The plantation area should be patrolled during the dry season. While these are the preventive measures recommended in the books of NFA, forest fires are still a big challenge to plantation forestry in Uganda. The major causes are categorised as either malicious (arson) or accidental. The malicious fires are started by disgruntled contract workers (who have not been paid) and former encroachers who had been evicted from these reserves. The accidental fires are caused by honey hunters, grazers and bush burners.

According to available data from NFA, a total of 220 ha of plantations were burned down during 2005/06, 102 ha in 2006/07 and 330 ha in 2009/10. This does not include fires which occurred in the private forest plantations. As the acreage expands fires are anticipated to increase. There is limited experience, skills and technology developed locally to fight fires where prevention has failed.

Table 9. Average area of forest plantations affected by fires. Source: NFA (2010).

Forest fire (ha)				Remarks/major causes
2005/2006	2006/2007	2009/2010	Total	
19	9	228	256	Malicious(disgruntled workers and former encroachers)
200	93	101	395	Accidental (honey hunters, grazers and bush banners)
219	102	329	651	

Experiences by SPGS from forest plantations outside the country are advocated for adoption by Uganda's plantation owners. These include both preventive and curative approaches. Much of the preventive efforts so far include:

- Community sensitisation: working with surrounding communities – not against them – and educate them on the dangers of forest fires;
- Identify risks well in advance and try to minimise them;
- Preparation of firebreaks in advance of the driest periods;
- Purchase and maintain suitable fire fighting equipment, although this is not widely taken up, so far;
- Continuous monitoring in dry seasons so that any fires are spotted early and ensuring that there are people on standby at critical times;
- Training has been conducted by SPGS to plantation staff and contractors on fire related preventive and curative safety activities; and,
- In areas where fires have occurred, immediate follow-ups to ensure compliance to disciplinary action where required.

Table 10 shows the main **pests and diseases** affecting plantation trees. Of late, the problem of the pine wilt has increased. According to SPGS (2011), localised pine wilt disease is found in Mpigi, Wakiso, Mubende and in the Albertine region. It is not yet a threat to the plantations as a whole but a solution has to be found to contain it before it spreads. SPGS has hired consultants to research this problem. This is one area that needs to be strengthened. It was hard to find how much of the forested area is infected with pests and diseases. However, in the table an indication is given as to the seriousness of the problem for each disease or pest.

Table 10. Uganda's main pests and diseases. Source: SPGS (2009).

Pest	Type	Notes
BLUE GUM CHALCID (BGC) <i>Leptocybe invasa</i> .	Minute insect(<1.5 mm long)	First spotted in Uganda in 2002 and has quickly spread throughout the country. It is black with transparent wings and only female individuals are known. Forms galls on the foliage and twigs of infected plants, containing eggs inserted by adult females. Infected shoots appear deformed and heavier infestations results in severe growth malformation and even branch dieback. Affects most commonly planted eucalypts in Uganda as well as some hybrid clones too. Not present in the higher, cool regions of SW Uganda. Currently no control measures are available against BGC but it is recommended to destroy material that is thought to be infected.
TERMITES <i>Macrotermes spp</i>	Insects-communal insects	High impacts found in the hotter and drier areas of Uganda. They eat roots, root collars and bark of trees up to two years old. Once the canopy has closed, termites are seldom a problem. <i>E. grandis</i> appears particularly susceptible. <i>Controlled by</i> physical removal of the queen followed by application of insecticides in mounds. <i>Preventive methods to control damage:</i> Using healthy and vigorous planting stock; Planting seedlings as early as possible in the rainy season; Ensuring seedlings are well watered immediately before planting out; Planting species or provenances that are resistant to termites.
BLACK PINE APHID – <i>Cinara cronartii</i> .	Insect (4 mm long)	Mature is pear-shaped, soft bodied, greyish black. Just heavily attacked trees have a black appearance. Still localised In Uganda, the black pine aphid has only been a localised problem, though this could change as pine plantations expand. Extract large amounts of sap from the host trees.
Animals	Rodents, primates goats, antelopes, cattle, elephants	Physical damage to shoots, barks, bole geometry. Sensitisation of communities to control animal movements is an effective control.
BOTRYOSPHERIA STEM CANKER <i>Botryosphaeria dothidea</i>	Fungus	Development of stem cankers and the death of tree tops. Stems cankers are most common on trees stressed by drought and are characterized by stem swellings. Cutting badly infected trees out during routine thinning operations. Apply optimum silvicultural techniques to minimize stress.
CONIOTHYRIUM STEM CANKER <i>Coniothyrium spp</i>	Fungus	Small, dark spots on young bark are the first signs, followed by larger patches of dead bark. It affects a range of <i>Eucalyptus</i> spp. and hybrid clones. PINE WILT: Yellowing and wilting leading to dieback and eventual death of young trees.
LEAF SPOTS <i>Cylindrocladium spp.</i> and <i>Mycosphaerella spp.</i>	Fungus	Leaf spots ranging from small, discrete lesions to irregular necrotic (dead) areas. Young stems can become infected and girdled, resulting in shoot blight. Widespread but generally not very serious. No eradication treatment available.
MVULE GALL <i>Phytolyma lata</i>	Gall-fly	causing serious damage to young mahogany and Mvule trees.
BACTERIAL WILT/BLIGHT <i>Pantoea anantis</i> or <i>Burkholderia solanacearum</i>	Bacterial	The bacteria occur in the soil and its mode of transmission on eucalypts is not known. Damage locally can be more serious: some eucalypt hybrid clones have been badly affected in Kifu nursery in Uganda. There is no known treatment. Research is needed to identify species and clones that may be more resistant to infection.

Illegal felling of trees in plantations is on the increase. According to NFA (2010), this is due to increased scarcity of trees outside the plantations. Because of delayed payment of patrolmen due to lack of funds, the patrolmen have instead started cutting down some trees to compensate for the non payment. This illegal felling is a problem in Lendu, Mafuga and Mbarara forest plantations. The Government has set up an Environment Protection Force of 600 personnel of which 150 are to

be deployed in NFA plantations to stop the illegal felling. It remains to be seen how this militaristic approach to protection will be effective.

2.3.6 Maintaining long term site productivity

Harvesting planning. Good roads are crucial for effective forest management. Timber harvesting operations are a potential major source of environmental damage, especially where heavy, wheeled machines are employed. Where operations may cause environmental damage, appropriate measures must be taken to minimise the damage and mitigate the impacts of any damages that has already occurred. Soil compaction is caused by use of heavy machinery during harvesting. One should therefore avoid harvesting during wet seasons as it results in soil compaction. It is also very important to use appropriate equipment considering the topography and soil type. The commercial forest tree crop is in a young stage with a few remaining mature stands. It is important that harvesting planning is done well in advance, and with the above considerations.

Erosion control. Soil quality is of fundamental importance for the productivity and sustainability of forest plantations. The biggest issues relating to soil quality are soil erosion, soil compaction, and soil water and nutrient loss. Erosion tends to increase during site preparation and road construction when the soil is exposed to wind and running water. The amount of erosion depends on slope, soil type and rainfall, and the nature of the tree canopy. Cultivating planting sites with heavy equipment during rainy seasons must be avoided to reduce erosion and compaction. Very steep slopes should not be mechanically ploughed.

The control of land degradation induced by soil erosion in forest plantations is carried out at several stages. During plantation establishment, plantation owners are advised not to leave land bare by monitoring weed growth using methods like slash management. On steep terrain that enhances soil erosion, contour land management is commonly used. This involves row pitting and planting, maintaining trenches in sensitive runoff areas of the sites, and maintaining a controlled weed surface that does not affect tree crop before canopy cover.

The burning of trash prior to planting can have negative consequences for the soil structure and nutrient status, especially if the fire is very hot, which can happen where conditions are very dry and there is a lot of trash. Thus, careful timing of trash burning is recommended to avoid hot fires.

2.3.7 Growth, yield and rotation age

As mentioned above, *Pinus caribaea* and *Eucalyptus grandis* are the main plantation species. Table 11 shows the mean annual increment, total yield and the rotation ages of these two main plantation species.

Table 11. Mean annual increment (MAI), total yield, and rotation age of *Pinus caribaea* and *Eucalyptus grandis*. Source: NFA, 2006.

	<i>Pinus caribaea</i> Site index 16 (on best sites)	<i>Eucalyptus grandis</i> Site index 30 (on average sites)	
Mean annual increment (MAI)	26 m ³ over bark (5 cm top diameter) or 20 m ³ under bark (10 cm top diameter) at rotation of 25 years.	25 m ³ over bark (5 cm top diameter) or 23 m ³ under bark (10 cm top diameter) at rotation of 12 years.	
Yield	12 yr-thinnings 59 m ³ (under bark to 10 cm top diameter).	3 yr-thinnings	14 m ³
		5 yr-thinnings	32 m ³
		8 yr-thinnings	46 m ³
	20 yr-rotation-320 m ³ 25 yr-rotation-440 m ³	12 yr-rotation-200 m ³ 20 yr-rotation-310 m ³ 25 yr-rotation-360 m ³	

These high growth rates will only be achieved by closely following the recommendations made by SPGS guidelines with regard to seed source, seedling quality, site selection, good land preparation, weeding before and after planting and then thinning to the correct stocking on time (SPGS, 2009). Table 12 gives a summary of the growing stock of plantations based on the yield model for *Pinus*

caribaea and *Eucalyptus grandis*. The details of the volume production per ha for each different age are shown in *Appendix 2*. The growing stock is estimated at c. 2.35 million m³, of which 80% with the private sector. *E. grandis* and *P. caribaea* make up around one third each of this volume, the eucalypt mainly in private and the pine in government plantations. The remaining one third of the growing stock is distributed on a dozen or so other species.

Table 12. Growing stock of forest plantations (in 1000 m³). Source: NFA, 2010.

Ownership		Total growing stock (1000 m ³)
Government	Private	
467	1 883	2 350

2.4 Forest plantation expansion

2.4.1 New areas available for forest plantation expansion

According to the NFA plantation strategy, the NFA set aside a total of 150 000 ha to allocate to the private sector commercial forestry plantation developers. Of that, less than 50 000 ha have been given out leaving almost 100 000ha available for plantation expansion. The amount available on private land is not known but there is still a lot that can be bought or leased. *Table 13* gives the details about ownership and location.

Table 13. New areas available for Forest plantations expansion. Source: NFA, 2010.

Type of area	Size of available land (ha)	Suitable tree species for afforestation
CFRs	104 100 ha of government land offered to private planters	<i>Pinus caribaea</i> , <i>Pinus patula</i> , <i>Eucalyptus grandis</i> , <i>Cupressus lusitanica</i>
CFRs -NFA	50 000 ha by NFA as per the strategic plan at inception	<i>Pinus caribaea</i> , <i>Pinus patula</i> , <i>Eucalyptus grandis</i> , <i>Cupressus lusitanica</i> ,
Private	*	<i>Eucalyptus grandis</i> , <i>Pinus caribaea</i>

*Data not available

2.4.2 Stakeholder views on establishment, expansion and improved management of forest plantations

As mentioned already, there is a lot of interest in forest plantation development by many people, both local and foreigners. Since 2004, with the help of the SPGS, it has been demonstrated in practice how it is possible to grow forest plantations as a business and not for the sake of “keeping the environment”. The acreage of new plantations has reached about 60 000 ha and more that 70% of these are less than 8 years old. The availability of land in CFRs rented to private companies and individual on long term permits of 50 years created more interest in the public to start investing in commercial forestry plantations. Companies and individuals have started buying private land following the suspension of land in CFRs in July 2007. With the formation of UTGA, it is expected that more investments in commercial forest plantations will come. SPGS has demonstrated the best practices of commercial forestry and all people involved, including the NFA, are looking ahead to improved management of forest plantations.

The NFA was created in 2003 as a result of reforms in the forestry sector which created a semi autonomous parastatal to manage the forests under government ownership. The NFA was supposed to become self financing after four years of existence which was a mistake. With reduced donor support, NFA is failing to expand its commercial forestry estate and even to maintain what had been planted with donor support. Unless the government injects new funds in the NFA, there is a bleak future of its commercial forestry plantations. And they may as well be sold.

2.4.3 Constraints and opportunities for plantation expansion

The following main constraints hinder the expansion of successful plantation enterprises:

1. **Land:** Commercial forestry requires large areas of suitable land in order to achieve economies of scale and reduce distances to markets. Other land related constraints include:

- Security of tenure is also very important whether investors are planting on private land or land leased from the NFA. Some land that was offered by the NFA for planting by private investors is illegally encroached by cultivators and cattle keepers. Of late, there has been bad press regarding the eviction of encroachers by the New Forest Company, the biggest of the foreign investors in the sector. This encroachment problem has caused several companies that had ambitious plans of afforestation to severely cut back as they monitor the progress on resolving the issue of illegal encroachers;
- There is in existence a ban on land allocation in CFRs to private tree planters by the NFA as a result of the Presidential Directive of July 2007; and,
- There is another problem of inadequate supervision by the NFA to ensure that people allocated land for commercial tree planting utilise it according to the agreed permit conditions. However, the UTGA is now lobbying hard on behalf of the private investors to get better Government support to resolve these land issues.

2. **Infrastructure:** The poor state of the rural road network in the country is a major constraint to investors in the forestry sector. There is a need to have good access to plantation areas for establishment purposes, for fire protection and finally to get to the logs at harvest time. Most of the rural roads are a responsibility of the districts in terms of making and maintaining them. The burden therefore falls on the investors which eventually reduces the profitability of their forestry business. The hope is that as the government realises how much forestry plantation development brings money to the communities in terms of employment, and more pressure from the UTGA, the road network will be improved.

3. **Location:** As the excitement of growing trees as a business went up, many individuals or small companies, including the NFA, started planting in scattered areas across the country, in CFRs and on private lands. They didn't think about the issue of markets of logs in terms of distances from current and future processing plants. When these trees mature, it might be a problem for owners to get good markets for their logs. However SPGS is now collaborating with the NFA who is the biggest land holder in the sector to have new plantings well planned in terms of processing.

4. **Inadequate financial support** from the government to create an attractive environment for commercial forestry plantation establishment. The lukewarm support from government could be a result of poor public attitudes towards forestry and lack of appreciation that timber is a very critical resource for the country's development, and that natural sources of timber are almost exhausted in the country. The issue of taxation of forestry revenue is still not conducive to investors. Forestry plantation business is of a long term nature, anywhere from 12 to 25 years. Since the main income comes at final harvest, the proceeds are taxed as if it were an annual income without recognising how long it had taken to accumulate this income. There is also lack of long term funding from financial institutions to sustain commercial forestry in the country. UTGA and SPGS are lobbying the Uganda Revenue Authority (URA) to reconsider its taxation of forestry income in such a way that the investor is allowed to use part of the income from final harvest to replant the area or exempting plantation forestry from income taxes.

5. **Research and Development and lack of skills:** As already mentioned, commercial forestry is a relatively new experience to Uganda and as such there is inadequate research support to the investors. The established training and research institutions (Makerere University, Nyabeyaya Forestry College and NaFORRI) are not in positions yet to give the required support. However, through the SPGS effort, scientists from Makerere and elsewhere have been identified and given research contracts on specific problems in the field. So far that is working well. Again, SPGS has intensified mounting of short term training courses for the commercial tree planting companies and communities. This is creating a skilled pool of labour, both at technical and managerial levels. Makerere University launched its commercial forestry training programme and in the next two years the graduates will be on the market.

6. **Markets:** There is a big market for saw logs, chips, transmission poles, building poles, fencing poles and firewood. The market will continue to expand as the country's GDP and population rise.

The challenge will be in regard to the very high population which will exert pressure on the land available for commercial forestry development.

7. Processing capacity: The current capacity for processing saw logs is very low. The sawmilling equipment is giving a recovery of around 20-35%, causing a lot of waste of raw material. The common equipment is Lucas and Kara mobile sawmills. The majority of the timber is supplied from pit sawing operations. As the mature plantation trees are almost finished, the investors will have an opportunity to invest in new and more efficient sawmills to get a recovery close to 45-50% as is happening in other parts of the world. According to Jacovelli P. and A. Finch (2005), Uganda needs a minimum of 5 000 ha of productive plantation in any one region (within a radius of around 50 km - more if the roads are good) to justify such a processing facility. The new developers have been advised to keep this in mind and also the community and other out-growers should look for such nucleus plantations and be in their vicinity to get a good price for their saw logs or chips. SPGS funding is helping such companies and farmers.

8. Institutional framework to promote plantation forestry: UTGA was founded in 2006 but only became fully operation after 2008. It is an all-encompassing and non-partisan organisation with membership drawn from small, medium and large scale tree growers as well as community planters, spread out across the country. The main objectives include purchase of improved seed and other forestry inputs; lobbying government for a better investment climate; exchange and sharing of information and experiences on tree growing and advocacy for better land tenure security. Currently, UTGA has 141 members. SPGS has worked hard to support the formation and sustenance of this association as a way of ensuring that all that has been achieved under the SPGS project life will be carried on by the association to advance the needs and aspirations of commercial timber growing in the country.

The Government is committed to promoting profitable and productive forestry plantation business (Forestry Policy 2001, Policy Statement 3). Among the strategies to effect the above policy statement is the issue of progressively divesting the management of existing commercial plantations on Forest reserves to the private sector. Regarding financing, it is proposed that innovative financing mechanisms, such as a Forestry Fund, and Fiscal incentives will be put in place in order to encourage investment and ensure sustainable sources of operational and re-investment funds. The challenge is for UTGA to lobby government hard to implement these good strategies. *Table 14* gives a summary of perception on risks for private sector investment in industrial forest plantations. The highest risks are exchange rate, governance issues and forest resources availability.

Table 14. Perception on risks for private sector investment in industrial forest plantations.

	Risk for forest investments		
	Low	Medium	High
SUPRA (Macro economy)			
Growth of GDP	√		
Exchange rate			√
Interest rate		√	
Free trade agreements	√		
Political stability and Government transparency		√	
Governance issues ¹			√
Fiscal policy	√		
INTER SECTOR			
Economic infrastructure			
– Transportation		√	
– Energy/Utility		√	

Social infrastructure: (water, sanitation, education, health)		✓	
Licenses and permits	✓		
Labour			
– Laws and labour contracts	✓		
– Wages	✓		
– Labour productivity		✓	
– Labour qualification		✓	
Access to credit		✓	
Justice and law enforcement		✓	
Capital gain policy		✓	
Land and resource tenure			
– Land tenure		✓	
– Land market	✓		
– Land use as collateral	✓		
Sectoral policies			
– Environment policies and restrictions	✓		
– Agricultural policies and restrictions		✓	
INTRA-SECTOR			
Forest resources (availability)			✓
Subsidies and financial mechanisms	✓		
Trade restrictions (on forest products)		✓	
Markets	✓		
Entrepreneurial development service		✓	
Forest vocation land (land suitable and available for forest)	✓		
Legal and institutional basis		✓	

¹ How effectively government policies and measures are being implemented

3. OUT-GROWER SCHEMES AND OTHER WOODLOTS

3.1 Extent and impacts of out-grower schemes/other woodlots

Farmers have been growing trees on their farm lands for a long time. There have been many donor projects in the past supporting tree planting by farmers. The most common species are various *Eucalyptus spp.* They grow these trees as a source for their own poles, timber and firewood, while others grow them to raise income. The number of farmers growing trees has increased in the recent past due to the publicity of growing trees as an income generator by the forestry sector and also due to increased demand for poles and firewood especially near big urban centres.

It is hard to know how many out-grower schemes there are in the country because of lack of records by the DFS. The FIEFOC has been supporting farmers with tree planting, so far in 33 districts. The total acreage so far is 20 000 ha according to the Project Manager (2011). This figure does not reflect what has actually survived and also the condition of the trees.

The SPGS recognised the need to support small-scale tree planting on farms by the majority rural poor although its main thrust is with commercial growers. They dubbed the support the Community Tree Planting Initiative and it started in 2005. To avoid the failures of other previous efforts from NGOs, the SPGS came out with an innovative way of supporting the communities: The community applies to SPGS by submitting the names and areas for each member of the community. After this, an SPGS team visits the community to appraise it. Training is organised for successful communities covering basic aspects for planning, land preparation, planting, maintenance and protection of trees. Members are then informed to prepare their planting sites targeting the next rainy season. In consultation with community leaders, SPGS then buys and transports seedlings at the start of the rainy season and members immediately plant the seedlings as trained. SPGS staff, in collaboration with community leaders, organises regular visits to communities to offer on-spot technical advice and further training in maintenance and protection of planted trees. SPGS has developed community planting guidelines which details all they need to know about being a successful tree grower. Support is continued to the communities as long as they have land available and are committed to planting. According to SPGS, the Community Support from 2005-2010 has achieved what is summarised in *Table 15*.

Table 15. Profile of SPGS Community Support Project. Source: SPGS homepage 2011.

Item(2005-2010)	Total
No. of districts	36
No. of communities	103
No. of members	3 120
No. of seedlings supplied	1 721 053
Area (ha) planted (at 80% survival)	1 239

3.2 Factors shaping growth of out growers and other woodlots.

- The profit and the relatively low risk associated with tree growing as a business is one of the factors shaping growth of out-growers and other woodlots;
- The financial and technical support: SPGS is providing good seedlings for free plus the training they give to communities which are good incentives. SPGS has allocated one Plantation Officer to take full charge of coordinating community activities;
- Supply of fuel wood has become more important as the small to medium processing and service industries increase. The industries include bakeries, hotels and restaurants, preparation of schools meals and others. Other industries that need fuel wood include tea factories and tobacco curing; and,
- Targeting the right communities: SPGS support has been focused on communities surrounding SPGS clients (large scale tree growers). This makes it easier to access communities while SPGS staff inspects clients. This has enabled the large scale tree growers to link up with communities so that they work together as part of sustainability.

A number of additional current and potential growth factors, and constraints, affect the establishment and up-take of out-grower schemes and establishment of small-scale woodlots, for example:

- Land tenure systems where some tenants are not allowed to plant trees since they don't permanently own the land. An example is the case of the Mailo land tenure, where a sitting tenant is not allowed to grow trees, and if s/he does, the land owner may take them;
- Lack of technical assistance to farmers, which leads to choice of poor quality seedlings and poor crop maintenance;
- Competing interests for those depending on home labour alone. Food crops normally take first priority over trees when it comes to planting and weeding;
- Access to good markets to get a good return on the investment;

- Myths about trees using too much water or spoiling the soil which discourages certain tree species to be planted (like Eucalyptus);
- Managing of trees by farmers to achieve maximum production and quality can be a challenge. Although some tree farmers often consider pruning as too costly for limited benefit, they are strongly advised to pursue it. Pruning improves access within the plantation, reduces risk of fire spread by preventing the spread of ground fires into the crowns. It also produces “clear wood” that is knot-free, among other benefits;
- Another problem that tree farmers, especially those growing pines, is the absence of ready and lucrative markets for thinnings, several tree farmers in Uganda are still reserved about carrying out thinning operations. This is a challenge that affects quality of forests at a later stage if they are not thinned on time, particularly pine plantations. In addition, given that thinning is a more expensive operation than clear felling and harvesting, some tree farmers seem to take up thinning reluctantly. This, however, applies mainly to the small tree planters; and,
- A few tree plantation farmers are attempting to construct forest roads so as to aid development of harvesting plans. Such activities are costly and several farmers are still reluctant to take them on much as they are important due to financial constraints.

4. FOREST AND TREE TENURE

4.1 Current forest/tree tenure systems

Forests cover 3.6 million ha, of which 17% consist of CFRs managed by the NFA, 18% consists of NPs and WRs of which 0.85% is jointly managed by NFA and UWA, and 0.03% are LFRs managed by respective local governments. The rest of the forests, 64%, are on private and communal lands, and hence managed by private and local community forest owners. *Table 2* above shows more details on how the forests are distributed among the responsible bodies.

4.2 Impacts of forest/tree tenure on poverty alleviation and SFM

Secure tenure of forest/tree resources greatly improves their management. In communities where government forests are handed over to them with proper training in their management, the improvement comes fast and leads to SFM. There are several success stories in Gambia, Tanzania, Nepal and Vietnam. With secure tenure, communities make decisions that will ensure a better managed forest. The development of forest based enterprises from tree resource brings income to alleviate poverty.

In the case of Uganda, there are few success stories on the Collaborative Forestry Management (CFM). In some cases, communities taking over a forest have led to its complete destruction. This could be because the process was rushed or there was no agreement within the community on how to implement the management plans. Poverty within the community can also push individuals to frustrate the whole arrangement so that with no body in charge, they can freely access the products.

4.3 Suggestions for improvement of tenure system

According to the Constitution (1995, Article 237) and the Land Act (1998, Article3), the following are the land tenure categories in Uganda: Customary, Freehold (formerly categorised as Public lands), Mailo and Leasehold. A forest can be owned in any of those categories of tenure. The Land Act gives the responsibility of managing land resources to the districts and empowers them to manage all land-related issues in their respective areas. This Act has important implications for the

management of forest areas on public land outside the forest reserves. These areas have had almost no formal management and many have been converted to other land uses, particularly agriculture. The districts will have failed to manage such forests due to insufficient resources both human and financial and also for them the forest is seen as a source of income. They can cut it down and convert it to timber or charcoal without being managed on a sustainable basis.

Private land ownership, especially where there are forests, may lead to forest fragmentation. There are some cases of depletion of forests as the land owners being not so much aware of the importance of their forests and are turning them into agricultural use. This is a hindrance to obtaining large blocks of land for commercial forest plantation development. On the other hand, private land ownership encourages investment in forest plantations by individuals that have the necessary resources and interest.

Whereas the National Land Use Policy was passed in 2007, the National Land Policy is still in draft form. This makes implementation of the land use policy difficult. Because of the present situation, environmental resources including forests are not well protected. Some people look at forest lands as free access land which hinders forestry development in the country. The passage of the National Land Policy will be very helpful in the protection of forest resources. It is proposed to convert public land and communal land ownership into a free hold ownership. This will enable whoever uses a particular piece of land to own it fully. This should encourage people to plant trees and own them.

The other issue concerns women, who are disadvantaged in security of tenure; they cannot inherit land and are rarely involved in making decisions concerning the management of natural resources. All these factors are disincentives for women to invest in tree growing. If this issue can be rectified and allow women to inherit land, it could boost their involvement into tree growing.

5. FINANCIAL AND HUMAN RESOURCES FOR PLANTATIONS AND OUTGROWERS/WOODLOTS

5.1 *Current financing mechanisms*

The Forestry sector in Uganda is financed through three major avenues, viz. government, development partners, and private sector funding. There is limited and probably non-existent information about out-growers since such a mechanism is not yet wide-spread in the country.

Government funding comes from two sources, namely allocation from the government treasury, and internally generated income for NFA and DFS.

The government provides an estimate of about 0.3% of its annual budget to the forest sector, mainly for salaries, allowances, administration costs and utilities (Kamugisha Ruhombe, 2010). The government funding targets mainly the management of CFRs using finances internally generated by the NFA. In addition, government funding to forestry trickles down to the management of LFRs following the decentralised system of government through three major avenues, viz. unconditional grants, conditional grants and equalisation grants. This funding also targets the Community Tree Planting Programme. The government borrowed money from the African Development Bank (ADB) to fund a project called the FIEFOC project. Part of these funds are used to raise seedlings and give to farmers who would like to plant trees, including timber trees like pines and eucalypts. It is not yet known how much acreage of plantations has been realised yet from this funding.

Official Development Assistance from development partners support specific programmes of the government related to forestry, for example the NFA activities. Much as NFA is self accounting and autonomous, at least 40% of its budget is met by ODA. Significant portions of finance from ODA are also obtained via Sector Wide Approaches (SWAPs) to Natural Resources Management that may include other key sectors of development like agriculture. The funding from development partners (mainly Norway) has been going down rapidly since 2007 due to unresolved governance issues in the sector. This has seriously affected new planting and the quality of the crop planted earlier because lack of funds has led to poor maintenance. However in the recent past, more funding has come from international initiatives on climate change adaptation and mitigation as

enshrined in the National Adaptation Plan of Action for Uganda. The World Bank is funding three carbon projects, at Rwoho, Rwenzori and Kasagala (total acreage of 6 000 ha).

Private Sector funding is quite substantial. This is availed by development partners through projects and NGOs that help the private forestry practitioners access finances. The biggest source of funding to private tree growers in Uganda is the SPGS. As already mentioned above, it is a joint initiative between the government, EU and Norway. It provides grants and technical support to private sector investors in timber and large transmission pole crops. Much of the finances that private people invest in forestry on a small level may not be documented in official statistics, but they also add on to the tree cover of the country. Since 2002, over US\$ 41 million has been raised by private sources to the cause of forestry development in Uganda. Private foreign companies, such as the Green Resources Ltd., New Forest Company and Global Woods, have started benefiting from carbon funds. This has enabled them to plant bigger areas as compared to the ones owned by local investors.

Generally, government funding to forestry has been declining and is expected to be further reduced in the near future based on observations since 2001. This is probably so because forestry is not yet a priority area during the budgeting process, much as it has been classified as a primary growth sector in the new National Development Programme (NDP). In the draft National Forest Plan 2011 (Ministry of Water and Environment, 2011), it is proposed that the government, including Development Partners, should fund 44% of the estimated US\$ 180 million 10-year plan, while the private sector and Civil Society Organisations (CSOs) fund 41% and 16% respectively. The support from development partners, though, will depend on action by the government to rectify some of the governance issues bedevilling the sector.

Private financing of forestry has been observed to rise since 2001 and is expected to continue rising as a result of the country wide campaign and advocacy for private forestry in Uganda. The anticipated rises in forestry funding from ODA and the private sector could be attributed to the expected demand for forest products and the Climate Change Adaptation and Mitigation Programmes (carbon funding) that are likely to be on the increase.

When looking at the plantation management budget and actual expenditures, it is apparent that actual expenditures are much lower than what had been planned. This is due to the fact that there is not enough money to do all the necessary activities. The managers of each range submit their budgets and, based on available resources, they are requested to reduce the number of hectares to be planted or even maintained depending on what is in each plantation. It is not possible to estimate future budgets and expenditures because the establishment of new plantations and the maintenance of existing ones will depend on available funds. It has been mentioned already that many areas under NFA have not been weeded, pruned or thinned due to lack of funds. NFA is facing big challenges raising its own funds since the mature trees it has been selling to fund its operations are virtually finished and there is also very little donor funds coming in. *Table 16* shows the overall financial support that has been going to NFA since its inception. For public forestry development, NFA takes the lead.

Table 16. Funds for forest development (1000 US\$). Source: NFA Reports, 2010.

Source of Revenue	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10
NFA Own Revenue ¹	3 097	3 679	4 131	5 669	6 618	4 800
Government subvention	94	111	12	21	70	470
Grants (ODA)	3 817	4 161	3 006	1 350	911	960
Total	7 008	7 951	7 150	7 040	7 600	6 230

The increase in government funding to NFA from 2009/10 is targeting the Community Tree Planting Programme. According to the National Development Plan 2010/11-2014/15, the forestry sector will have 96% of planned budget not funded by government (MWE, 2001).

¹ This revenue excludes the revenue collected by the District Forest Services.

5.2 Potential financing mechanisms

The increasing awareness and advocacy for plantation forestry has raised the desire for individuals and private companies to invest more in forestry activities expecting bigger returns. In addition, there is expected funding from global grants and agreements of 'Willingness to Pay for Pollution' and 'Willingness to Plant Trees' as part of the REDD mechanisms and carbon sequestration campaigns in Uganda.

Payment for environmental services (PES) derived from the forestry sector is likely to grow in importance as the world appreciates the contribution of forestry to many sectors in the economy. Forests have an impact on the water flow and quality and therefore affect urban water supply services and the generation of hydro-electricity. As the contribution of the forestry sector is recognised and valued, it is important that those who benefit from the services make a contribution to the planting and conservation of the forests.

According to the study on sustainable forest financing strategy and instruments for Uganda (Ministry of Water and Environment, 2011), the following financing options are recommended:

Forest (Tree) Fund/Trust: PES is a potential avenue for financing the forest sector such as taxing oil revenues, retaining a proportion of water supply revenues for watershed management, mainstreaming forestry into all other sectors that relate to forestry such as energy, agriculture and tourism. This fund should support community forestry, environmental forestry, watershed management and grants to commercial tree planters.

Commercial and Development Credit for the forestry sector: Development banks have already started joint ventures with forestry investment companies whereas commercial banks in Uganda have only funded short term forestry ventures like nursery establishment, harvesting and value addition. With more engagement and clear understanding of forestry, the funding could increase.

5.3 Human resources

Uganda has many graduates from forestry training institutions, at degree, diploma and certificate levels, from Makerere University and Nyabyeya Forestry College, respectively. Unfortunately, most of these graduates have not had training in the required skills of commercial plantation forestry. Of those that are working, few have had the opportunity for further training. This is due to the history of forestry development in the country, which was mainly geared towards management of tropical forests. The curricula of the training institutions dwelt more on managing forest ecosystems and, later, the softwood plantations. Here it was more about silvicultural operations and inventory work. Not much emphasis was put on profitability issues since most of the forests and plantations belonged to the state. Agroforestry training was introduced but, even then, the emphasis was on multipurpose trees being introduced in farmlands. Nevertheless, with short on-the-job training, trainees often become quality technical personnel. There is also an inflow of graduates from a number of technical and vocational colleges, which produce artisans that add value to forestry products in the fields of carpentry, building and craft making. The country also has skilled personnel in research under NaFORRI that develops technologies for forest management.

Table 17 gives the number of personnel currently engaged in the forestry sector. For the public institutions, NFA has the biggest number of staff with degrees and diplomas and, currently, most of them work with forest plantations. The Forestry Support Services Department (FSSD) has fewer people because of limited establishment which is expected to increase as more DFS get the permission to hire more staff. It is not easy to get the actual number of people in the private sector, especially for the small enterprises. This is one area that the UTGA promises to tackle as it assesses the training needs of the members. There are more people employed in NGOs that deal with natural resources management. The recorded numbers here are mainly from mainstream forestry institutions.

Table 17. Forest sector human resources. Source: NFA, 2011.

Sector	Degree holders	Diploma holders	Certificate holders	Skilled workers	Gaps in the various cadres
Public	330	290	100	100	20 graduates to run the FSSD and 200 Diploma to run DFS
Private	100	100	50	200	Need for more skilled workers in the plantations and industries
Total	430	390	150	300	

A training needs assessment of the sector commissioned by SPGS in 2010 found that:

- Training is needed in the following areas: technical skills relating to plantation establishment and maintenance, fire protection, nursery operations, plantation monitoring (inventory) and pests and diseases;
- Planning on both the administrative and the operational levels; and,
- Business skills (business management), contract management, labour management and computer skills.

Currently, SPGS is the main unit providing short courses to plantation owners but they are stretched beyond capacity. They also conduct exposure visits (e.g. clients meetings). Makerere University, Faculty of Forestry lacks adequate infrastructure and staff with appropriate experience in plantation forestry which hinders training of managers and supervisors. A new degree programme with plantation forestry as an option was started this academic year (2011). The challenge is that the lecturers themselves do not have the required experience in plantation forestry. The plan is to have more guest lecturers with the required skills as the faculty trains its own staff.

Although the Nyabyeya Forestry College provides technical education, many staff there have little experience of commercial plantation forestry. The college has pine and eucalyptus plantations, and these facilities could be used for training of already existing staff in the sector and also new curricula can be developed for plantation forestry, both short term, certificate and diploma.

5.4 Other resources

Under NFA, there is a very good unit the Biomass Study Unit which provides regular information regarding the forest cover and growing stock. It is a good unit for monitoring the performance of the sector.

6. INCENTIVES FOR PLANTATION ESTABLISHMENT BY PUBLIC/PRIVATE SECTOR AND OUTGROWERS

6.1 The rationale behind incentives

As per definition, an incentive is a thing that encourages somebody to do something. Commercial forestry plantations are a long term business which may take up to 25 years before one gets the final income and profits. There are few people who can lock up their capital over such a long time with many risks involved during growth, like fires, pests and diseases. The incentives reduce the anxiety and costs associated with such a long term investment. The investment climate has to be enabling. There is always fear of political instability in our part of the world, also the economic situation may not be as stable as in the western countries where many of the big investors are likely to come from.

6.2 Current incentives: impacts and effectiveness

The government policy of industrialisation led to the establishment of the Uganda Investment Authority (UIA) that caters for investment opportunities and advocacy in the country. It oversees and designs investment incentives as covered under the Income Tax Act 1997. These incentives are administered by the URA as part of the taxation system. The incentives include capital allowances (on plant and machinery), import duty exemptions and deductible annual allowances (computer and data handling equipment, vehicles etc). Forestry and processing of forest products have a high ranking in the priority areas of the country's investment priorities.

In addition to those general incentives, there are other specific incentives for private commercial forest investors. The main incentive is the planting grant provided under the SPGS, which covers half of the estimated establishment costs. Equally important is the availability of land in CFRs (150 000 ha) which can be rented out to investors to develop commercial forestry plantations. The permit runs up to 50 years (equivalent to two pine crop rotations). There is also other private lands which can be purchased for plantation development.

Private planters under the SPGS benefit from various support mechanisms, notably:

- Site visits from the SPGS Technical Advisory team;
- Plantation training courses, which are very practical 2-5 day courses;
- Quarterly meetings to share experiences; and,
- SPGS Tree Planting Guidelines for Uganda.

Table 18 summarises the available incentives for plantation development.

Table 18. Incentives for plantation development. Source: UIA, 2010.

Type of incentive	Brief description of incentive	Source	Period	Target group	Outcomes, impacts & short-comings
Access to land and assets thereon	Provision and ease of access to land by the government to willing investors and tree farmers	Ministry of Water and Environment (NFA).	50- year permits	Investors in the forestry sector, especially plantations	Misuse of land, breaching of contracts.
Security of tenure of land	Protection of the assets of investors in general	GoU-UIA	Business life span	Big investors, including forest sector	
Financial support	Through SPGS: the scheme provides a direct subsidy (grant) for private timber growers; the max. amount paid is UGX 850 000/ha. This amount is 50% of total establishment cost. For planters >500 ha, the subsidy is UGX 600 000/ha.	EU ,Govt. of Norway and GoU, coordinated by SPGS	Establishment stages spread over 3 years	Big plantation developers (>25 ha). Recently, also support for eucalypt wood-lot developers	Sustainability challenges and investors level.
Site visits from SPGS technical advisory team	Visit plantations to advise managers and other staff	SPGS	Regularly	Forest plantations	Excellent
Plantation training courses	Short term courses; very practical covering establishment activities	SPGS.	Offered regularly	Plantation owners, managers and workers	The impact has been great because most owners and workers lack commercial forestry skills
Quarterly meetings to share experience	Owners, managers and workers meet quarterly to share their experiences	SPGS and UTGA	Quarterly	Plantation owners, managers and technical staff	

Tax exemption	The Income Tax Act under section 21 (1) (u) exempts interest earned by a financial institution on a loan granted to any person for the purpose of forestry among others from withholding tax.	Government agencies and para-statal e.g. UIA, URA, Treasury	Viable business duration/life time	Foreign and local investors	
Technical literature; tree planting guidelines for Uganda & SPGS newsletter	The planting guidelines give the technical information about the what, where, when, how to manage commercial forestry plantations,	SPGS	Newsletter comes out every two months.	Plantation owners and others interested in the sector	Very informative

6.3 Suggestions for improvement of incentives

The SPGS is currently coordinating efforts to persuade the Government to change the unfair fiscal treatment of forestry. Whilst it will undoubtedly take time to obtain agreement, the two most likely options being considered are:

- to allow the costs of replanting to be set against the proceeds from the harvest of the first crop; and,
- exempt plantation forestry from income tax.

As much as the investors are allocated land in CFRs, there is still a lack of a clear plantation strategy by the Government and the method of allocation and conditions of tree planting permits in CFRs by the NFA. This follows from the halting of the issuance of permits in 2008 with orders from the President's office. Currently some companies are allocated land in CFRs rather secretly while others are reminded of the ban as they are denied allocations.

7. SUPPLY AND DEMAND OF FOREST PRODUCTS

7.1 Supply scenarios and projections

The biggest challenge is getting data on supply and demand of forest products. The problem starts from the forests where the Forest Rangers and their supervisors fail to transmit information about what has been sold and in what quantities. This could be due to several reasons but a prominent one is the issue of corruption and related illegal activities. Once information does not reach the headquarters it becomes difficult to know exactly what is going on. In annual reports you find that some districts have failed to send this crucial data. The other issue is the reforms in the forestry sector that created NFA, FSSD and DFS. Good data about the sector was misplaced or lost in the transitional period. The Uganda Bureau of Statistics (UBOS) relies on NFA to supply them with data and also the FAO will rely on the national institutions to supply them with data. The market is also not very transparent when it comes to give amounts supplied and traded.

Table 19 presents wood removals from plantations and natural forests during 2009. A total of c. 48 million m³ was removed from the forest. Wood fuel accounted for nearly 91% while 8 % was for industrial round wood.

Table 19. Wood removals (1000 m³) from plantations and natural forests, 2009. Source: FAO Stat (2010).

Type of forests	Industrial roundwood	Industrial poles	Domestic poles	Woodfuel	Total (1000 m ³)
Plantations	349				349
Natural forests	3 140			43 581	46 721
Grand total	3 489	288	601	43 581	47 959

This concurs with a recent study commissioned by National Environment Management Authority (NEMA) on the physical stocks and flows of forest resources in Uganda (NEMA, 2011), which also showed that the annual average rate of growth in timber production is 4.25%. About one third of the timber production is monetary and two thirds non-monetary (used at the domestic subsistence level).

Table 20 shows the production/supply of wood and some wood products every second year from 2002 to 2010, to indicate trends. The amount of **sawn wood** from both plantations and natural forests continue to go down, an indication of a dwindling resource. On the other hand, fuel wood extraction continues to climb, a reflection of the dependence of the population on woody biomass energy. It should, however, be pointed out that fuel wood production figures are based on projections, not measurements of actual production.

There is no data on **Non-Wood Forest Products** (NWFPs). However, it is well known that they play a big role in sustaining the well being of most rural people in the country. Some of the more promising NWFPs are medicinal plants, ecotourism, honey, mushrooms, shea butter, gums/resins, rattan, wild foods and handicrafts. Although some of them are already commercialised, it has not yet been captured in national statistics.

The supply of **wood fuel** is mainly from private forest areas and woodlots in addition to that from the natural forest. In addition, the energy supply in urban Uganda is mostly through charcoal production in rural areas transported to the towns. There is a steady rise in the area under private forest cover and this is seen as a possible source to increase the supply of wood fuel. However, the other pressures from population rise and the construction boom may not render an effective rise in supply. Nonetheless, wood used as fuel will continue to dominate for the foreseeable future. Investors can tap in this opportunity as there are diverse options for value added activities in this sector.

Timber supply is mainly from uncontrolled harvesting from private natural forests, woodlands, on farm, and plantations in CFRs. The largest timber volume comes from Tropical High Forests with pit sawing as the major conversion technology. Since 2004, at the advent of SPGS, the timber supply for poles has had a rise especially from thinnings for the early planters.

Table 20. Production/Supply of wood and wood products 2002-2010. Source: FAOSTAT (2010).

Product/Year	2002	2004	2006	2008	2010
From plantations					
Industrial roundwood (1000 m ³)	269	287	327	349	349
Sawnwood (1000 m ³)	67	67	24	24	24
Paperboard (1000 tons)	3	3	3	3	3
From natural forests					
Woodfuel (1000 m ³)	38 902	40 195	41 523	42 878	43 581
Industrial roundwood (1000 m ³)	2 906	2 959	3 076	3 140	3 140
Sawnwood (1000 m ³)	197	197	93	93	93

Table 21 shows the production/supply projections for 2015 to 2030. Industrial round wood production in forest plantations is expected to increase from 296 000 m³ in 2015 to 2 849 000 m³ in 2030. This is because the young forest plantations will be due for commercial thinning by 2018 and be mature and ready for clearfelling by 2030. It is assumed that the pine plantations will yield 300 m³ under bark per hectare on final harvesting. The increasing supply of timber from plantations will be a big relief to the conservation of the natural forest with its biodiversity.

This area needs more intense studies/documentation because the actual planted area is not fully known. While it is easy to know what has been planted on the CFRs, plantings on private lands have not been fully captured in the statistics. According to NFA records, as of the end of 2010, there was a total of approximately 45 000 ha of plantation forests in CFRs at different ages, the majority (32 000 ha) being under 5 years of age. In addition, there are about 8 000 ha of forest plantations on private land.

Table 21. Production/supply projections 2015-2030. Sources: FAOSTAT (2010) and NFA (2011)

Forest product	2015	2020	2025	2030
Plantations/woodlots				
Industrial round wood (1000 m ³)	296	602	1 185	2 849
Sawn wood (1000 m ³)**	110	265	521	1 425
Natural forests				
Wood fuel (firewood and charcoal) (1000 m ³)	47 270	51 292	55 679	60 468
Industrial round wood (1000 m ³)	3 866	4 761	5 862	7 219

Assumptions:

**Assuming higher recovery with more efficient machinery (37-50%)

1. Annual average rate of growth in timber production: 4.25%

2. Wood fuel growth rate: 1.5%

3. Wood charcoal growth rate: 2.8%

7.2 Demand scenarios and projections

Wood fuel is the major source of rural energy in the country and the demand and supply was estimated to be around 43.5 million m³ in 2010 (FAO STAT, 2010). About 95% of this is consumed as fuel wood. This wood is used by both commercial and subsistence needs. The major commercial users include hotels and catering, schools, brick kilns, tea, tobacco and fish smoking. The major subsistence consumers of wood apart from the rural people are the urban dwellers that use it in the form of charcoal, the demand for which is estimated to be growing at a rate of 6% per annum similar to the rate of urbanisation. The booming construction industry and inadequate supply of the alternative sources of fuel has pushed up the demand for wood. This demand is expected to rise. The supply and demand for some products were shown in *Table 20* above.

The **demand for timber** has been greatly increased in the past decade to compete with the growing economy estimated at 7% per annum that has seen a construction boom that has steeped the timber demand (UBOS, 2005). Since the vast majority of the timber produced in Uganda is processed and consumed in Uganda, there is a need for over 75 000 ha of highly productive forest plantations to meet its demand deficit by the year 2025. However, it only has less than 40 000 ha that is depreciating at a rate of 3% per year due to low conversion efficiencies (UNIQUE, 2010). This puts the country in a timber demand deficit for about 10 years given that most of the planting done currently is less than 4 years old.

According to NFA, estimates and projections by the year 2030, the demand for sawn timber will be about 880 000 m³. The equivalent round wood is 1 832 000 m³. This assumes that the sawmill recovery rate will be about 48% which is indeed a very optimistic figure given the current low technology of the sawmills. This means that if we can not increase recovery rates, we need to cut down more trees to meet the demand. *Table 22* shows the projected demand for the various forest products. The demands for wood fuel will continue to grow because the alternative sources are not promising.

Table 22. Future demand of plantation and natural forest wood. Sources: NFA (2011) and FAOSTAT(2010).

Forest product	2015	2020	2025	2030
Plantation/woodlot				
Industrial round wood (1000 m ³)	2 693	3 614	5 824	10 434
Sawn wood (1000 m ³)	607	687	777	879
Pulp for paper (1000 tons)	146	186	238	296
Paper and paperboard (1000 tons)	254	807	2 563	6 621
Natural forest wood				
Wood fuel (firewood/charcoal) (1000 m ³)	31 850	37 283	43 643	51 087
Industrial round wood (1000 m ³)	1 344	944	564	-
Sawn wood (1000 m ³)*	501	422	256	-

Note: Natural forest sawn wood forecast: difference between demand and what can be supplied from plantations.

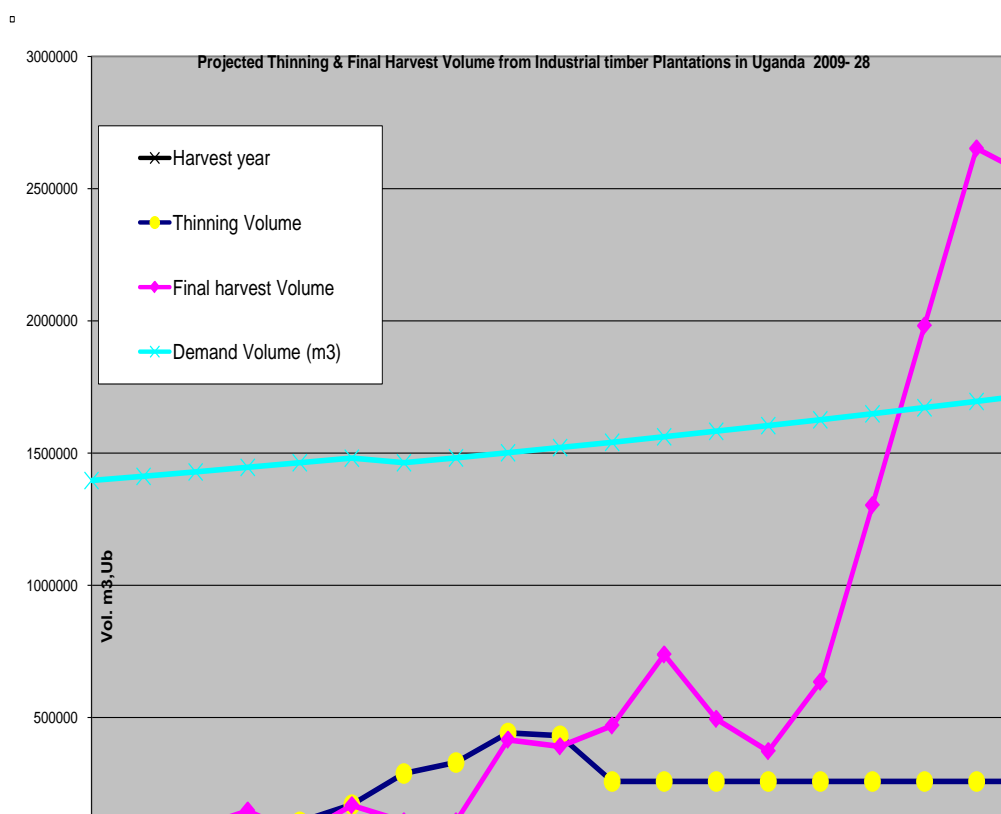


Figure 3. Projected thinning and final harvest volume from industrial timber plantations 2010-29. Source: NFA (2011).

Table 23 shows the current and future demand of plantation and natural forest wood. It was developed by the NFA looking at different scenarios in terms of growth of the demand for wood products. Given the amount of sawn wood and other products that will be needed in the future, calculations were made to estimate how much round wood would be needed and the number of

hectares needed to satisfy that anticipated demand. It was assumed that the demand for sawn wood will be growing at an annual rate of 2.53% while that of paper to be 4.07%. It is anticipated that by the year 2028, the supply of round wood from the plantations will be exceeding the demand. Figure 3 shows the projected thinning and final volume from the industrial timber plantations in the country for the period 2009-2028. It clearly shows *that the current supply of timber is from unsustainable harvesting of the natural forest.*

Table 23. Current and future demand of plantation and natural forest wood. Source: NFA (2011).

Product/Year	2010	2015	2020	2025	2030
Sawn Timber (1000 m ³)	537	607	687	777	879
Equivalent round wood UB for sawn timber	1 412	1 463	1 561	1 672	1 832
Area equivalent (ha)	5 179	5 365	5 725	6 130	6 718
Recovery %	38%	42%	44%	47%	47%
Board products					
Equivalent round wood (1000 m ³)	80	254	807	2 563	6 621
Area equivalent (ha)	267	847	2 690	8 543	22 071
Pulp & Paper (1000 tonnes)	106	146	186	238	296
Equivalent round wood (1000 tonnes)	175	241	308	393	489
Equivalent round wood (1000 m ³)	709	976	1 246	1 590	1 981
Area equivalent (ha)	2 364	3 254	4 152	5 300	6 603
Total round wood equivalent needed (1000 m³)	2 202	2 693	3 614	5 824	10 434
Total area (ha) to be planted annually	7 810	9 466	12 568	19 972	35 392

Based on following assumptions:

Demand of 237 600 m³ of sawn wood base year 1995

Productivity of 300 m³ per ha

Demand growth rate of 4.07% for pulp and paper (income elasticity of 0.74)

Demand growth rate of 2.53% (income elasticity of 0.46) sawn wood

GDP growth rate 5.5%

7.3 Consumer prices (2010)

In a recent SPGS Newsletter, timber prices for the period second quarter of 2010 to first quarter of 2011 were reported for the fast moving timber species, mainly pine, eucalyptus and the high end furniture species (mahogany, Mvule and Nkalati). There is a price fluctuation between different retail yards caused by the quality of the boards, dimensions, source of timber (distance, and imported from DRC/Southern Sudan), or if taxes were fully paid. The demand and supply situation is also a key price determinant. The furniture boards are naturally much more expensive than the construction timbers. For example, pine timber prices varied between 193 and 444 US\$/m³, and mahogany between 378 and 697 US\$/m³. Prices of all species went up in the last quarter of 2010 due to UNRA's enforcement of maximum tonnage carried by trucks, something that timber dealers are complaining about because they now carry slightly less timber per truck than before the enforcement came into place.

The timber prices were steadily increasing until 2008 but dropped when the financial crisis reached Uganda. Since 2010, prices seem to be once more on the upward trend or have remained steady at a high level (SPGS News Issue no.29, pp22). *Table 24* gives the prices of local and imported timber and other wood products. There is no clear pattern in the prices. Some prices for local products are

higher than the imported ones, for example sawn pine wood costs US\$ 314/m³ whereas the price of the imported timber is US\$ 143/m³.

Table 24. Prices (US\$) of local and imported timber and wood products and where obtained 2010. Sources: FAO Sta. (2010) and NFA (2011).

Forest product	Price (local)	Price (imported)	Countries of origin
From plantations/woodlots			
Industrial round wood (m ³)	34/m ³	77	Sudan
Sawn wood (m ³) (pine)	314/m ³	143	Sudan, Rwanda
Paper and paperboard (tons)	*	2 496	
Plywood (m ³)	880/m ³	796	Kenya
Particleboard	396/m ³	527	Kenya
From natural forests			
Industrial round wood (m ³)	60	*	
Sawn wood (m ³) (Mahogany)	570/m ³	697	DRC, Sudan
Others (Charcoal)	350/m ³	667	

*Data not available

7.4 Forest products trade

Ugandan export of **round wood timber** was banned in 1992 by the Ministry to avoid depleting the indigenous forests. However, data from the URA shows higher round wood exports than imports (URA, 2010). This may be explained by re-exports of round wood imports, using Uganda as a transit country. Such illegalities distort information since the same wood may be recorded as both imports and exports. According to a study conducted by Unique Forestry Consultants (2010) round wood imports comprise both illegal timber from Democratic Republic of Congo (DRC) and Southern Sudan and legal imports from Kenya, Tanzania and South Africa. Another study by Forest Monitor (2007), found that the major flows of timber and wood products in the great lakes region were complex considering illegal timber trade from DRC. The information indicates that about 40 000 m³ are imported to Uganda, of which 20 000 m³ are in transit to Kenya and other countries.

In recent years, Uganda has increased its exports of poles to the neighbouring countries, peaking at an export volume of more than 1 400 tons in 2008 (UN COMTRADE data, 2010). Due to the high demand within the country, the quantity of sawn wood exports is low, whereas imports reached almost 350 tons in 2009 (Unique Forestry Consultants, 2010).

According to a study by Unique Forestry Consultants (2010), imports of **veneer sheets used in plywood** production and furniture manufacturing have increased by more than 450% since 2007 and reached approximately 78 tons in 2009. Plywood imports have increased by more than 100% within the last three years reaching more than 2 000 tons in 2009. Exports are also increasing; Nileply Ltd., the sole local plywood manufacturer, is increasingly exporting to Sudan, DRC and Kenya.

Particle and fibre boards are highly demanded products in Uganda and yet there is only one plant manufacturing particle boards. According to the study by Unique Forestry Consultants (2010), imported quantities of particle boards reached almost 2 500 tons in 2009 while fibre board imports were about 2 800 tons.

Carpentry and joinery products, mainly builders' joinery/carpentry, doors and windows are important trade items. Uganda imports much more than it exports. This group of products is very important to the country for local value addition, offering employment and income for many small and medium enterprises. Export values and quantities vary between 100 and 200 tons and between 200 000 and 300 000 US\$ respectively (Unique Forestry Consultants, 2010).

Table 25 gives the wood and wood products that are being traded in with Uganda's partners. During the last five years Uganda has been a net importer of plantation industrial round wood while it is also a net exporter of industrial wood from natural forests. It is a net importer of hardwood sawn wood and paper and paper boards.

Table 25. Trade in wood and wood products Source: FAOSTAT (2010).

Forest product	2006		2007		2008		2009		2010	
	Import	Export	Import	Export	Import	Export	Import	Export	Import	Export
Plantations/woodlots										
Industrial round wood (1000 m ³)	13	3	7 142	79	415	3597	26	1331	26	1331
Sawn wood (1000 m ³)	4	37	4	37	4	309	7	9	7	9
Paper and paperboard (tons)	11 247	5	20 932	48	23 562	49	17 080	43	17 080	43
Natural forests										
Wood fuel (1000 m ³)	*	82	*	752	20	830	20	830	20	830
Industrial round wood (1000 m ³)	33	331	99	4 462	205	14 918	355	335	355	335
Sawn wood (1000 m ³)	33	508	849	222	4 448	576	16	277	16	277

*Data not available

Markets for timber in Uganda fall into two broad categories: commercial markets (mainly Kampala City, and the municipalities of Entebbe, Masaka, Jinja, Mbale, Mbarara, Gulu, Arua, Kabale, Fort Portal, Soroti and Tororo); and *ad hoc* and spot markets (local markets and towns near forests). The record of timber trade is still a challenge since a big section of the trade is informal, in addition to being illegal. Much timber is locally consumed with middlemen making most profits from it. On average, 126 000 m³ or about 58% of the timber production is traded in the local markets and consumed in the households, and 52 000 m³ reaches the central markets. A few saw-millers trade in high value timbers that fetch them more revenues from low volumes of less than 15 000 m³ annually. Due to the high costs, very little timber is treated with preservatives, in spite of the several advantages of treated timber. Storage of timber at trade shades/stores is very poor (no proper stacking) which makes the timber prone to deterioration.

The three main timber markets in the suburbs of Kampala were visited, namely: Ndeeba, Bwaise and Kireka trading centres. It is suggested that these three markets represent about 50% of total timber consumption in Kampala. The timber trade prices are based on end use and probably wood density. Timbers with higher density fetch more revenues compared to those with low density. The sales are categorised as valuable, heavy construction and light construction.

The respondents were somehow not very open in answering the questions on quantities being sold, probably because of the presence of illegal timber in their businesses. There was more hardwood timber on the market than softwoods. Based on available literature, mainly from studies funded by SPGS and conducted by Unique Forestry consultants, the information collected for this study was found not to give a true picture of the situation. A Timber Market Study had been done in 2010 by Unique Forestry Consultants, and it was providing more reliable data. The data collected for this study was therefore used to update or triangulate the SPGS data. SPGS has also developed a good timber market monitoring system and publishes a quarterly report to that effect.

Main issues identified from the market survey:

1. Production issues.

- Generally, the quantities of supplied timber are dwindling especially pines and cypress; however, eucalyptus boards are increasing on the market, a sign of its acceptance as a roofing timber. The general hardwoods are coming in from more distant districts in the west, south west and Lake Victoria islands;
- It is hard to get accurate information on actual amounts being supplied and sold by the retailers (fear of the tax implications). Figures are quoted in terms of lorry loads. The details of which species and source districts are shown in *Appendix 3*; and,
- The retailers employ mainly men to pull out boards for customers or take to planing machines to edge the boards. The number of permanent employees ranges from one to five depending

on the size of the business (small, medium or big). They also employ temporary workers for help depending on the need for extra labour.

2. Type of timber on the market.

- The most common sizes are the following: 4x2, 4x3, 6x2, and 12x1 inches (Construction: rafters, purlins and shuttering boards (Kirundu);
- Other sizes : 8x2, 12x2, 12x1 for furniture making;
- There are more medium size retailers (60%), and less than 10% for the big enterprises;
- The market has middlemen who get to the customer first and try to convince them to buy the timber. The middlemen will already have known the selling price from the owner so he tacks on his commission and get the price to the prospective customer. This situation may not happen all the time and the consumer gets to the seller directly. The issue of the middlemen can cause discomfort where a customer refuses to buy because of inflated prices;
- Most buyers are either individuals or private companies (construction firms). A few cases of institutional purchases are also recorded; and,
- Several of the retailers were complaining of reduced amount of timber coming on the market and were thinking of either starting furniture making by planting their own trees or quitting the timber business all together.

3. Constraints related to policy instruments.

- Many timber transporters tend to avoid paying proper taxes or have proper movement permits, when the timber monitoring units come to such a person, they normally impound it and take it to NFA and auction it off;
- The UNRA has recently introduced the Axle Load tax which made the prices to go up, thus reducing the profit margins. The Lorries can't just load any amount of timber anymore. Less timber for high transport charges has resulted in higher prices for the customer; and,
- Selling timber cut by chainsaws is illegal; such timber will be impounded by NFA and auctioned off.

8. FOREST ROYALTIES AND OTHER REVENUES

8.1 Forest royalties and licences

8.1.1 Structure and amount of forest royalties and licences

Before the reforms in the forestry sector which created the NFA and DFS, the Forestry Department was charged with the responsibility of setting and collecting forest charges. The charges were collected from all forests except private forests. In 1997, revenue sharing with local district administrations was initiated, and until 2003, with the enactment of NFTP, 60% of the total revenue collected was submitted to central government and 40% was retained by local government. This was a good incentive for the local governments to monitor the management of the forests. However, when NFA was created, it was given to collect all royalties and licences in the CFRs while the DFS was given the LFRs (only about 5 000 ha). The decision to give all revenues from CFRs to NFA was to improve management of the forests through better revenue collection and so develop the sector better. This action deprived the local governments of income from the big and better managed forests.

Charges for round wood production. These are classified into timber royalty, forest produce fees and licence fees. Timber royalty is charged on the basis of volume of round wood taken by saw millers and pit sawyers. The charge per cubic metre varies with species and is based on the value of different timber species and market demand.

The forest produce fees are charges levied on smaller sizes of round wood. Poles are classified according to diameter classes and a distinction is made between poles from forest plantations and from the natural forest.

Charges for production of non-wood forest products and services. In Uganda, the most common non-wood forest products include: charcoal; bamboo; Christmas trees; seeds and

seedlings; palms; rattan canes; minor forest produce (MFP); and minerals extracted from the forest (brick making materials, and sandstone). Forest services include: ecotourism; grazing; and hunting. MFP include: beds; chair, mats, baskets, fruits, honey, herbal medicines, ornamentals, wood carvings, walking sticks, drum frames and brewing troughs.

Table 26 gives the structure and the amount of forest royalties that existed before the formation of the NFA and DFS (FAO, 2001). The DFS is still using these guidelines, while the NFA has gone on to revise upwards as the demand dictates. The current NFA revenue streams are:

- Timber licences (soft wood logs, eucalyptus and hardwood logs);
- Poles (construction & utility poles);
- Land licences (tree planting), land rent, grazing licences;
- Sale of sand, charcoal and firewood;
- Sale of milled timber and timber auctions (confiscated from illegal traders);
- Sale of seeds and seedlings;
- Eco-tourism (camping fees, accommodation, guiding fees, entrance fees etc.); and,
- Other products and services (consultancy- Biomass and Inventory, sale of maps and digital data, IS and mapping).

Table 26. Timber royalty, produce fees and licence fees. Source: FAO 2001.

Item	US\$	Remarks
i. Timber¹		
Class IA - Hardwoods	57	Per standing cubic metre true measure
Class IB - Hardwoods and cypress	26	Over-bark (from FD tables)
Class II - Hardwoods and pines	16	Over-bark (from FD tables)
Class III - Hardwoods	10	Over-bark (from FD tables)
ii. Poles		
A. From forest plantations		
Class I (5 – 9 cm dbh)	0.5	Per standing pole
Class II (10 – 14 cm dbh)	0.8	Per standing pole
Class III (15 – 19 cm dbh)	0.8	Per running metre of length
Class IV (20 – 24 cm dbh)	1	Per running metre of length
B. From the natural forest and bush		
Class I (5 – 9 cm dbh)	0.5	Per standing pole
Class II (10 – 14 cm dbh)	0.9	Per standing pole
C. Cutting charges²	0.1	Per pole
iii. Faggots (withes)	0.6	Per head load
iv. Fencing posts		
A. Treated posts		
Class II (10 – 14 cm dbh)	0.8	Per running metre of post
Class III (15 – 19 cm dbh)	1	Per running metre of post
Class IV (20 – 24 cm dbh)	1.5	Per running metre of post
B. Untreated posts (from plantations)		
Class II (10 – 14 cm dbh)	0.4	Per running metre of post
Class III (15 – 19 cm dbh)	0.8	Per running metre of post
Class IV (20 – 24 cm dbh)	1	Per running metre of post
C. Palms (<i>Phoenix reclinata</i>)	0.2	Per running metre
v. Firewood		
A. From forest plantation	3	Per stacked cubic metre (in forest reserves)
B. From the natural forest and bush	4	Per stacked cubic metre (on other public land)
C. Licence fees ³		
➤ Petty trade	13	Per month per person
➤ Large scale wood cutting and trade	129	Per month per person
D. Licence for firewood transportation ⁴		
➤ Lorry	26	Valid for 3 days from the date of issue
➤ Pick-up or canoe	10	Valid for the date of issue of the licence
➤ Bicycle	7	Per month per person

vi. Charcoal⁵		
A. Licence to burn and/or sell	21	Per month per person
B. Licence to burn charcoal transportation ⁴		
➤ Lorry	35	Valid for 3 days from the date of issue
➤ Pick-up or canoe	23	Valid for the date of issue of the licence
➤ Bicycle	13	Per month per person
vii. Bamboo		
Wild and forest plantation species	0.3	Per pole (in forest reserves and public land
viii. Christmas trees⁶		
Below 3 m high	4	Per tree
3 – 5 m high	6	Per tree
Over 5m high	8	Per tree
ix. Seeds and seedlings⁷		
A- Seeds	6	Per kg, Depending on species
B – Seedlings ⁸		Depending on species and size
C - Fruit plants	0.60	Depending on species and size
D- Wildings		Depending on species and size
Ornamentals	3	Shade and foliage trees and shrubs and indoor plants
x. Palms (<i>Borassus</i> and other palms)	7	Per tree (in forest reserves and public land)
xi. Rattan canes	26	Per year per person (for petty trade in all areas)
xii. Timber grading fees⁹	13	Per cubic metre
xiii. Felling fees¹⁰	3	Per tree
xiv. Sawmilling licence fee	800	Per year per saw miller (applied in forest reserves)
xv. Pit sawyers registration fee	200	Per year per pit sawyer (applied on reserved land)
xvi. Forest fees on sawn timber		15% of the value of the sawn timber ¹¹
xvii. Casual trade licences		
➤ Walking sticks, stools, wood carvings, wooden tools and handles, mortal and pestles.	26	Per year per person (for petty trade in all areas)
➤ Non-wood forest products (e.g. grasses, palm fronds, forest lianas and climbers, mats, baskets, winnowers)	26	Per year per person (for petty trade in all areas)
➤ Forest based food (e.g. bamboo shoots, palm oil, other forest fruits and vegetables)	26	Per year per person (for petty trade in all areas)
xviii. Wild coffee	14	Per month per person (in forest reserves)
xix. Gum Arabic	0.50	Per kg (in forest reserves)
xx. Resins	0.10	Per kg (in forest reserves)
xxi. Forest minerals		
A. Bricks(Mpigi, Entebbe, Kampala)	171	Per month per person (in forest reserves)
B. Bricks (other areas)	57	Per month per person (in forest reserves)
C. Sand (Mpigi, Entebbe, Kampala)	171	Per month per person (in forest reserves)
D. Sand (other areas)	57	Per month per person (in forest reserves)
E. Stones (all areas)	39	Per month per person (applied in forest reserves)
F. Murram (all areas)	7	Per tonne (in forest reserves)

Notes:

1. A complete list of the species in the different classes is available in NFA
2. This is a labour charge for cutting poles, payable to the cutters.
3. This type of licence is for firewood production on other public land and is for commercial producers.
4. Paid by everyone transporting firewood and charcoal, regardless of the origin of the produce.
5. Paid for the production and/or sale of charcoal produced on public land
6. The price charged per plant in FD nurseries.
7. Price charged in FD seed centres and nurseries respectively.
8. Includes planting materials raised from forest tree species.
9. Fee paid by timber owners to graders, regardless of the source of timber.
10. Paid by forest concessionaires to the DFO to obtain a felling permit.
11. Paid by saw millers falling under the threshold for VAT and is applied in all areas.

Timber is charged in royalties per cubic meter using standing volume of round wood that will be harvested. In forest plantations, diameter at breast height (dbh) is used to estimate tree volume, while in the natural high forests a technique of stock mapping, called Integrated Stock Survey and Management Inventory (ISSMI), is used to determine the round wood volume for the purpose of collecting charges. The concessionaire would then pay the amounts due to NFA. The licenses are often cancelled or suspended if any inconsistency with the concessionaire is observed.

When the NFA was formed, it sought to establish a better system of determining the value of the round wood, given the fact that the price of sawn wood was very high which gave the timber millers and traders a very high profit margin. It therefore introduced the bidding system as described below.

The NFA invites companies and individuals to bid for licenses to harvest forest plantations. This process is conducted in accordance with the public bidding disposal method contained in the Public Procurement and Disposal of Public Assets Act, 2003 and Regulations thereof (S.I. No 70/2003) and the procedures described in this Part. The purpose of this bid document is to enable interested entities to bid for production of timber or veneer products from forest plantations in CFRs. The bidder should state clearly the purpose for which they are bidding.

The crop to be harvested is categorised in coupes. Before advertising, the coupes are assessed in terms of volume of round wood available. The quality of the crop is assessed and also the distance from Kampala which is the biggest timber market. The nearer the plantation, the higher is the reserve price. Bidders are permitted to bid for one or more complete coupes. Potential bidders are given a chance to inspect the crop prior to preparing the bids. The bid validity required is specified and normally not more than 60 days. The bidder is required to submit a Bid Security either a bank guarantee or bank draft of specified amount of Uganda shillings. A bidder must submit a statement on the practices to be used in harvesting and conversion. It will be an integral part of the harvesting license and will be used by the NFA to monitor performance in the field. It is important that logging practices do not adversely affect the environment, the subsequent operations that will be carried out to re-plant the area and the health and safety of people.

The bidders are required to state how they will manage their activities to ensure that these do not result in destruction of existing roads/tracks, including forest management and logging roads /tracks in the CFR. Bidders are also required to state the qualifications and skills of the key personnel for logging and plant operation.

Bids are submitted and opened in the presence of the bidders or their representatives. The evaluation of bids is based on preliminary examination, technical, price and other relevant criteria. NFA sets the reserved price for a particular coupe and only those bids equal to or above the reserve price for that coup will be evaluated. *Table 27* shows the current reserve prices as set by NFA for the remaining mature trees.

Table 27. Reserve prices set by NFA. Source: NFA (2010).

Forest Reserve	Species	Reserve price US\$/m3 2004	Reserve price US\$/m3 2005
Lendu	<i>Cupressus lusitanica</i>	38	39
Lendu	Pines	29	29
Lendu	Eucalyptus	25	26
Mafuga	<i>C. lusitanica</i>	42	40
Mafuga	Pines	31	29
Mafuga	Eucalyptus	28	25
Muzizi	Pines	38	-
Muzizi	Eucalyptus	29	-
Awang	Eucalyptus		26
Awang	Pines		29
Rwoho	Pines		29
Oruha	Pines		35
Katugo	Pines		43

8.1.2 Suggestions for improvement of forest charges and licences

The NFA bidding system is still good in that it sets the reserve prices after considering the market prices.

8.2 Forest concessions/permits

8.2.1 Current concessionaires/permit holders

In 2009, NFA made a total of just over US\$ 3.2 million from the sale of 104 000 m³ of round wood using the bidding system. These were plantation species (pines, cypress and eucalyptus), sales from the tropical hardwoods was only 508 m³ which fetched a total of US\$ 20 162. There were a total of 119 successful bidders. The details are shown in *Table 28*. The sale of hardwoods is not very popular, many times the logs stay without being bought in the forest for a long time. The number of concessionaires has dramatically gone down due to lack of mature plantation trees.

Table 28. Concessionaires, volume sold by NFA, and fees collected in 2009. Source: NFA(2011).

Number of concessionaires	Type of forests	Concession Volume (m ³)	Forest Fees (US\$)
115	Plantation forest	103 608	3 194 745
3	THF	508	20 162
1	Transmission Poles	150	1 500
Total: 119			3 216 407

8.2.2 Monitoring of compliance

Once a license is issued to the successful bidder, there are conditions attached to it for the smooth operation of log harvesting. The conditions, among other things, specifies the type of converting equipment if it to be done within the forest; issue of taxes to be paid for the non VAT registered operators. Currently, it is 18% of the value of timber to be transported. This money is paid to the Chief Finance Officer of the District Local Government of origin. The Plantation/Range Manager monitors the operations of the licensee to make sure that there is full compliance with the conditions for the license. The monitoring officer shall draw the licensee's attention to matters that require improvement. If no significant improvement is made in the agreed period, then the license may be suspended or terminated depending on the gravity of the infraction. In the case of a cancelled license, the licensee shall forfeit the forest produce. For those licensees who comply fully with the conditions set in the agreement, they are given a chance to be selected during the next bidding phase as an incentive. The sale of hardwood logs from natural high forestry is different from that in plantation forests. After the stock mapping is finished under the ISSMI the trees to be sold are marked and then felled by the NFA staff. The logs after being measured for volume are then put up for bidding. This system was introduced to avoid bidders cutting the wrong trees.

8.2.3 Suggestions for improvement of concessions/permits

To avoid monopoly by a few companies/individuals, the opportunities for timber sale should be publicised more. The bidder's equipment and technical staff should be scrutinised more to avoid brief case bidders. Overall, more transparency should be encouraged to remove favouritisms in the process.

8.3 Administration of forestry revenue system

The NFA has the biggest forest estate because most of the private plantations are still very young. The LFRs don't have many resources for sale. The NFA, therefore, sets the forest royalties after

monitoring the prevailing opened market prices for timber products. The Minister of Water and Environment will endorse or reject the proposed charges as advised. The DFS will depend on the rates set by the FSSD which also have to be endorsed by the same Minister.

Monitoring and collection of revenue. As already mentioned above, in the NFA plantations bidding for specific coupes is used and payment for the logs is agreed upon between NFA and the licensee. NFA insists on full payment or at least 50% of the bid amount to be paid up front. This protects the NFA from licensees that may not perform well.

Total forest revenue collection. The reforms in the forest sector greatly improved forest revenue collection. The setting of royalty rates after studying the market rates of forest products helped to increase the revenue. Under the NFA bidding system, competition between bidders also made a big improvement on how much they were willing to pay. During the 1995/96 financial year, FD recorded total revenue collection was c. US\$ 108 000 which kept increasing up to US\$ 633 400 during 1999/2000. When NFA was formed, there was a big jump in revenue collection to US\$ 7 578 000 during 2008/09. The details of totals collected for each year since 2002/03 are shown in *Table 29*.

Table 29. Total forest revenue collection; 2002/03 FD, after that NFA. Sources: FAO (2001), NFA (2006).

Year	Timber 1000 US\$	Poles 1000 US\$	Firewood/ Charcoal 1000 US\$	All other revenue 1000 US\$	Total** 1000 US\$
2009/10	2 993	23	122	1 679	4 817
2008/09	4 991	33	141	2 413	7 578
2007/08	4 099	81	122	1 367	5 669
2006/07	2 757	-	-	463	3 219
2005/06	2 371	-	-	339	2 710
2004/05	*	*	*	*	1 538
2003/04	*	*	*	*	1 282
2002/03	*	*	*	*	705

* Data not available

** The shilling decreased against the US\$ over this whole period

Suggestions for improvement of revenue collection systems

The NFA as a semi-autonomous body that is striving to be self-financing needs to critically look for ways of improving revenue collection.

- The best way to improve revenue collection systems is first of all to increase transparency (reduce corruption of staff). This is a problem right from Headquarters down to the forests;
- They need to regularly review the level of charges for the roundwood and sawn timber to reflect realistic market prices;
- The NFA headquarters staff need to regularly supervise their field staff, e.g. plantation and sector managers, to see how they deal with concessionaires as they extract the timber. They need to check on the illegal activities like forest encroachments and illegal timber harvests;
- Forest practices need to be improved. The loss of revenue through careless tendencies (e.g. abandoning short logs, and use of destructive logging techniques) should be minimised by carrying out technical audits and by intensifying supervision;
- Bonus systems can be introduced to reward those that excel in the collection of revenue; and,
- Improve on the mobility of field staff by providing reliable field transport. There is need to have effective forest patrols to check on illegal activities.

In the case of DFS, the situation is very difficult in terms of overall funding. The above points also hold for them. There is urgent need for the support from the central government to be increased beyond just paying salaries.

9. PROCESSING OF PRODUCE

9.1 Ownership and types of industries

The forest based industries are owned by the private sector. Overall, the big forest industries are owned by foreign companies, but local investors are now moving from the low to high market targets as more Ugandans demand for better quality furniture.

Primary wood processors

The main categories of processing are:

- Primary processing: harvesting, sawn timber production, handling and storage;
- Secondary processing: industrial processing, preservative treatment of transmission poles, carpentry, joinery and artisan crafts; and,
- Tertiary processing: trade in furniture and fittings.

Charcoal production, distribution and marketing will not be handled in this report.

Pit sawing: It is done in both natural forests and plantations. Pit sawing licenses are issued to pit sawyers/traders, who sub-contract artisans to do the actual sawing work. There are very many pit sawyers operating in private forests and most are not even licensed. Both licences and artisans have few incentives to undertake sustainable forest management and there is much wastage in the forest. The recovery rate during timber conversion is estimated at 25-30% for pit sawyers in the natural forest and up to 35% in the plantation. The pit sawyers supply the majority of timber on the market today.

Saw milling: Most sawmilling operations are done on site inside the forest. They operate mobile sawmills and the recovery rate is between 30 to 35%. There is only one big operator who mills hardwood and softwood in a factory in Jinja. This miller is also the only plywood and particleboard manufacturer in the country. The mill is integrated in that it processes plywood, sawn wood and particle board. According to NFA records (2009), there were a total of 45 sawmills licensed in the NFA plantations; 2 gang sawmills, 3 Woodmiser, 35 Lucas and 5 Kara mills. They had been licensed to convert a total of c. 111 000 m³ of round wood. There is no data regarding who is cutting from private forests. The Lucas and Woodmiser mills are best suited for converting hardwood (big diameter) logs. The sawmill industry can thus be characterised as having low technological standards (cheap mobile sawmills and lack of skilled personnel), resulting in wasteful harvesting techniques, low recovery rates, and low quality sawn timber.

The secondary sector: It consists of both industrial operations and traditional trades but the vast majority of businesses is small roadside workshops. There is poor storage, and no quality grading of the sawn timber by timber dealers and secondary processors resulting in low value products. There are very few dry kilns in operation in the country; those that exist are owned by the big furniture manufacturers. The majority of consumers who are low income earners don't mind buying furniture articles that are not properly dried, so for somebody who is catering for this low market, drying timber is an extra unnecessary cost that the consumer may not appreciate. The majority of big furniture companies are foreign owned and they produce the high market products. They have better storage and some have kiln drying facilities.

There are five pole treating plants in the country. In recent years, Uganda has increased its exports of poles to the neighbouring countries. The demand for treated transmission poles is increasing internally as the government intensifies the rural electrification programme with support from development partners.

9.2 Raw material supply and quality

Plantation wood is very popular especially pines and cypress. Very mature eucalyptus logs from the plantation fire lines are also being converted, mainly into plywood. Eucalyptus on private forests is also being converted into building lumber (purlins and rafters). Among the softwood logs, some are

not very good due to poor maintenance of the crop (no pruning and thinning), while others have suffered from fires.

As already mentioned above the mature forest plantations are almost all cut down and there is going to be a period of severe log shortage up to the year 2018 when new plantations will have reached commercial maturity. The quality of the next crop of plantation trees should be better now that private sector investors are heavily involved in plantation development.

9.3 Constraints facing the sub-sector

- The main constraint is the growing resource shortage of mature plantation trees and over exploited natural forests;
- The other constraint is low technology wood conversion equipment. There is a need to invest in new and more efficient and appropriate sawmill machinery;
- The available labour has low levels of skills, so there is need for training and capacity building;
- The market is unregulated and mostly sells unseasoned and unsorted timber leading to waste and loss of production; and,
- Sawmills and the industry itself lack reliable information about log consumption sales and recovery rates.

9.4 Potential for future investment

Capacity projections of existing industries. As discussed above, the existing mobile sawmills should be replaced by regular mills built near the plantations. The new machinery should be more efficient in terms of sawn wood recovery and having higher production.

New industries. The country will need a pulp and paper mill in the future; modern efficient saw-mills, furniture machinery, more plywood mills, and fibreboard factories.

Types of processing industries for wood and NWFPs. Table 30 shows the type of wood processing industries there is in the country. There is one major sawmill and plywood mill. The other sawmills are mobile, and their capacities are not indicated. Then pole treating plants are relatively new in operation except the one for the Government Electricity Company UETDC Ltd.

Table 30. Current and potential capacity of forest industries utilising plantation and natural forest wood and NWFPs 2009. Source: Green Resources (2011).

Owner	Type of forest industry	Current capacity	Integration with forest plantation	Potential capacity
Nileply Ltd.	Plywood, particleboard, sawmill, pole treating plant	40 000 poles/year	Own plantation but still young	80 000 poles/year
New Forests Company	Pole treating plant	40 000 poles/year	Own plantation but still young	80,000 poles/year
Green Resources	Pole treating plant (sawmill and charcoal plant under construction)	25 000 poles/year	Own mature eucalyptus trees and pines	40 000 poles/year
UETDC(govt. electricity company)	Pole treating plant	40 000 poles/year	Buy poles	80 000 poles/year
Ferdsult Ltd	Pole treating plant	40 000 poles/year	Own plantation of eucalyptus and pines	80 000 poles/year

10. SOCIO-ECONOMIC AND ENVIRONMENTAL CONTRIBUTIONS OF FORESTS

10.1 *Income generation*

10.1.1 Current income

Forests and trees contribute to national economic growth through various ways. The Forestry Policy (Ministry of Water, Lands and Environment, 2001) estimates that the contribution of forests to GDP is 6%. Bush *et al.* (2004) estimated the total economic value of Uganda's forests at UGX 593 billion (US\$ 300 million). They also estimated the annual contribution of forests to household cash income at 11-27%, and the contribution to ecosystem services (soil and water management, carbon sequestration and future uses for Uganda's biodiversity) at UGX 222 billion (US\$ 110 million). According to UBOS (2009), 92% of Uganda's energy needs are met from woody biomass, with rural households consuming about 97% of the household energy requirements. About 34.4 million tonnes of round wood worth UGX 258 billion (US\$ 130 million) was used in construction work in 2007. The Forest sector contributes a lot to other sectors, namely water, agriculture, tourism and manufacturing. Unfortunately, these contributions are not attributed to the sector in the official statistics.

From Chapter 8 above in *Table 29*, a summary of available data on total forest revenues has been presented. The trend in total revenue collection shows that it has steadily increased due to better governance, data capture and reporting. Records of revenue collection are not available for the 1980s and early 1990s, but during these periods it is believed to be very low due to illegal activities, logistical limitations, and lack of motivation on the part of Forestry Department field staff. Revenue collection jumped from US\$ 108 000 in 1995/96 to US\$ 1 281 500 in 2003/2004 at the time of sector reforms which created the NFA. With NFA, timber concessions were reviewed and competitive bidding was introduced which greatly improved forest revenue, especially from timber which is the dominant source of income. Total revenue collection peaked at US\$ 7 578 000 during 2008/09.

Forest revenue from other sources also increased tremendously; for example, the sale of seeds and seedlings jumped from US\$ 200 during 1999/2000 to US\$ 142 100 in 2005/06, and reaching US\$ 568 000 in 2008/09. The income from other services (eco-tourism, consultancy, maps and digital data) has also increased upwards. The income from NWFPs has not been well captured and it is difficult to find that information in the available literature or forestry offices. It is one of those informal market items in addition to firewood.

10.1.2 Potential for income generation

Estimating the potential for income generation is a bit of a problem. Currently, the mature forest plantations are projected to be completely harvested by the end of 2012. The income from plantations will therefore be almost nothing until commercial thinnings are cut in 2018. This situation has already been seen in the reduced income for NFA where most money was coming from harvesting of plantations. The sale of logs from the tropical high forest has been contributing about 10% of timber revenue. The other timber being harvested is from private forests and woodlands where there are no management plans to indicate what is to be harvested and when. As plantation forests mature, new mills are going to be set up to process logs into many products, sawn wood, plywood, fibreboards etc. These new products will diversify the income from forests. Also the NWFPs will be commercialised in the future thus adding more income to the communities and national treasury.

10.2 *Employment*

10.2.1 Current employment

The forestry sector is an important employer in Uganda, especially in rural areas. According to the draft National Forest Plan (Ministry of Water and Environment, 2011), the government estimates

that the sector employs about 1 million people. One hundred thousand of these are employed in the formal sector. During the period 2004-2007, 21 000 ha of plantations were established leading to an additional 10 000 permanent jobs and another 15 000 part time jobs. The biggest number of employed people is found in firewood and charcoal production, household firewood production and commercial and industrial firewood production.

10.2.2 Potential for employment creation

According to the draft National Forest Plan (Ministry of Water and Environment, 2011), the plantations will create many jobs especially in the area of plantation establishment. It is estimated that the following new jobs will be created: 4 955 in 2015, 6 530 in 2020, 9 105 in 2025, and 9 680 in 2030. As forest industries are established to process the mature trees, many jobs will be created. The number of new jobs will depend on what type of machinery will be installed and the products. At this point in time it is difficult to make a guess.

10.3 Plantations in forest conservation

While the key objective of commercial forestry investors is to maximise the production of utilisable products, in order to sustain this production, plantations must be planned and managed in an environmentally and socially sustainable manner. With proper planning, plantations can be managed to enhance biodiversity conservation, protect and enhance water resources, and minimise any possible negative impacts.

By producing such high volumes of utilisable products, intensively grown plantations take considerable pressure off natural forests, which supply such products in much more extensive way. This compensatory benefit of plantations works when there is an effective mechanism in place for protecting the natural forest areas. In Uganda, it is a requirement that one carries out an Environment Impact Assessment (EIA) to identify wetlands, tropical high forest patches, watersheds, as well as cultural sites which need protection. In establishing new plantations in areas where water availability is a critical issue, the planning should take this into consideration.

Plantation forests are now being developed as carbon sinks. This is a good programme which is going to avail extra resources for plantation development. In Uganda, there are already three forest projects totalling 6 000 ha under carbon sequestration initiatives and more are likely to come on line in the future.

11. CONCLUSIONS AND WAY FORWARD

11.1 Conclusions

The main conclusion from this study is that there is no sustainable management of planted and natural forests in Uganda. The consequences of this are the poor quality and productivity, and inadequate wood derived from forest plantations and woodlots, and high deforestation and degradation of natural forests. The main reasons for this state of affairs are limited human and financial resources. The government has not supported the forest sector with enough resources; most of the support has been to pay staff salaries. Also, given the fact that 64% of the current forests are on private land, and nothing is done in terms of forestry extension, it is not surprising that the highest degradation rate is found in these areas.

The involvement of the private sector in forestry plantation development since 2004 is very welcome. The formation and implementation of the SPGS indeed was catalytical in generating such a big interest from individuals and companies, both local and foreign, in tree growing. The need to sustain the current incentives that brought about the tree growing is a must. The government, however, has to pronounce itself on the issue of tenure of land in the CFRs and also develop comprehensive national forestry financing strategies, like the forest/tree fund which will create mechanisms and conditions for expanding and diversifying the financial basis for forest plantations and woodlots. The processing of forest produce needs planning now as the plantation trees mature

so that an efficient and profitable industry can be created to replace the almost obsolete one in place today.

11.2 Way forward

The following recommendations as ways forward arise from this study:

- As demand for forestry products increases due to the increasing population, there is an urgent need to improve the management of forests by upgrading technologies in forest production, harvesting and processing. The issue of planting materials should be taken up urgently.
- The Government should have a clear plantation development strategy which will reassure the investors about the security of their land tenure in the CFRs and also tax exemptions; .
- Furthermore, the Government should continue to improve the investment climate in the country by developing comprehensive national forestry financing strategies like the proposed forest/tree fund which will create mechanisms and conditions for expanding and diversifying the financial basis for forest plantations and woodlots;
- The sector has to urgently address the governance issues that are causing development partners to stop funding forestry development programmes;
- The Government should build up human resource capacity (technical, vocational and managerial) for forest plantations. There should also be improvement of extension services to support woodlots establishment by individuals and communities. A public-private partnership to promote research and development should be instituted soon;
- There is an urgent need to improve on data collection, storage and dissemination, especially data about demand and supply of all forest products including the NWFPs;
- The import/export timber trade should be monitored well in collaboration with neighbouring countries to reduce illegal activities of smuggling products across borders;
- The Government should promote alternative sources of energy supply to reduce the dependence of the population on woody biomass given the fast growing population;
- It is important to regularly review the level of charges for round wood and sawn timber to reflect realistic market prices;
- Forest practices need to be improved. The loss of revenue through careless actions (e.g. abandoning short logs, and use of destructive logging techniques) should be eliminated or minimised. Bonus systems can be introduced to reward those that excel in the collection of revenue;
- As forest plantations mature, forest industries - sawmills, fibre and particle board and plywood mills - need to be planned and set up to take advantage of the abundant raw materials; and,
- The contribution of forests to national development in terms of income, provision of products, employment and environmental services should be highlighted more through valuations of forests.

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List of People Interviewed

Name	Organisation	Position
Hudson Andrua	NFA	Ag. Executive Director
Rosette Natumanya	NFA	Human Resource Manager
Edward Senyonjo	NFA	Remote Sensing Specialist
Rashid Ssekitto	NFA	Land Management Specialist
Maxwell Kabi	NFA	Utilisation Specialist
Obed Tugumisirize	NFA	Plantation Development Specialist
James Ndikumulaga	NFA	Coordinator Forest Products & Utilisation
Abdul Mubiru	NFA	Management Accountant
Israel Kikangi	NFA	Coordinator Plantations
Thomas Muteeba	NFA	Range Manager
Paul Jacovelli	SPGS	CTA
Isaac Kapalaga	Green Resources Ltd	Managing Director
Fred Babweteera	Core Woods Ltd	Director
Babra Nakigudde	UTGA	Administrative Officer
Maths Baldas	Global Woods AG	Country Manager
Bob Kazungu	FSSD	Forest Officer
Margaret Mwebesa	FSSD/FIEFCO	Project Manager
Charles Byaruhanga	FSSD/FIEFCO	Monitoring Officer
Stephen Khauhka	Havilah Co. Ltd	Managing Director
Grace Nakabonge	Makerere University	Lecturer - Forest Pathology
Justine Namaalwa	Makerere University	Lecturer - Resource Assessment
Owen Sseremba	Makerere University	Lecturer - Wood Utilisation
Maurice Bafiirawala	Kalangala District	DFO
George Gawayo	Kampala Timbers Ltd.	Director
J. Matovu	Bwaise Timbers	Director
Mrs. Male	Ndeeba Timber sales *	Director
Hajji Kazibwe	Ndeeba Timber sales	Sales manager
Mr. Mutabaazi	Timber sales	Director
Alex Sekamba	Timber sales	Timber Seller
Brown Muyindi	Brown timbers	Director
Richard Mukasa	Timbers Ltd.	Director
Mr. Ssemakula	Bwaise Timbers	Director
Mr. Begumisa	Ndeeba Timber sales*	Director

* Not company names but suburb where the timber yard is located.
Most of the timber shade owners were not willing to give us their names.

APPENDICES

Appendix 1. Establishment, location and site conditions of NFA commercial forest plantations.

Range (Zone)	Alt-Range m	Mean Annual Rainfall mm	Mean Annual Temperature	Soils	Accessibility
Bugamba	<1000	> 1229		Laterites, with iron salts stains. Peaty, 0.5-1.0 m deep.	Good
Lendu	975 - 1550	>1250	23 – 24 °C	Conglomerates	Good
West Nile	975 - 1550	>1250	23 – 24 °C	Conglomerates	Good
Mwenge		1250 - 1500	18 – 22 °C	Ferralitic	Good
Katugo		1000 - 1250	22 – 24 °C		Good
Mafuga		> 1250 mm	<18 °C		Good
Kyoga		1000 - 1250	22 – 24 °C		Good
Achwa River		1250	>24 °C		Good
Lake Shore		1250 - 1500	18 – 22 °C		Good
Budongo		> 1250	22 – 23 °C		Good
Souith Western	1000-1250	1180 - 1220			Good
Muzizi	1000-1250	1180 -1220			Good

Note: Private sector has most of their plantations on CFRs or near CFRs.

Appendix 2. Volume production per hectare for *P. caribaea* and *E. grandis*

Age of plantation	Standing Volume m3 per ha (pines, etc) *	Standing Volume m3 per ha (Eucalyptus) **
1	-	4
2	6	30
3	20	55
4	34	88
5	51	105
6	68	133
7	98	160
8	127	186
9	143	171
10	159	190
11	192	208
12	225	226
13	229	243
14	232	259

15	261	274
16	290	290
17	319	304
18	348	318
19	377	331
20	405	344

1. Yield model for *Pinus caribaea* growing on average site well managed, site index 16,3 thinnings with initial planting of 1111trees/ha.and volume assumed to be 5 cm top diameter over bark. Since *P. caribaea* is the dominant species the rest of the softwoods have been assumed to have the same volume per ha.

2. For the hardwoods the figures for the *Eucalyptus grandis* on Site index 30 are used. Also all other hardwoods have been assumed to have the same.

Appendix 3. Tree species most commonly traded and source districts.

Commercial name	Botanical name	Use	Source District/Area
Kalitunsi	<i>Eucalyptus</i>	Construction	Ntungamo, Kabale, Rukungiri, Kabarole, Kanungu, Mbarara, Bushenyi
Kirundu	<i>Antiaris toxicaria</i>	Construction	Kyenjojo, Kibaale, Kalangala
Nkuzanyana	<i>Blighia unijugata</i>	Construction, furniture	Kibale, Kyenjojo, Hoima, Kalangala
Namukago		Furniture	
Pine	<i>Pinus sp</i>	Construction, furniture	Arua, Nebbi, Nakasongola, Kabale
Cypress	<i>Cupressus lusitanica</i>	Furniture/construction	Nebbi, Kabale
Namagulu/Mukusu	<i>Uapaca guineensis</i>	Furniture/construction	Kalangala,
Musizi	<i>Maesopsis eminii</i>	Furniture/Construction	Kalangala, Mubende, Hoima
Nkalati	<i>Aningeria altissima</i>	Furniture	Kibale, Kyenjojo, Hoima, DRC
Mahogany	<i>Khaya anthotheca</i>	Furniture	Masindi, Hoima, DRC
Nongo	<i>Albizia spp.</i>	Furniture	Kalangala, Kyenjojo, Kibale
Mpewere	<i>Piptadenia b Buchananii</i>		Kalangala, Kibale, Kyenjojo

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