UGANDA BUREAU OF STATISTICS

THE REPUBLIC OF UGANDA

UGANDA WOOD ASSET AND FOREST RESOURCES ACCOUNTS

Uganda Natural Capital Accounting Program

WAVES

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WORLD BANK GROUP

FOREWORD

The Wood Asset and Forest Resources Accounts for Uganda have been developed under the Natural Capital Accounting (NCA) Program, which is a collaboration between the Government of Uganda and the World Bank's Wealth Accounting and Valuation of Ecosystem Services (WAVES) initiative. These are the second set of sector accounts developed under the NCA Program. The first set had the National Land Physical Asset Accounts. The Wood Assets and Forest Resources Accounts cover wood assets, forest resources and the supply and demand for wood and forest products.

Uganda's wood assets have been quantified and monetised for each type of land cover in the country, including both wood found on forest land and wood found outside forests. The stocks have then been subdivided into wood available for supply and wood not available for supply, depending on the system of land ownership and resource management. Historical trends in supply, demand and asset values have been analysed from 1990 to 2015 and projections have been made up to 2040.

The Wood Asset and Forest Resources Accounts show that Uganda's aggregate national wood stock reduced by 45 percent between 1990 and 2015. This was caused by a combination of factors, including a reduction in the area of forest (mainly driven by conversion to small-scale agriculture), a rapid increase in wood demand associated with a high population growth rate, policy implementation failures and a widening wood supply deficit.

Uganda's forest resources supply wood products such as sawn wood (timber), poles as well as commercial, industrial and household firewood and charcoal. Demand for charcoal is the highest in terms of wood supply required, followed by firewood and sawn wood. Despite the large amount of wood associated with its production, charcoal is a low-priced product, in part because the value of the wood used for charcoal-making excludes extraction costs and resource rents. Uganda is a net importer of wood products, but the trade deficit on wood products reduced between 1990 and 2015.

There are numerous challenges to the sustainability of wood assets and forest resources in the country. So, this report provides a wealth of information that will enable planners and policymakers to effectively address some of these challenges.

On behalf of the Government of Uganda (BoU), the Uganda Bureau of Statistics (UBOS) congratulates the Technical Working Group of the NCA Program for compiling these Wood Asset and Forest Resources Accounts. The Government also thanks the World Bank for its technical and financial support. It also thanks Statistics Canada and Statistics Netherlands for reviewing the draft accounts. I believe that these accounts will contribute enormously to the management of wood assets and forest resources in Uganda.

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The Government of Uganda's Natural Capital Accounting initiative extends gratitude to the ministries, agencies and local government authorities who participated in the compilation of the Wood Asset and Forest Resources Accounts. The Government is especially grateful to the Ministry of Finance, Planning and Economic Development (MoFPED) and the National Planning Authority (NPA) for their leadership; to the National Forestry Authority (NFA), the Forestry Sector Support Department in the Ministry of Water and Environment (MWE), the National Environment Management Authority (NEMA) and the Uganda Wildlife Authority (UWA) for compiling the physical data. The Government of Uganda also extends gratitude to the Uganda Bureau of Statistics (UBOS) for developing the accounts themselves and to the Technical Working Group for their guidance and support. In-depth reviews by Statistics Netherlands and Statistics Canada are also gratefully acknowledged.

The Government is, additionally, grateful to the Sawlog Production Grant Scheme, the Uganda Timber Growers Association, the Makerere University School of Forestry, Environmental and Geographical Sciences, and the Food and Agriculture Organization (FAO) of the United Nations (UN).

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ACRONYMS AND ABBREVIATIONS

AFR100	Africa Restoration 100 (under the Bonn Challenge)
CFR	Central Forest Reserve
CITES	Convention on Illegal Trade in Endangered Species of Wild Flora and Fauna
FLR	Forest Landscape Restoration
FSSD	Forest Sector Support Department
GoU	Government of Uganda
ISSMI	Integrated Stock Survey and Management Inventory
LFR	Local Forest Reserve
MSUT	Monetary Supply and Use Table
MWE	Ministry of Water and Environment
NCA	Natural Capital Accounting
NDP	National Development Plan
NEMA	National Environmental Management Authority
NFA	National Forest Authority
NPA	National Planning Authority
NWFP	Non-Wood Forest Product
PSUT	Physical Supply and Use Table
SAM	Social Accounting Matrix
SEEA-CF	System of Environmental-Economic Accounting - Central Framework
SNA	System of National Accounts
THF	Tropical High Forest
UBOS	Uganda Bureau of Statistics
UNRA	Uganda National Roads Authority
UWA	Uganda Wildlife Authority
WAVES	Wealth Accounting and the Valuation of Ecosystem Services

EXECUTIVE SUMMARY

Background

In October 2018, the Government of Uganda, with the support of the World Bank-led Wealth Accounting and the Valuation of Ecosystem Services (WAVES) global partnership, embarked on the development of natural capital accounts for Uganda under the Natural Capital Accounting (NCA) Program. The Program aims to mainstream natural capital into development policy dialogue and planning processes, including for the Third National Development Plan (NDP-III) and other national and sectoral policies. Under the joint leadership of the Ministry of Finance, Planning and Economic Development (MoFPED), the Uganda Bureau of Statistics (UBOS), the Ministry of Water and Environment (MWE), and the National Planning Authority (NPA), the NCA Program aims to increase understanding of the contribution of natural assets and ecosystem services to the economy, as well as the impact of economic activity on natural assets.

This report presents the first comprehensive set of Natural Capital Accounts for Uganda's wood assets and forest resources, using the United Nations System of Environmental-Economic Accounting Central Framework (SEEA-CF 2012). The accounts comprise physical asset accounts, monetary asset accounts and the physical and monetary flows of wood and other forestry resources from 1990 to 2015, including snapshots for 2000, 2005 and 2010. Projections of supply and demand from 2015 to 2040 are also provided.

Importance of wood assets and forest resources in Uganda

Uganda's forests are an important and treasured natural asset that provide multiple environmental, social and economic benefits, meeting the country's needs for woodfuel, timber and poles, providing habitats for flora and fauna, and helping mitigate climate change. Forest ecosystems are Uganda's principal source of energy, since woody biomass accounts for 78 percent of energy production (MEMD 2016). Many rural communities are highly dependent on forest ecosystem services, while Uganda's nature-based tourism sector is in large part reliant on the integrity of the tropical high forests and woodlands that support rich biodiversity and provide habitat for wildlife.

Whereas the National Accounts currently record that the forestry sector contributes 4 percent of Uganda's Gross Domestic Product (UBOS 2018), research suggests that this contribution may in fact be as high as 8 percent (NEMA 2011). However, disparate findings are often based on unreliable extrapolation from case studies. The SEEA-CF provides a system for generating more reliable results that are compatible with Uganda's System of National Accounts, the Vision 2040 and the National Development Plans (NDPs) that are aligned to it. The long-term goal of Vision 2040 is to restore Uganda's forest cover to 1990 levels, when 24 percent of the land was under forest.

Findings

Uganda's wood assets include standing stock in the five forest land cover classes of broadleaved plantations, coniferous plantations, Tropical High Forest (well-stocked and low-stocked) and woodlands. Additional wood stocks are found in the non-forest land covers (bushlands, grasslands, wetlands, farmlands, built-up areas and impediments). These assets may be subdivided into wood stocks available for supply and those not available for supply, according to the applicable system of land ownership and management.

The wood asset calculations across all the land cover classes indicate a 45 percent reduction in national aggregate wood stock between 1990 and 2015, from 355.5 million tonnes to 197.1 million tonnes. After an initial 4 percent increase in wood biomass between 1990 and 2000, the national stock suffered a significant reduction of 42.5 percent between 2000 and 2005. Despite a modest 3 percent recovery between 2005 and 2010, the aggregate stock fell by another 9 percent between 2010 and 2015.

After a slow rate of stock reduction prior to 2000, the subsequent acceleration in stock reduction led to a 53 percent decline in the wood available for supply between 2000 and 2015, from 224.6 million tonnes to 91.5 million tonnes. The wood supply deficit expanded by 22 times during this period, from a relatively small gap of 1.6 million tonnes in 2000 to 35.0 million tonnes in 2015. This growing supply deficit prompted initiatives intended to close the gap, with afforestation programs such as the Sawlog Production Grant Scheme (SPGS) and larger-scale forest landscape restoration programs. A combination of SPGS and private investment led to a doubling of wood stock in plantations, from 858,000 million tonnes in 2005 to 1.7 million tonnes in 2015. Despite these useful additions, the national aggregate wood stock still reduced by a much larger 14.4 million tonnes over the same period.

Two thirds of the reduction in national wood stocks between 1990 and 2015 occurred on private land.[1] Despite this sizeable loss, 40 percent of aggregate wood stock was still found on private land in 2015.

The long-term decline in wood stocks can be partly explained by a reduction in forest cover, but a comparison of trends in forest area and stocks suggests that other factors are also at play, including forest sector policy, regulatory reforms and increased demand for wood products resulting in a widening supply deficit. The particularly drastic reduction in stocks between 2000 and 2005 was probably a result of reforms in forestry governance, as the responsibilities of the former Forest Department were transitioned to the National Forest Authority (NFA) and the District Local Governments (DLGs), leading to reduced technical and regulatory support for forests on private land and for more remote Central Forest Reserves (CFAs). Now regulation of production and trade in woodfuel on private land is the responsibility of local governments, while licensing of production of sawn wood is undertaken jointly by the Forest Sector Support Department and the DLGs. But due to limited financial and human capacity at district level, the bulk of woodfuel and sawn wood production and transportation is unlicensed, and thus effectively illegal.

The supply and use table results show that the quantity of wood supplied for charcoal production was 40 to 60 times more than the quantity supplied for sawn wood between 1990 and 2015. In contrast, the monetary value of charcoal was only one third higher than the monetary value of sawn wood. Similarly, despite 1.5 to 3 times more wood being supplied in the form of charcoal than firewood, the monetary value of firewood was higher than the value of wood used for making charcoal throughout the same period.

The price of wood used for charcoal production is below that of the next lowest valued wood, which is industrial firewood. This indicates that charcoal producers have limited prospects for profitability and that opportunities for capturing resource rents from charcoal are very likely absent. The high market supply of charcoal is driven by value addition and margins equivalent to about 80 percent of the retail price, while charcoal producers' returns are usually between 12.5 percent and 20 percent of the retail price. The current structure of fiscal instruments, including production permits, transportation licences and market dues, do not internalise the economic and social cost of wood production, thereby leading to wood depletion without re-investment in the wood sources.

The supply and use tables also show that Uganda's wood product trade deficit (the difference between exports and imports), reduced by 8.8 times between 2000 and 2015. The economic flows of selected non-wood forest products (shea oil and *Prunus africana* bark) were valued at UGX 280 (US$128.6 million) in 2010 and UGX 281 billion (US$86.7 million) in 2015, with exports of UGX 15.2 billion (US$7.0 million) and UGX 15.5 billion (US$4.8 million), respectively.

[1] Private land refers to non-public forest land. It includes customary tenure lands.

Due to rising demand for wood products as a result of population growth and urbanisation, national wood demand is projected to more than double from its 2015 level by 2040, from 48 million tonnes to 105 million tonnes per annum. Under these demand projections, and considering also the expansion of agriculture, sustainable wood supplies from areas defined as forest will be fully depleted by 2025, leaving an annual wood supply deficit of 72,600 tonnes by 2030. Wood available for supply from outside forests will reduce to just 3.0 million tonnes by 2040, less than 3 percent of total demand in 2040. Consequently, most future wood production will then have to shift to areas reserved for forest and wildlife conservation

Policy implications

1. While a reduction in the area of forest is often cited as the outstanding cause of wood stock reduction in Uganda, other factors have also played a part in the progressive loss of the country's wood assets and forest resources. Policy implementation failures contributed to the drastic wood stock reduction recorded between 2000 and 2005). After 2005, a combination of increasing wood demand and a growing wood supply deficit, alongside forest cover reduction and regulatory challenges, ensured that the decline in wood stock continued, albeit at a slower rate. The Uganda Forestry Policy (2001) and the National Forestry Policy and Tree Planting Act (2003) did not balance the emphasis on support and regulation of forest management on private land with that assigned to public land. This was a major oversight that needs to be corrected to ensure sustainable forest production on private land while also ensuring optimal management of public forests.

2. Wood stocks outside Forest Reserves, National Parks and Wildlife Reserves, particularly on private land, are an important category of wood that has not been fully recognised and integrated in policy and regulation. Targeted guidelines on tree production and silvicultural management are needed for private land, with a conducive regulatory environment and implementation support to encourage forest production for the recovery of large landscapes. A revision in the 2001 Forest Policy may be needed to enhance sustainable wood production, including the introduction of principles of resource rents, and an improved market structure for wood grown outside forests.

3. Demand for wood is led by the high requirements for charcoal production. The current charcoal market structure and value chain offer minimal incentive for the adoption of improved kilns, as frequently promoted, because charcoal operates under sub-optimal subsistence conditions that are less profitable than firewood production. A new market structure is needed, and the value chain needs to include wood extraction costs and resource rents for charcoal, firewood, sawn wood and poles. Other proposed demand side interventions include improvement in energy use efficiency through the adoption of improved cooking stoves, kiln technologies and enhanced incentives for the adoption of alternative sources of energy for cooking, especially liquified petroleum gas and electricity.

4. Current afforestation efforts (such as the SPGS) are relatively small compared to the scale of wood supply that is needed in the country. The required increase in wood output to significantly reduce the supply deficit necessitates actions at a much larger landscape scale, emphasising the restoration of natural forest cover as the major base of wood stock in the country.

5. There is a need to conduct more detailed research into non-wood forest products, including medicinal plants, bark cloth, rattan cane, gum arabic, bamboo and resins, among others, to quantify their economic contribution more accurately. There is also an opportunity to think beyond forest accounts towards a Social Accounting Matrix (SAM). A SAM is a comprehensive economy-wide database that records transactions between economic agents for a specified period of time. The Wood Asset and Forest Resources Accounts can not only enrich the National SAM for Uganda, but can also inform economy-wide analysis of the contribution of wood and forest sector investments to the economy, and how they can be leveraged to achieve poverty reduction.

GLOSSARY

Forest land cover categories of the National Biomass Database (National Forestry Authority)

Class 1: Broadleaved plantations	Planted trees or forests of hardwood species including *Eucalyptus* spp., *Maesopsis eminii*, *Acacia mearnsii* (black wattle) and *Markhamia lute*a.
Class 2: Coniferous Plantations	Planted trees or forests of softwood species, including Pine and Cypress spp.
Class 3: Tropical High Forest well-stocked or normal	Normally stocked, i.e., densely stocking density natural forests rich in species biodiversity of flora and fauna.
Class 4: Tropical High Forest low-stocked, depleted or encroached	Depleted, degraded or encroached natural forests rich in species biodiversity, but with reduced species richness and composition dominated by secondary growth, in particular *Solanum gigantea*.
Class 5: Woodlands	Wooded areas where trees and shrubs are predominant. There are wet and dry types. The wet type occurs as a zone along wetlands (riverine forest) and the dry type is found on grass-covered upland areas.

Forest land	Land defined as forest with forest cover on it (with at least 1 ha of a continuous canopy of trees above 4 m tall). This does not include land designated as forest land whose cover has changed to other land covers.
Forest wood stock	The wood stock in forest land areas, which is the wood stock within forest plantations, Tropical High Forest (THF) well-stocked, THF low-stocked and woodlands.
Non-forest land	Land that is not classified as forest land and which falls into one of the other seven land cover classes (bushlands, grasslands, wetlands, small scale farmlands, commercial farmlands, built up areas and impediments.). This may contain woody biomass that contributes wood for fuel, timber or other uses.
Non-forest wood stock	Wood stock in the seven non-forest land cover classes.
Integrated Stock Survey and Management Inventory	An inventory to guide silviculture decisions, management and control at the compartment level of a forest.
National Biomass Survey	A two-stage biomass inventory process that combines (i) spatial analysis to determine and stratify land use/land cover and (ii) inventory of biomass resources based on sample plots to quantify the stock of biomass in a country or region. The survey was conducted every five years between 2000 and 2015, moving to every two years thereafter.
Natural capital	Everything that we get from nature: clean air and water, fish, forests, biodiversity, minerals and more.
Natural capital accounting	An inclusive and systematic way of measuring natural capital resources, recognizing their value and incorporating that information in national economic accounts and statistics.
Resource rent	Resource rent (also known as economic rent) is defined as a surplus value, i.e., the difference between the price at which a resource, or the output

	from it, can be sold, and its respective extraction and/or production costs, including normal returns.
SEEA Central Framework	A multipurpose conceptual framework for understanding the interactions between the economy and the environment, and for describing stocks and changes in stocks of environmental assets.
System of National Accounts (SNA)	An internationally agreed standard set of recommendations on how to compile measures of economic activity. The SNA describes a coherent, consistent and integrated set of macroeconomic accounts in the context of a set of internationally agreed concepts, definitions, classifications and accounting rules. It provides an overview of economic processes, recording how production is distributed among consumers, businesses, government and foreign nations
The Bonn Challenge	A global effort to bring 150 million ha of deforested and degraded land into restoration by 2020, and 350 million ha by 2030.

CHAPTER 1: INTRODUCTION

1.1 Background

Uganda's Natural Capital Accounting (NCA) Program aims to mainstream natural capital into development policy dialogue and planning, by integrating a set of accounts that will inform the third National Development Plan (NDP III) and other national and sectoral policies. Among other things, the Program aims to increase understanding of the contribution of natural assets and ecosystem services to the economy, and how the economy and its sectors affect this natural asset base.

The NCA Program is implemented with financial and technical support from the World Bank-led Wealth Accounting and the Valuation of Ecosystem Services (WAVES) partnership. The lead Government of Uganda (GoU) counterparts are the Ministry of Finance, Planning and Economic Development, the Uganda Bureau of Statistics (UBOS), the National Planning Authority (NPA), the Ministry of Water and Environment (MWE) and the National Environmental Management Authority (NEMA).

1.2 Purpose and objectives

Uganda's long-term development strategy, the Vision 2040, includes targets related to forests and wetlands as core performance indicators for the management of the environment and natural resources. One of those targets is to restore Uganda's forest cover to its 1990 extent of 24 percent of land area (GoU/NPA 2013). The national strategy for natural capital management and development, the Uganda Green Growth Development Strategy, prioritises forestry, tourism development, wetlands and optimal water resources management (GoU/NPA 2017).

In 2015, the Government of Uganda joined the Bonn Challenge. This a global effort aligned with the United Nations Framework Convention on Climate Change, the United Nations Convention to Combat Desertification and the Convention on Biological Diversity to bring 150 million ha of deforested and degraded land into restoration by 2020, and 350 million ha by 2030. African Governments agreed to contribute 100 million ha towards the 2030 target under the African Restoration 100 (AFR100) initiative. This includes a commitment from Uganda of 2.5 million ha of forest restoration. Between 2015 and 2019, the MWE undertook a series of studies to establish the feasibility of Forest Landscape Restoration (FLR) in the country. While the studies showed that FLR was feasible, additional information was needed to support private and public investments for the forestry sub-sector (MWE and IUCN 2018).

The purpose of these Wood Asset and Forest Resources Accounts is to provide information to guide more efficient implementation of the Uganda Forestry Policy (2001) and the National Forestry and Tree Planting Act (2003), to inform the development of the NDP III with more accurate valorisation of wood assets and forest resources, and to realise the targets of Vision 2040 and the Green Growth Development Strategy. The Accounts will also contribute accurate data in support of the FLR effort under AFR100.

At a wider level, the accounts aim to help Uganda and its people to achieve a sustainable increase in the economic, social and environmental benefits derived from forests and trees, and to ensure that wood stocks are conserved and managed in a manner that meets the needs of present generations, without compromising the rights of future generations, by safeguarding forest biological diversity and environmental benefits that accrue from forest resources.

1.3 Scope of the wood asset and forest resources accounts

The Wood Asset and Forest Resources Accounts were developed at the national level. The accounts consider all forest resources existing or produced domestically, as well as exports and imports. The

accounts cover both forest land and non-forest land, standing stocks of wood, wood available (and not available) for supply, and the supply and use of wood non-wood forest products (NWFPs), through the value chain from natural inputs to finished products. The products included were woodfuel, sawn wood and poles and the NWFPs shea oil, *Prunus africana* bark *and* sandalwood oil.

The accounts follow the System of Environmental-Economic Accounting Central Framework (SEEA-CF 2012). Within this framework, the physical assets comprise forest land and the wood on the land, while wood assets are subdivided into wood available for supply and wood not available for supply, which is determined by the land management system in place and from survey and inventory estimates. For example, wood from plantations is assumed to available for supply over an average 15-year harvesting cycle, and wood from natural forests over a 30-year cycle (Odokonyero 2005). The National Forestry Authority (NFA) conducts Integrated Stock Surveys and Management Inventories (ISSMIs) across the country to guide wood production for Central Forest Reserves (CFRs) and forests on private land. The wood deemed not available for supply is the standing stock that would remain unharvested, either because it is either immature or is excluded from harvesting for conservation purposes, or as a wildlife habitat or for the protection of ecosystems, among others (UNSEEA 2014).

Uganda has 13 land cover classes adopted from the United Nations (UN) Food and Agriculture Organization (FAO) Land Cover Classification System into the National Biomass Survey System (MWLE/Forest Department 1991; 2002). Five of the 13 classes are forest classes: broadleaved forest plantations, coniferous forest plantations, well stocked Tropical High Forest (THF), low-stocked THF and woodlands. The remaining seven land cover types are non-forest classes: bushlands, grasslands, wetlands, small scale farmlands, commercial farmlands, built-up areas and impediments. The non-forest land cover classes also contain wood, but do not have enough trees to meet the requirements for an area defined as a forest.

As part of Uganda's efforts to meet the AFR100 target for FLR, the country is also divided into seven forest restoration landscapes according to ecological, climatic and agricultural: (i) Afro-montane, (ii) Karamoja, (iii) Lake Victoria Crescent, (iv) Northern Moist, (v) South East Lake Kyoga, (vi) Southwest Rangelands and (vii) Western Mid-Altitude farmlands (MWE and IUCN 2016).

The physical and monetary wood stock accounts comprise wood stock from both the forest and non-forest land covers, as well as wood available and wood not available for supply. The physical wood assets are presented both as a national aggregate (in the main report) and for the seven forest restoration landscapes (in Annexes 1 and 2). The monetary forest accounts were developed by national aggregate only. Similar to the wood assets, the supply and use tables were aligned with the time series of the National Biomass Surveys, specifically 1990, 2000, 2005, 2010 and 2015.

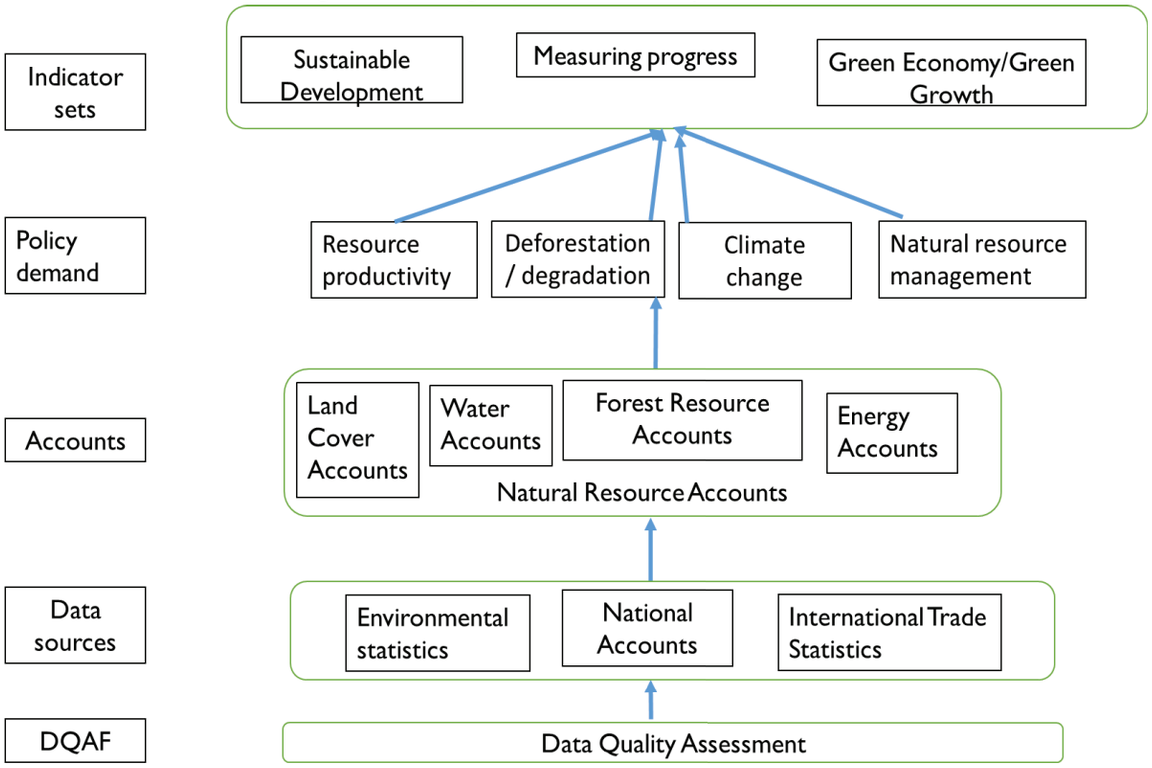
CHAPTER 2: METHODS AND TOOLS

2.1 Design

The Wood Assets and Forest Resources Accounts were developed following the SEEA-CF, as proposed in Uganda's National Plan for Advancing Environmental-Economic Accounting (UBOS 2019a). The SEEA-CF is a satellite system to the System of National Accounts (SNA) and adheres to the SNA accounting concepts, structures, rules and principles. It provides a framework for organising information that covers, as completely as possible, the stocks and flows that are relevant to the analysis of environmental and economic issues.

In accordance with the National Plan for Advancing Environmental-Economic Accounting and the National Statistical System, data was sourced from the responsible Ministries, Departments and Agencies (MDAs), and compiled by UBOS with support from the World Bank WAVES Program. The inter-institutional Technical Working Group of the NCA Program supported data quality assessment and technical review during the development of the accounts, as elaborated in Figure 2.1. Statistics Canada and Statistics Netherlands provided extensive technical review.

Figure 2.1: Design of accounts development process



Source: adapted from UBOS (2019) and UNSD (2019)

2.2 Data sources and data collection

Four types of data were used to prepare the accounts:

(i) physical forest land data;
(ii) physical wood data;
(iii) physical NWFP data; and
(iv) price data for the physical assets and flows.

The data on forest land and wood stocks on forest land were collated from the NFA's National Biomass Survey database for 1990, 2000, 2005, 2010 and 2015 (NFA 2015, 2017), drawing also upon the National Land Physical Accounts as the main secondary source of land cover data (UBOS 2019).

The physical wood stock data for areas outside forest land cover was also collated from the National Biomass Survey database (NFA 2019), with additional data from National Biomass Survey reports (MWLE 1991, 2002) and inventory work by the NFA. The benchmarks for wood stock on non-forest land covers were derived from the 1990 and 2015 National Biomass Surveys, using a combination of satellite imagery and ground truthing, corroborated with data routinely collected from NFA permanent sample plots purposively established across the 13 land cover classes (MWLE 1990, 2002; NFA 2009; MWE 2016). Wood data is presented as dry weight in tonnes (t), areas are given in hectares (ha), and prices are quoted in Uganda shillings (UGX) and United States dollars ($) (NFA 2017, 2018).

The data for the supply and use tables is divided into natural inputs, wood products and NWFPs. The wood product data from the National Accounts Office covers wood products of sawn timber and poles, as well as woodfuel. Woodfuel includes household, commercial and institutional firewood, as well as charcoal. Several NWFPs were also explored, including medicinal plants, bee honey[2], shea nuts and other shea products, bamboo and bamboo products, *Prunus africana* and its by-products, bark cloth, gum arabic, rattan cane and sandalwood oil. Whereas several surveys of such NWFPs exist, the resulting data were generally not deemed sufficiently reliable to include, under the data quality assessment framework. Only the supply and use data for shea oil, sandalwood oil and *Prunus africana* bark for the years 2005, 2010 and 2015 was reliable enough to use in the accounts, albeit with gaps.

Data on shea butter was derived from NEMA surveys in the major shea-growing areas of northern Uganda (NEMA 2016, 2018, 2019). A cost-benefit analysis conducted in 2016 provided additional monetary information. Physical data on *Prunus africana* and sandalwood was taken from the website of the Convention on Illegal Trade in Endangered Species of Wild Flora and Fauna (CITES). NEMA provided additional data and leads to websites for data on sandalwood.

Price data for wood was based on national averages from the price list used by the NFA. The NFA estimates wood stock prices based on stump prices provided by the NFA Finance and Accounts office. Wood product prices were based on farm-gate prices estimated by UBOS as part of the Uganda National Household Survey questionnaire. Land prices were collated from approved Resettlement Action Plan reports for the Uganda National Roads Authority (UNRA) and other government agencies. Shea butter prices were collated from NEMA. Trade data on *Prunus africana* and sandalwood was obtained from reports on the CITES website (CITES 2019), while farm gate prices were obtained from the database of the Forest Sector Support Department (FSSD) within the MWE (FSSD 2019).

2.3 Data Analysis

The source data for the accounts was jointly reviewed by the Forest Accounts Technical Team comprising the NFA, UBOS, FSSD and the World Bank. Change matrix tables were also developed and reviewed jointly with the Forest Accounts team. Wood available for supply and wood not available for supply was synthesised based on the management systems in place for forest land and non-forest land. All forest and non-forest land can be used for wood production, with the exception of National Parks, Wildlife Reserves, Nature Reserves[3] and conservation zones of CFRs.

[2] Honey is categorised in the national supply and use table categories as an agricultural product. To avoid double counting, it was therefore not included in the wood asset and forest resource accounts.
[3] Nature Reserves are considered part of Wildlife Reserves, and are hereafter included in that description.

The accounts were compiled with MS Excel, which allowed for the conversion of the source data into a format suitable for the compilation of the accounts. The physical data from the National Biomass Survey was synthesized using pivot tables and change matrices were developed using the PowerPivot Add-In. Simple linear regression was used to fill data gaps, such as gaps in trade data between 1990 and 2005. Where many data points were missing, the data was not used at all.

Supply and use tables were generated to facilitate input-output analysis, by comparing the natural inputs and wood products in the supply and use tables with the wood available for supply reported in the accounts. The supply and use tables were consistent with the physical and monetary wood asset accounts, especially the component on the wood available for supply.

Monetary accounts were developed using the market price approach. Government market prices were used for forest land, while farm gate prices were used for wood and producer prices were used for NWFPs (shea, *Prunus africana* and sandalwood). For forest land, the data compiled from Resettlement Action Plans of the UNRA and other agencies provided the bulk of the data. The analysis of land prices was based on the replacement value approach used by the Government Valuer (UNRA 2018). Using the UBOS consumer price index (UBOS 2018), backward projections allowed gap filling for land prices between 1990 and 2005.

A business as usual scenario was simulated to project performance of wood stocks and flows from 2015 to 2040. The simulation was used for integrated analysis of the accounts and their potential impacts on livelihoods and the economy. The integrated analysis was also used to simulate relationships between wood demand, supply and use, and the Uganda Forestry Policy (2001) and the National Forestry and Tree Planting Act (2003). The analysis was also informed by expert judgment and discussions with technical teams in the NFA, MWE and UBOS, and an FAO forestry consultant based in the NFA.

CHAPTER 3: FOREST LAND ASSET ACCOUNTS

3.1 Forest land assets for Uganda

The Wood Asset and Forest Resource Accounts were developed for both the forest and non-forest land covers. Forest lands in Uganda are defined as those with a minimum forest area of 1 ha, a minimum crown cover of 30percent and with trees able to attain a height of 4 m or above (MWE 2016). Wood within forest lands is held in the five forest land cover classes used in the National Biomass Survey: broadleaved plantations, coniferous plantations, well-stocked THF, low-stocked THF and woodlands. Plantations include species usually planted for timber and poles, but may also be used for woodfuel. The two most popular plantation species in Uganda are eucalyptus and pine (MWE 2016). THF are dense forests with high biomass density in timber and leaves. They sequester large quantities of carbon dioxide and support many hydrological systems. Examples of THF species are *Khaya* spp. and *Cordia* spp. Woodlands, on the other hand, are sparse and contain relatively smaller trees such as *Terminalia* and *Combretum* spp.

The areas of physical forest land were converted into monetary values, based on reported and projected market prices for the year in question (UNRA 2005, 2010, 2015). Forest land accounts are presented both as national aggregates and by type of land administration (UBOS 2019b). Disaggregation by type of land administration is significant, because forests on private land are generally available for supply, while those in protected areas have restricted access, which affects the areas and wood stocks available for harvest. Forest land values are also broken down for the 11 sub-regions of Uganda. Additional breakdowns of forest areas and biomass stocking by forest landscape are presented in Annexes 1 and 2, respectively.

3.2 National physical forest land

The total forest land area of Uganda was 4.93 million ha in 1990. This decreased by 60 percent to 1.95 million ha in 2015 (NFA 2017, 2019). Woodlands suffered the largest loss (69%), reducing from 3.97 million ha to 1.21 million ha (Table 3.1). Well-stocked THF and low-stocked THF reduced by 19 percent and 63 percent, respectively, over the 25-year period, while broadleaved plantations increased by 2.4 times (from 18,682 ha to 44,237 ha) and coniferous plantations by 3.9 times (from 16,384 to 63,486 ha). All three classes of natural forest cover showed a continuous decline, except for a short-term increase in well-stocked THF between 1990 and 2000.

Table 3.1: Forest land physical asset accounts at national level, 1990 – 2015 (in hectares)

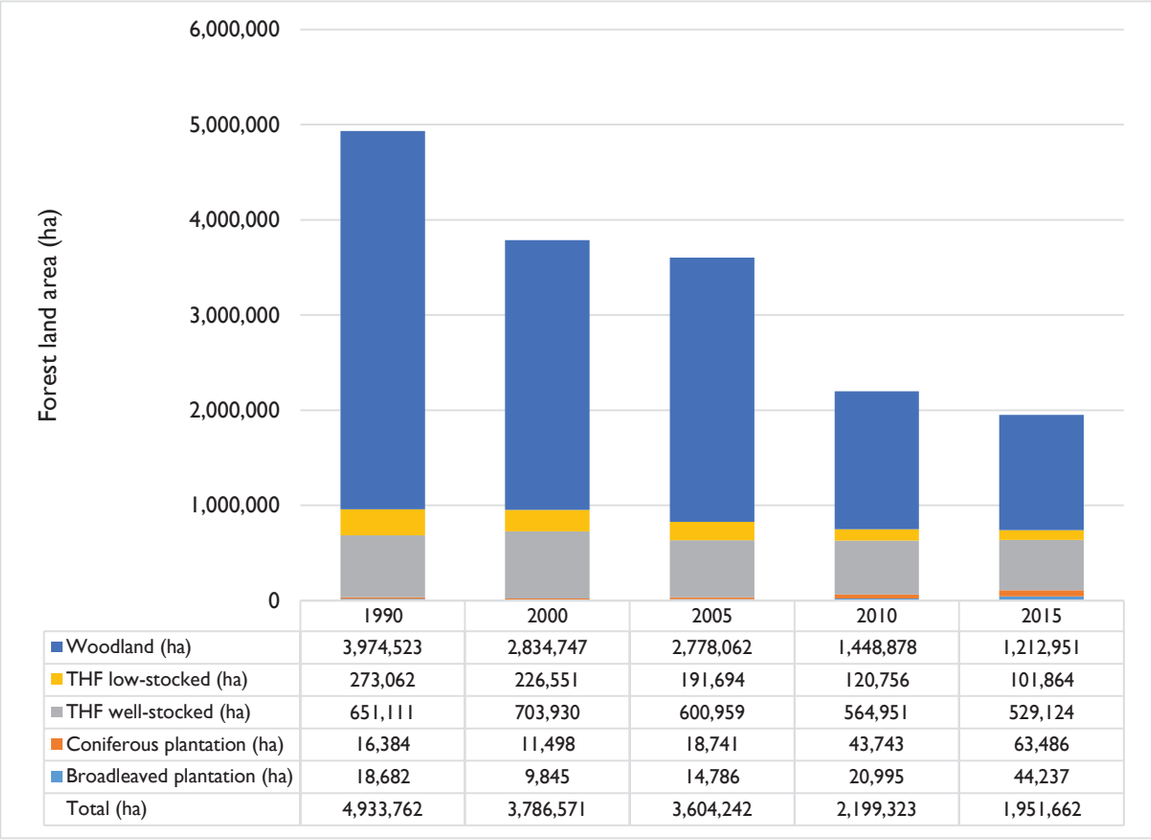
	Broadleaved plantation	*Coniferous plantation*	*THF well-stocked*	*THF low-stocked*	*Woodland*	***Total***
1990 – 2000						
Opening stock (1 Jan 1990)	18,682	16,384	651,111	273,062	3,974,523	**4,933,762**
Additions	8,059	3,787	186,030	158,163	1,111,145	**1,467,184**
Reductions	16,896	8,673	133,210	204,673	2,250,920	**2,614,372**
Net change	(8,837)	(4,886)	52,820	(46,510)	(1,139,775)	**(1,147,188)**
Closing stock (31 Dec 1999)	9,845	11,498	703,931	226,552	2,834,748	**3,786,574**
2000 - 2005						
Opening stock (1 Jan 2000)	9,845	11,498	703,930	226,551	2,834,747	**3,786,571**
Additions	13,107	11,489	68,654	124,979	1,319,547	**1,537,776**
Reductions	8,166	4,246	171,626	159,835	1,376,233	**1,720,106**
Net change	4,941	7,243	(102,972)	(34,856)	(56,686)	**(182,330)**
Closing stock (31 Dec 2004)	14,786	18,741	600,959	191,694	2,778,061	**3,604,241**
2005 - 2010						
Opening stock (1 Jan 2005)	14,786	18,741	600,959	191,694	2,778,062	**3,604,242**
Additions	18,460	33,710	87,904	90,494	678,877	**909,445**
Reductions	12,251	8,708	123,911	161,432	2,008,061	**2,314,363**

Table 3.1: Forest land physical asset accounts at national level, 1990 – 2015 (in hectares)

	Broadleaved plantation	*Coniferous plantation*	*THF well-stocked*	*THF low-stocked*	*Woodland*	***Total***
Net change	6,209	25,002	(36,007)	(70,938)	(1,329,184)	**(1,404,918)**
Closing stock (31 Dec 2009)	20,995	43,743	564,951	120,756	1,448,878	**2,199,323**
2010-2015						
Opening stock (1 Jan 2010)	20,995	43,743	564,951	120,756	1,448,878	**2,199,323**
Additions	34,128	27,538	37,951	59,186	441,480	**600,283**
Reductions	10,886	7,795	73,778	78,078	677,407	**847,944**
Net change	23,242	19,743	(35,827)	(18,892)	(235,927)	**(247,661)**
Closing stock (31 Dec 2014)	44,237	63,486	529,124	101,864	1,212,951	**1,951,662**
1990 - 2015						
Opening stock (1 Jan 1990)	18,682	16,384	651,111	273,062	3,974,523	**4,933,762**
Additions	42,210	54,478	111,899	75,158	507,067	**790,812**
Reductions	16,656	7,376	233,885	246,355	3,268,638	**3,772,910**
Net change	25,554	47,102	(121,986)	(171,197)	(2,761,571)	**(2,982,098)**
Closing stock (31 Dec 2014)	44,237	63,486	529,124	101,864	1,212,951	**1,951,662**

The aggregate trend by forest type is summarized in Figure 3.1.

Figure 3.1: Aggregate trends of forest land by forest cover class, 1990 to 2015



	1990	2000	2005	2010	2015
Woodland (ha)	3,974,523	2,834,747	2,778,062	1,448,878	1,212,951
THF low-stocked (ha)	273,062	226,551	191,694	120,756	101,864
THF well-stocked (ha)	651,111	703,930	600,959	564,951	529,124
Coniferous plantation (ha)	16,384	11,498	18,741	43,743	63,486
Broadleaved plantation (ha)	18,682	9,845	14,786	20,995	44,237
Total (ha)	4,933,762	3,786,571	3,604,242	2,199,323	1,951,662

Source: adapted from NFA (2019)

Table 3.2 provides full details of the conversions that took place between land cover types over the 25-year period from 1990 to 2015 in a net change matrix. The matrix highlights especially the transitions that took place from forest land cover types to non-forest land cover types. According to the table, 60 percent of the reduction in forest cover came about from conversion to non-forest land

cover classes. This transformation was greatest for woodlands, followed by THF low-stocked and THF well-stocked, which lost 2.73 million ha, 141,020 ha and 171,197 ha, respectively.

Meanwhile there were net gains in forest plantation coverage, with broadleaved and coniferous forest plantations gaining 25,555 ha and 46,477 ha, respectively. The increase in broadleaved forest plantations came from well-stocked THF, low-stocked THF, woodlands, bushlands, wetlands and small-scale farmlands. Broadleaved plantations meanwhile lost area to commercial farmland, built-up areas and impediments. Coniferous plantations had a net gain from all other land covers, except for impediments, the highest of which was 21,021 ha (from woodlands) and the smallest was 28 ha (from built-up areas).

Woodlands suffered net losses to all other land cover classes, with the largest being 1.17 million ha ceded to small scale farmlands, 885,862 ha to grasslands and 503,483 ha to bushlands. Whereas it gained 47,117 ha of land, the well-stocked THF lost 2.7 times as much (127,088 ha) to small-scale farmlands. Similarly, the low-stocked THF gained 3,879 ha from woodlands and grasslands, but lost 33 times as much land to small-scale farmlands.

The most striking overall pattern is the massive conversion of forest areas to small-scale farming and the downgrading of remaining woodland areas to bushlands and grasslands.

Table 3.2: Net land cover change for forest land, 1990-2015 (in hectares)

	Net change in land cover (ha)															
	Broadleaved plantations	Coniferous plantations	THF well-stocked	THF low-stocked	Woodlands	Bushlands	Grasslands	Wetlands	Small scale farmlands	Commercial farmlands	Built-up Areas	Open water	Impediments	**Total Net Change**	Opening stock	Closing stock
Broadleaved Plantations		807	(2,299)	(2,275)	(8,945)	(387)	(3,671)	(377)	(9,234)	511	313	(20)	23	**25,555**	18,682	44,237
Coniferous plantations	(807)		(143)	(2,573)	(21,021)	(421)	(9,319)	(146)	(11,645)	(333)	(28)	(43)	3	**46,477**	16,384	63,486
THF well-stocked	2,299	143		(10,327)	(8,783)	16,075	517	3,679	127,088	7,462	373	2,335	159	**(141,020)**	651,111	529,124
THF low-stocked	2,275	3,199	10,327		(2,636)	18,450	(1,243)	4,768	129,769	2,056	2,838	1,363	30	**(171,197)**	273,062	101,864
Woodlands	8,945	21,021	27,817	2,636		503,483	885,862	4,768	1,167,265	96,631	4,376	2,645	2,585	**(2,728,034)**	3,974,523	1,212,951
Bushlands	387	421	(16,075)	(18,450)	(503,483)											
Grasslands	3,671	9,319	(517)	1,243	(885,862)											
Wetlands	377	146	(3,679)	(4,768)	(38,306)											
Small scale farmlands	9,234	11,645	(127,088)	(129,769)	(1,167,265)											
Commercial farmlands	(511)	333	(7,462)	(96,481)	(96,631)											
Built-up areas	(313)	28	(373)	(2,838)	(4,376)											
Open water	20	43	(2,335)	(1,363)	(2,645)											
Impediments	(23)	(24)	(20)	(30)	(2,585)											

Numbers in parentheses () are negatives. Blue-shaded area indicates non-forest land cover classes.

3.3 Forest cover in protected areas

Protected areas include Local Forest Reserves (LFRs), CFRs, National Parks, Wildlife Reserves and Dual Joint Management (DJM) zones (UBOS 2019; NFA 2019). While the management of DJM zones is officially shared between the NFA and UWA, in practice they are managed as conservation areas and generally controlled by UWA. Nature Reserves and Wildlife Sanctuaries are included within Wildlife Reserves.

3.3.1 Current physical forest cover in Local Forest Reserves

The forest area within LFRs was 1,631 ha in 1990, representing 32.6 percent of the total LFR area of 4,996 ha (Table 3.3). By 2015 this had decreased by 42.6 percent to 936 ha. The greatest percentage loss of area in LFRs was seen in THF well-stocked, which reduced by 227 ha (89.6 percent), followed by the low-stocked THF, which lost 235 ha (81.3 percent). Woodlands in LFRs lost 44.1 percent of their cover, while broadleaved plantations lost 28 percent. In contrast, the area of coniferous plantations within LFRs increased by 11.5 times, from 15 ha to 173 ha.

Table 3.3: Forest land physical asset for Local Forest Reserves, 1990 to 2015 (in hectares)

	Broadleaved plantation	Coniferous plantation	THF well-stocked	THF low-stocked	Woodland	**Total**
1990 - 2000						
Opening stock (1 Jan 1990)	560	15	309	235	512	**1,631**
Additions	76	5	237	75	381	**774**
Reductions	525	16	168	219	292	**1,220**
Net change	(449)	(11)	69	(144)	89	**(446)**
Closing stock (31 Dec 1999)	**111**	**5**	**379**	**91**	**599**	**1,185**
2000 - 2005						
Opening stock (1 Jan 2000)	111	5	379	91	599	**1,185**
Additions	241	19	21	104	455	**840**
Reductions	17	5	276	74	442	**814**
Net change	224	14	(255)	30	13	**26**
Closing stock (31 Dec 2004)	**335**	**19**	**123**	**120**	**614**	**1,211**
2005 – 2010						**-**
Opening stock (1 Jan 2005)	335	19	123	120	614	**1,211**
Additions	260	155	7	76	137	**635**
Reductions	147	11	30	85	396	**669**
Net change	113	144	(23)	(9)	(259)	**(34)**
Closing stock (31 Dec 2009)	**447**	**164**	**100**	**110**	**358**	**1,179**
2010-2015						
Opening stock (1 Jan 2010)	447	164	100	110	358	**1,179**
Additions	98	25	-	10	115	**248**
Reductions	143	16	67	75	190	**491**
Net change	(45)	9	(67)	(65)	(75)	**(243)**
Closing stock (31 Dec 2014)	**401**	**173**	**33**	**44**	**285**	**936**

3.3.2 Current physical forest cover in Central Forest Reserves

The forest area in CFRs was 729,951 ha in 1990. By 2015 this had reduced by 32 percent to 495,491 ha (Table 3.4). The area of broadleaved plantations within CFRs increased by 70.5percent during this period, from 6,041 ha to 10,297 ha, while coniferous plantations increased by 3.7 times, from 13,395 ha to 49,123 ha. Natural forest cover in THF and woodlands meanwhile declined significantly. Well-stocked THF decreased by 12 percent (from 257,847 ha to 226,935 ha) and low-stocked THF decreased by 47.6 percent (from 57,551 ha to 30,153 ha). The largest loss of forest area within CFRs took place in woodlands, with a reduction of 54.6 percent (179,433 ha).

Table 3.4: Forest land physical asset for Central Forest Reserves, 1990 to 2015 (in hectares)

	Broadleaved plantation	Coniferous plantation	THF well-stocked	THF low-stocked	Woodland	**Total**
1990 - 2000						
Opening stock (1 Jan 1990)	6,041	13,395	257,847	57,551	395,117	**729,951**
Additions	1,980	2,690	40,735	22,766	93,265	**161,436**
Reductions	4,742	6,688	23,153	45,023	163,253	**242,859**
Net change	(2,762)	(3,998)	17,582	(22,257)	(69,988)	**(81,423)**
Closing stock (31 Dec 1999)	**3,280**	**9,398**	**275,429**	**35,296**	**325,128**	**648,531**
2000 – 2005						**-**
Opening stock (1 Jan 2000)	3,280	9,398	275,429	35,296	325,128	**648,531**
Additions	4,064	7,753	17,051	27,167	94,355	**150,390**
Reductions	2,482	3,060	49,229	25,775	110,790	**191,336**
Net change	1,582	4,693	(32,178)	1,392	(16,435)	**(40,946)**
Closing stock (31 Dec 2004)	**4,863**	**14,091**	**243,252**	**36,688**	**308,692**	**607,586**
2005 – 2010						**-**
Opening stock (1 Jan 2005)	4,863	14,091	243,252	36,688	308,692	**607,586**
Additions	4,015	27,047	34,536	20,206	79,633	**165,437**
Reductions	3,813	4,973	31,554	30,554	179,224	**250,118**
Net change	202	22,074	2,982	(10,348)	(99,591)	**(84,681)**
Closing stock (31 Dec 2009)	**5,064**	**36,166**	**246,234**	**26,339**	**209,102**	**522,905**
2010-2015						
Opening stock (1 Jan 2010)	5,064	36,166	246,234	26,339	209,102	**522,905**
Additions	6,490	18,367	10,628	18,570	43,641	**97,696**
Reductions	1,258	5,410	29,929	14,753	73,311	**124,661**
Net change	5,232	12,957	(19,301)	3,817	(29,670)	**(26,965)**
Closing stock (31 Dec 2014)	**10,297**	**49,123**	**226,935**	**30,153**	**179,433**	**495,941**

3.3.3 Current physical forest cover in Dual Joint Management zones

The DJM zones had a combined forest area of 68,787 ha in 1990, which had decreased by 8 percent to 63,507 ha by 2015. These zones are occupied only by natural forests of well-stocked THF, low-stocked THF and woodlands. Between 1990 and 2015, the area of well-stocked THF and woodlands in DJM zones decreased by 30 ha and 7,134 ha, respectively, while low-stocked THF increased by 516 ha (Table 3.5).

Table 3.5: Forest land physical asset for Dual Joint Management zones, 1990 to 2015 (in hectares)

	Broadleaved plantation	Coniferous plantation	THF well-stocked	THF low-stocked	Woodland	**Total**
1990 - 2000						
Opening stock (1 Jan 1990)			27,850	1,587	30,325	**68,787**
Additions	-	-	909	138	5,519	**47,691**
Reductions			1,320	1,335	6,484	**10,055**
Net change	-	-	(411)	(1,197)	(965)	**37,636**
Closing stock (31 Dec 1999)			**27,438**	**389**	**29,360**	**106,422**
2000 – 2005						**-**
Opening stock (1 Jan 2000)			27,438	389	29,360	**106,422**

Table 3.5: Forest land physical asset for Dual Joint Management zones, 1990 to 2015 (in hectares)

	Broadleaved plantation	Coniferous plantation	THF well-stocked	THF low-stocked	Woodland	**Total**
1990 - 2000						
Additions	-	-	3,073	27	5,176	**15,269**
Reductions			3,818	388	10,582	**57,532**
Net change	-	-	(745)	(361)	(5,406)	**(42,263)**
Closing stock (31 Dec 2004)	**-**	**-**	**26,695**	**27**	**23,954**	**64,159**
2005 – 2010						**-**
Opening stock (1 Jan 2005)			26,695	27	23,954	**64,159**
Additions	-	-	4,103	1,477	11,761	**23,667**
Reductions			3,203	27	9,393	**21,109**
Net change	-	-	900	1,450	2,368	**2,558**
Closing stock (31 Dec 2009)	**-**	**-**	**27,595**	**1,478**	**26,321**	**66,719**
2010-2015						**-**
Opening stock (1 Jan 2010)			27,595	1,478	26,321	**66,719**
Additions	-	-	1,026	1,277	2,058	**7,776**
Reductions			800	655	5,190	**10,991**
Net change	-	-	226	622	(3,132)	**(3,215)**
Closing stock (31 Dec 2014)	**-**	**-**	**27,820**	**2,102**	**23,191**	**63,507**

3.3.4 Current physical forest cover in National Parks and Wildlife Reserves

National Parks and Wildlife Reserves contribute an important part of Uganda's forest cover. The forest cover in National Parks and Wildlife Reserves decreased by 22 percent from 814,893 ha in 1990 to 635,202 ha in 2015 (Table 3.6). Within these areas, coniferous plantations decreased by 28.3 percent (from 2,273 ha to 1,630 ha), low-stocked THF decreased by 21 percent (from 37,320 ha to 29,584 ha) and woodlands decreased by 37.8 percent (from 584,580 ha to 363,524 ha). In contrast, broadleaved plantations increased by 15.6 times (from 190,678 ha to 239,808 ha) and well-stocked THF increased by 25.8 percent (from 190,678 ha to 239,808 ha).

Table 3.6: Forest land physical asset for National Parks and Wildlife Reserves, 1990 to 2015 (in hectares)

	Broadleaved plantation	Coniferous plantation	THF well-stocked	THF low-stocked	Woodland	**Total**
1990 - 2000						
Opening stock (1 Jan 1990)	42	2,273	190,678	37,320	584,580	**814,893**
Additions	487	110	70,336	3,324	169,892	**244,149**
Reductions	43	1,519	7,241	27,994	301,683	**338,480**
Net change	444	(1,409)	63,095	(24,670)	(131,791)	**(94,331)**
Closing stock (31 Dec 1999)	486	865	253,774	12,648	452,788	**720,561**
2000 – 2005						**-**
Opening stock (1 Jan 2000)	486	865	253,774	12,648	452,788	**720,561**
Additions	62	1,748	20,957	1,586	314,651	**339,004**
Reductions	486	183	24,644	12,426	159,878	**197,617**
Net change	(424)	1,565	(3,687)	(10,840)	154,773	**141,387**
Closing stock (31 Dec 2004)	62	2,430	250,085	1,810	607,559	**861,946**
2005 – 2010						**-**
Opening stock (1 Jan 2005)	62	2,430	250,085	1,810	607,559	**861,946**
Additions	42	312	24,794	25,784	151,364	**202,296**
Reductions	54	1,801	38,132	863	390,984	**431,834**
Net change	(12)	(1,489)	(13,338)	24,921	(239,620)	**(229,538)**
Closing stock (31 Dec 2009)	49	943	236,748	26,732	367,939	**632,411**
2010-2015						**-**
Opening stock (1 Jan 2010)	49	943	236,748	26,732	367,939	**632,411**
Additions	650	760	17,663	16,293	107,224	**142,590**
Reductions	43	72	14,602	13,444	111,639	**139,800**
Net change	607	688	3,061	2,849	(4,415)	**2,790**
Closing stock (31 Dec 2014)	656	1,630	239,808	29,584	363,524	**635,202**

3.3 Physical forest cover on private land

Private forest land was the largest category in the country with an area of 3.3 million ha in 1990. This covers all forest land outside LFRs, CFRs, National Parks and Wildlife Reserves. But by 2015, the forest on private land had decreased by 77 percent to 766,472 ha. 90 percent of this reduction came from loss of woodlands, which accounted for 89 percent of the forest cover in 1990 but decreased in area by 78 percent from 2.96 million ha to 646,518 ha by 2015. The well-stocked THF and low-stocked THF areas also reduced by 80 percent and 77 percent, respectively, from 174,427 ha to 34,529 ha, and from 176,369 ha to 39,981 ha (Table 3.7). Whereas the areas of broadleaved plantations and coniferous plantations increased by 2.7 times and 18 times from 12,039 ha to 32,883 ha, and from 701 ha to 12,561 ha, respectively, their starting basis was too low to compensate for the losses seen in the natural forest covers.

Table 3.7: Forest land physical asset for private land, 1990 to 2015 (in hectares)

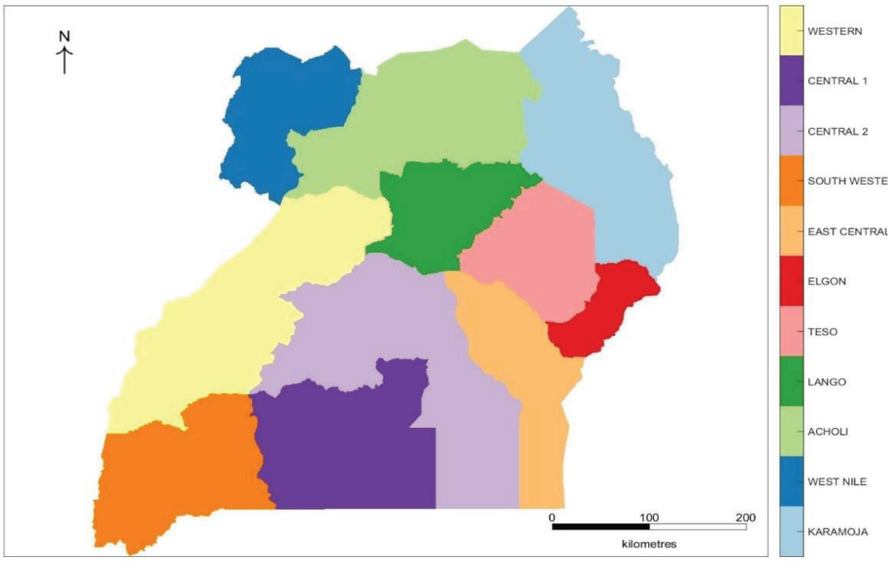
	Broadleaved plantation	Coniferous plantation	THF well-stocked	THF low-stocked	Woodland	**Total**
1990 - 2000						
Opening stock (1 Jan 1990)	12,039	701	174,427	176,369	2,963,988	**3,327,524**
Additions	5,513	979	73,809	131,859	842,093	**1,054,253**
Reductions	11,585	452	101,330	130,101	1,779,207	**2,022,675**
Net change	(6,072)	527	(27,521)	1,758	(937,114)	**(968,422)**
Closing stock (31 Dec 1999)	5,968	1,230	146,910	178,127	2,026,872	**2,359,107**
2000 – 2005						
Opening stock (1 Jan 2000)	5,968	1,230	146,910	178,127	2,026,872	**2,359,107**
Additions	8,742	1,967	27,551	96,092	904,910	**1,039,262**
Reductions	5,182	997	93,657	121,173	1,094,541	**1,315,550**
Net change	3,560	970	(66,106)	(25,081)	(189,631)	**(276,288)**
Closing stock (31 Dec 2004)	9,527	2,201	80,804	153,049	1,837,241	**2,082,822**
2005 – 2010						**-**
Opening stock (1 Jan 2005)	9,527	2,201	80,804	153,049	1,837,241	**2,082,822**
Additions	14,142	6,193	24,463	42,949	435,979	**523,726**
Reductions	8,235	1,923	50,992	129,901	1,428,063	**1,619,114**
Net change	5,907	4,270	(26,529)	(86,952)	(992,084)	**(1,095,388)**
Closing stock (31 Dec 2009)	15,434	6,470	54,275	66,098	845,157	**987,434**
2010-2015						
Opening stock (1 Jan 2010)	15,434	6,470	54,275	66,098	845,157	**987,434**
Additions	26,891	8,387	8,634	23,034	288,441	**355,387**
Reductions	9,441	2,296	28,378	49,153	487,077	**576,345**
Net change	(17,450)	(6,091)	19,744	26,119	198,636	**220,958**
Closing stock (31 Dec 2014)	32,883	12,561	34,529	39,981	646,518	**766,472**
1990 - 2000						
Opening stock (1 Jan 1990)	12,039	701	174,427	176,369	2,963,988	**3,327,524**
Additions	32,071	12,366	16,946	31,700	288,729	**381,812**
Reductions	11,227	506	156,844	168,088	2,606,199	**2,942,864**
Net change	20,844	11,860	(139,898)	(136,388)	(2,317,470)	**(2,561,052)**
Closing stock (31 Dec 1999)	32,883	12,561	34,529	39,981	646,518	**766,472**

3.5 Monetary value of forest land

The value of forest land was estimated for each of Uganda's 11 sub-regions (Figure 3.2) (UBOS/UNHS 2010[4]).

[4] The 11 sub-regions were subdivided further in 2016/17; however, the revisions have not yet been integrated in the National Biomass Surveys.

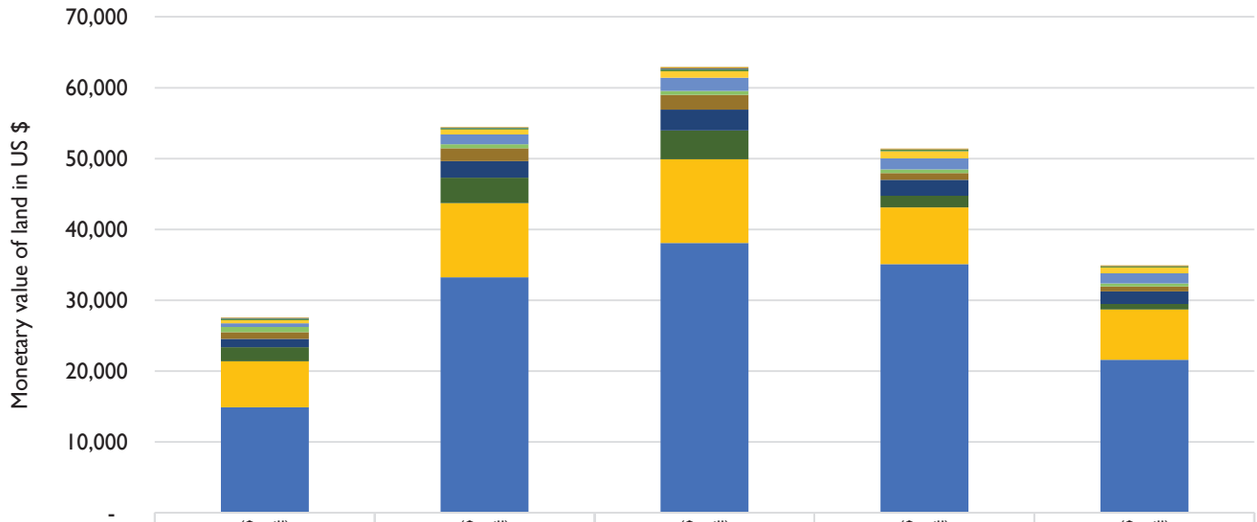
Figure 3.2: Sub-regions of Uganda in 2011



Source: UNHS (2010/2011)

The total monetary value of forest land increased by 26.7 percent between 1990 and 2015, from $27.6 billion to $34.9 billion, despite a 60 percent decline in forest area over the same period. Higher land values were seen between 2000 and 2010 when the US$ to UGX exchange rate was more favourable (World Bank 2018; Tumushabe and Tatwangire 2017). In 2000, the total value of forest land was $54.4 billion, double the equivalent value in 1990. The forest land value peaked at $62.9 billion in 2005, 2.3 times higher than the forest land value in 1990, before tumbling 1.8 times to $34.9 billion in 2015.

Figure 3.3: Total forest land values by sub-region, 1990 to 2015



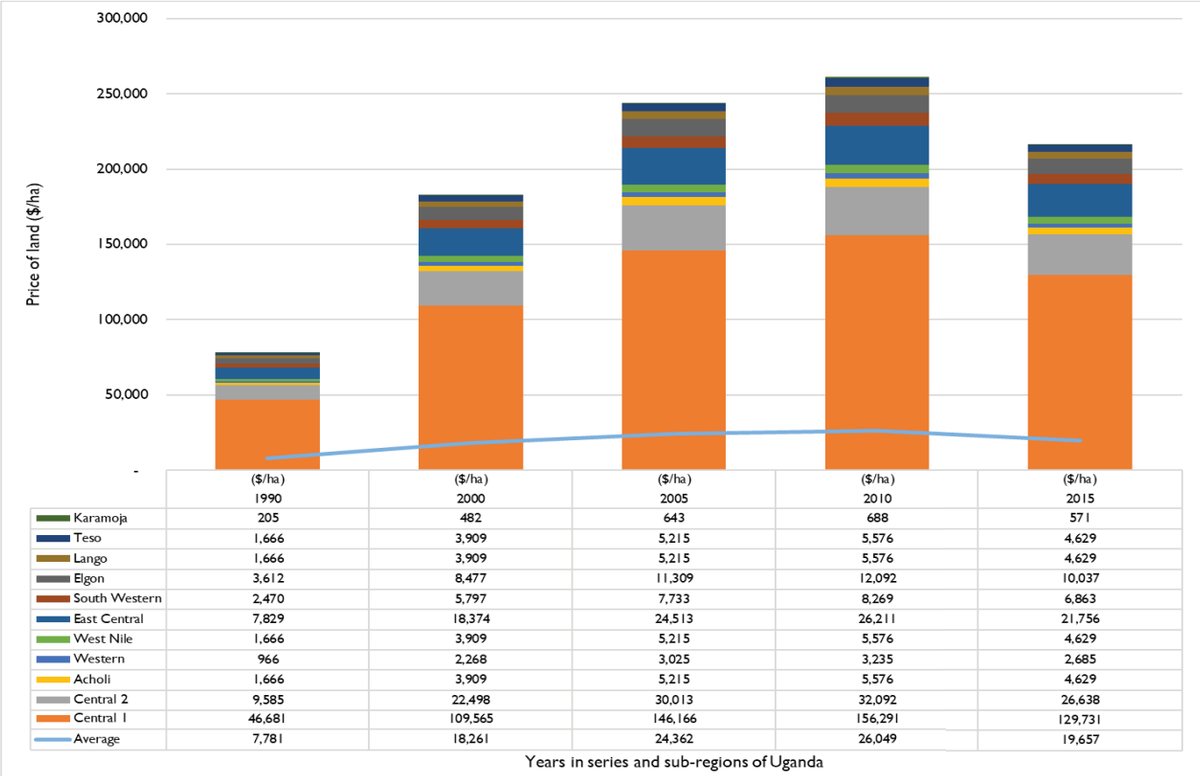
	($ mill)	($ mill)	($ mill)	($ mill)	($ mill)
Karamoja	71	89	249	156	109
Teso	85	56	110	45	29
Lango	230	180	278	205	150
Elgon	422	706	893	980	825
South Western	495	1,395	1,853	1,563	1,429
East Central	755	544	583	520	430
West Nile	943	1,839	2,087	941	683
Western	1,186	2,342	2,940	2,266	1,763
Acholi	1,994	3,584	4,035	1,648	810
Central 2	6,462	10,450	11,831	7,984	7,072
Central 1	14,911	33,255	38,083	35,114	21,615
Total	27,556	54,439	62,941	51,422	34,917

Source: Adapted fromUBOS (2019)

About 54 percent of the forest land value was associated with the Central 1 sub-region, covering Kampala City and the adjacent Wakiso District, while the Central 2 areas of Mukono, Kayunga and Luwero Districts, among others, were associated with 23percent of the value of forest land in 1990 (Figure 3.3). By 2015, Central 1 contributed 61percent of the value of forest land, Central 2 still contributed 23 percent, while the rest of the country's sub-regions accounted for just 16percent.

Whereas the average price of forest land increased by 2.5 times between 1990 and 2015, from $7,800/ha to $19,700/ha, the per ha price of forest land for Central 1 (which was already six times higher than the average price in 1990), increased by 2.8 times to $129,700/ha (Figure 3.4). The pursuit of infrastructure development and large-scale agricultural projects has changed the overall economic landscape. These changes have triggered actual and perceived high returns from land, with increasing demand driving up prices (Tumushabe and Tatwangire 2017). Increasingly, forest land and wood production have to compete with agriculture and infrastructure development. The result is that where competition for land is high and the alternative enterprises are more valuable, especially in the expanding urban areas, forests are being replaced by land uses considered more lucrative.

Figure 3.4: Per-hectare forest land prices by sub-region, 1990 to 2015



	($/ha) 1990	($/ha) 2000	($/ha) 2005	($/ha) 2010	($/ha) 2015
Karamoja	205	482	643	688	571
Teso	1,666	3,909	5,215	5,576	4,629
Lango	1,666	3,909	5,215	5,576	4,629
Elgon	3,612	8,477	11,309	12,092	10,037
South Western	2,470	5,797	7,733	8,269	6,863
East Central	7,829	18,374	24,513	26,211	21,756
West Nile	1,666	3,909	5,215	5,576	4,629
Western	966	2,268	3,025	3,235	2,685
Acholi	1,666	3,909	5,215	5,576	4,629
Central 2	9,585	22,498	30,013	32,092	26,638
Central 1	46,681	109,565	146,166	156,291	129,731
Average	7,781	18,261	24,362	26,049	19,657

Source: Adapted from NFA (2017) and UBOS (2019)

CHAPTER 4: WOOD ASSET ACCOUNTS

4.1 National wood assets

The wood assets for Uganda include both wood inside forests and wood outside forests. By definition, a forest is land with at least 1 ha of a continuous canopy of trees above 4m tall (NFA 2009). Aggregations of trees that do not meet these criteria lie outside a forest. Wood within forests is held in the five forest land cover classes previously described.

Uganda's wood assets can also be aggregated according to the land management system in which they are found, either as forests in protected areas (LFRs, CFRs, National Parks, Wildlife Reserves and DJM zones) or as forests on private land. This differentiation is important for determining whether the wood on the land is available for supply (NFA 2002, 2009; GoU 2001, 2003). Wood available for supply is deemed to include wood in the production zones of CFRs and LFRs, and all the wood on private land; whereas the wood in National Parks, Wildlife Reserves and the conservation, tourism and buffer zones of CFRs and LFRs is not available for supply. In 2016, the GoU aggregated the forest landscapes into seven zones[5] to support the implementation of FLR actions in the country (MWE and IUCN 2016). Disaggregation of wood stocks for these FLR zones is described further in Annexes 1 and 2.

4.2 National wood stock

4.2.1 National aggregate wood stock

The national aggregate wood stock for Uganda reduced by 45 percent between 1990 and 2015, from 355.5 million tonnes to 197.1 million tonnes (Figure 4.1 and Table 4.1). The situation was initially quite stable, with a 4 percent *increase* in total wood stock between 1990 and 2000. A significant decline then occurred between 2000 and 2005, when the wood stock reduced by 43percent, from 368.4 million tonnes to 211.5 million tonnes. This coincided with sector reforms that saw the National Forestry Policy (1988) replaced by the Uganda Forestry Policy (2001), and the Forest Act, Cap. 246 and the Timber (Export) Act, Cap. 247 replaced by the National Forestry and Tree Planting Act (2003). A centralised system of forest management under the former Forest Department was replaced with a decentralised system in which the NFA retained responsibility only for CFRs, which were 15 percent of the forest estate in 2002, while UWA continued to manage the National Parks and Wildlife Reserves (equivalent to 15percent of the forest estate). 70percent of the forest estate was left in the hands of private individuals, community structure and other government agencies, with technical support from Local Governments[6] (MWLE/FD 2002).

Compounding these reforms was the failure to regulate wood production, especially for wood stock outside CFRs, National Parks and Wildlife Reserves, and in CFRs located in remote areas. A study on forest land conversion in central Uganda found that deforestation of Forest Reserves occurs in phases, initially involving encroachers who harvest the large trees for timber, then moving to poles and charcoal when the timber is exhausted (CARE 2015). As the number of standing trees reduces, nearby communities may harvest poles and firewood for their own use, and to produce charcoal for sale. Some of the land is then converted into farmlands and the rest remains a mix of bushland, grassland and regenerating forest.

Between 2005 and 2010, the wood stock stabilised somewhat, with national aggregate stock increasing by 3.0percent, before further declining by 9.5percent from 2010 to 2015.

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[5] FLR zones were created in 2016 as part of Uganda's efforts to restore 2.5 million ha under AFR100 and the Bonn Challenge.

[6] Local Governments also retained LFRs, which accounted for less than 0.5percent of the national forest cover.

Figure 4.1: National aggregate wood stock for Uganda, 1990 to 2015

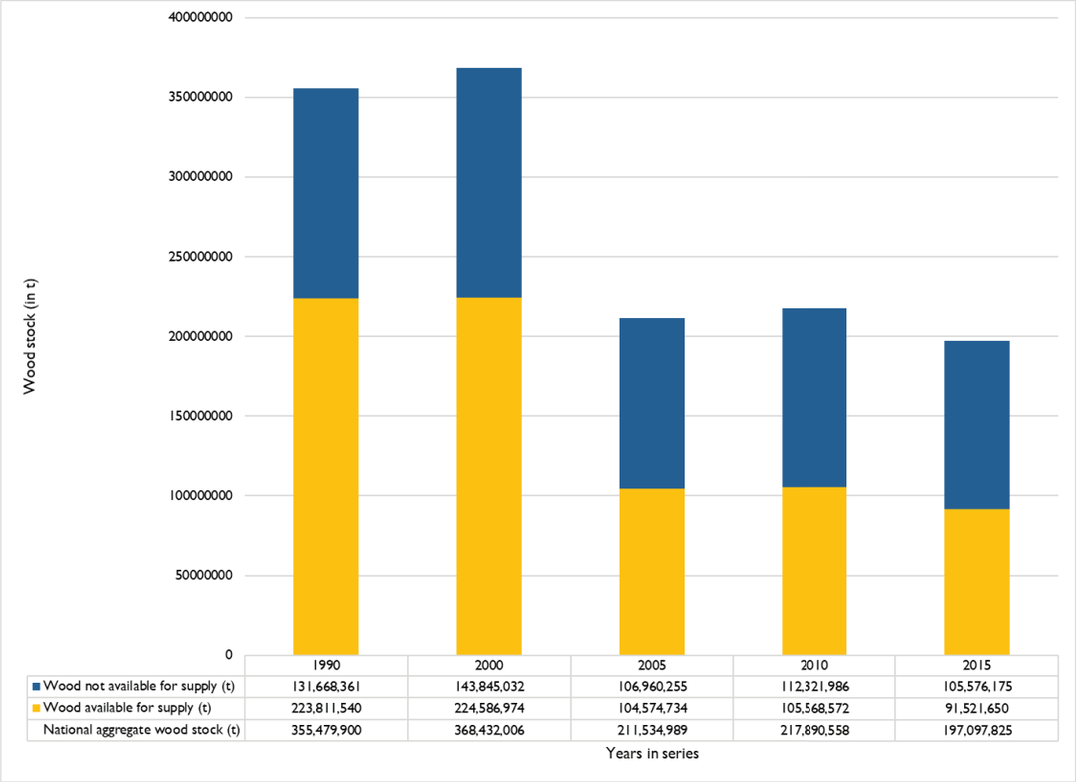


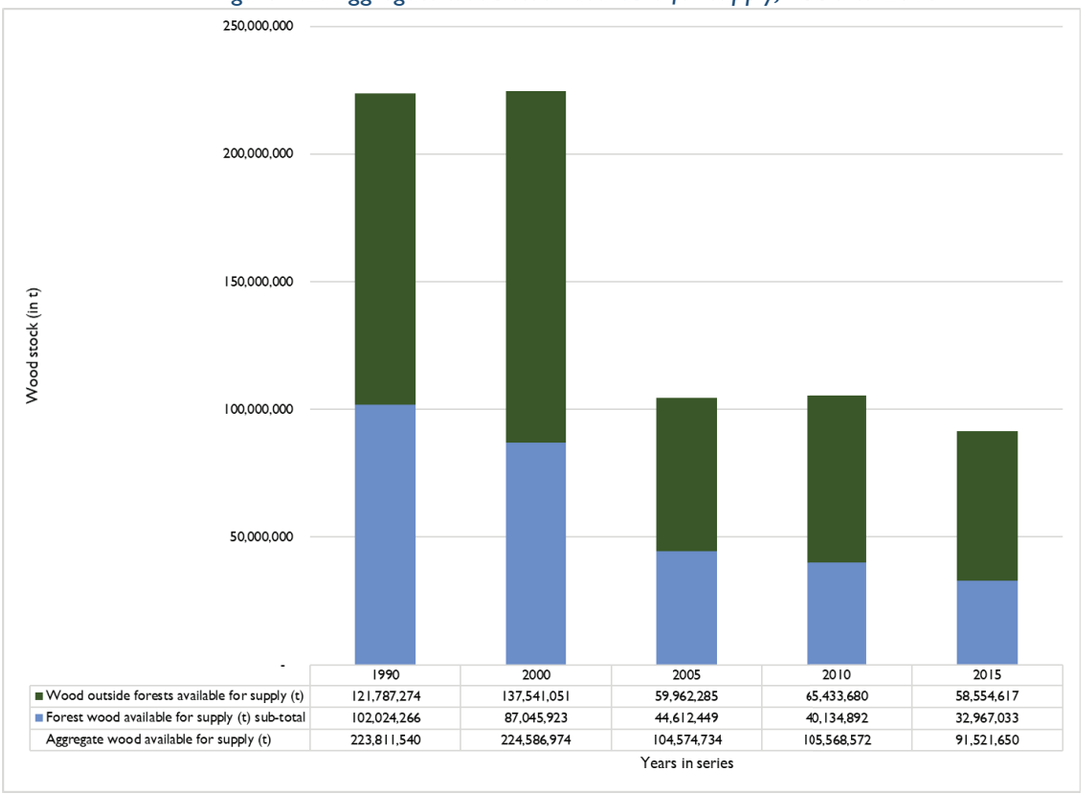
Table 4.1: National aggregate wood stock account

	Wood available for supply (t)				Wood not available for supply (t)			National aggregate wood stock (t)
	Plantations	Natural wood (in forests)	All wood (outside forests)	Total	Natural wood (in forests)	All wood (outside forests)	Total	
1990-2000								
Opening stock	975,732	46,223,311	121,787,274	168,986,317	111,025,426	20,642,935	131,668,361	355,479,900
Additions	210,729	5,367,422	32,511,878	38,090,029	9,177,500	10,219,026	19,396,526	72,623,028
Reductions	389,656	2,341,006	32,511,878	35,242,540	9,071,255	10,219,026	19,290,280	72,623,028
Net change	(178,928)	3,026,417	0	2,847,489	106,246	0	106,246	0
Closing stock	729,313	35,734,445	137,541,051	174,004,809	119,990,550	23,854,482	143,845,032	368,432,006
Net change to other lands	(425,346)	(7,462,450)	15,753,777	7,865,981	9,071,369	3,211,547	12,282,917	12,952,106
2000-2005		-	-	-	-	-	-	-
Opening stock	729,313	35,734,445	137,541,051	174,004,809	119,990,550	23,854,482	143,845,032	368,432,006
Additions	445,066	9,401,691	35,179,744	45,026,501	10,938,347	12,917,365	23,855,712	78,223,727
Reductions	178,230	864,294	35,179,744	36,222,268	11,097,505	12,917,365	24,014,870	78,223,727
Net change	266,837	8,537,396	0	8,804,233	(159,158)	0	(159,158)	0
Closing stock	857,990	13,530,783	59,962,285	74,351,058	95,558,458	11,401,796	106,960,255	211,534,989
Net change to other lands	395,513	(13,666,265)	(77,578,766)	(90,849,518)	(24,591,250)	(12,452,685)	(37,043,936)	(156,897,017)
2005-2010	-	-	-	-	-	-	-	-
Opening stock	857,990	13,530,783	59,962,285	74,351,058	95,558,458	11,401,796	106,960,255	211,534,989
Additions	477,740	3,593,288	27,708,077	31,779,105	9,701,956	5,137,382	14,839,338	50,766,052
Reductions	227,812	751,833	27,708,077	28,687,722	9,826,879	5,137,382	14,964,261	50,766,052
Net change	249,928	2,841,454	0	3,091,383	(124,923)	0	(124,923)	0
Closing stock	2,268,727	11,428,025	65,433,680	79,130,431	98,083,967	14,238,020	112,321,986	217,890,558
Net change to other lands	1,660,665	738,696	5,471,395	7,870,756	2,400,586	2,836,223	5,236,809	6,355,569
2010-2015	-	-	-	-	-	-	-	-
Opening stock	2,268,727	11,428,025	65,433,680	79,130,431	98,083,967	14,238,020	112,321,986	217,890,558
Additions	892,414	1,223,801	26,547,101	28,663,316	5,979,324	5,069,974	11,049,298	42,776,169
Reductions	204,583	281,179	26,547,101	27,032,862	6,214,035	5,069,974	11,284,009	42,776,169
Net change	687,831	942,623	0	1,630,454	(234,712)	(0)	(234,712)	0
Closing stock	1,735,198	8,843,086	58,554,617	69,132,900	91,372,245	14,203,930	105,576,175	197,097,825
Net change to other lands	154,302	(1,642,316)	(6,879,063)	(8,367,077)	(6,946,433)	(34,089)	(6,980,523)	(20,792,733)

4.2.2 National wood stock available for supply

The national wood stock available for supply contracted by 59 percent, from 223.8 million tonnes in 1990 to 91.5 million tonnes in 2015 (Figure 4.2 and Table 4.2). As expected, the largest 53 percent decline in aggregate wood available for supply coincided with the largest decline in aggregate wood stock between 2000 and 2005 (section 4.2.1). There were 86 percent of wood stock outside forests (equivalent to 121.8 million tonnes out of 142.4 million tonnes) available for supply in 1990, and this reduced to 64 percent by 2015, while the percentage of the wood stock inside forests available for supply reduced from 48 percent to 26 percent over the same period. The contribution of wood stock outside forests to wood available for supply increased from 54 percent to 64 percent, with a commensurate reduction in the contribution of wood stock from within forests.

Figure 4.2: Aggregate wood stock available for supply, 1990 to 2015



	1990	2000	2005	2010	2015
Wood outside forests available for supply (t)	121,787,274	137,541,051	59,962,285	65,433,680	58,554,617
Forest wood available for supply (t) sub-total	102,024,266	87,045,923	44,612,449	40,134,892	32,967,033
Aggregate wood available for supply (t)	223,811,540	224,586,974	104,574,734	105,568,572	91,521,650

The decline in the available supply of wood from forests reflects both a reduction in the area of forest, reduced stocking, and the fact that a higher proportion of the remaining forest cover is set aside for wildlife habitat, biodiversity conservation and tourism, leaving a smaller proportion available for wood production (MWE 2016).

Given the changes in forest administration brought about by the National Forestry and Tree Planting Act (2003), most of the wood stock available for supply now lies outside forests and on private land. The NFA has traditionally dominated the timber supply chain, but a combination of private concessions for plantations in CFRs and fuelwood production on private land, indicates an increasing, and perhaps dominant, role for the private sector in wood supply in the near future.

Table 4.2: Wood stock account: Wood available for supply

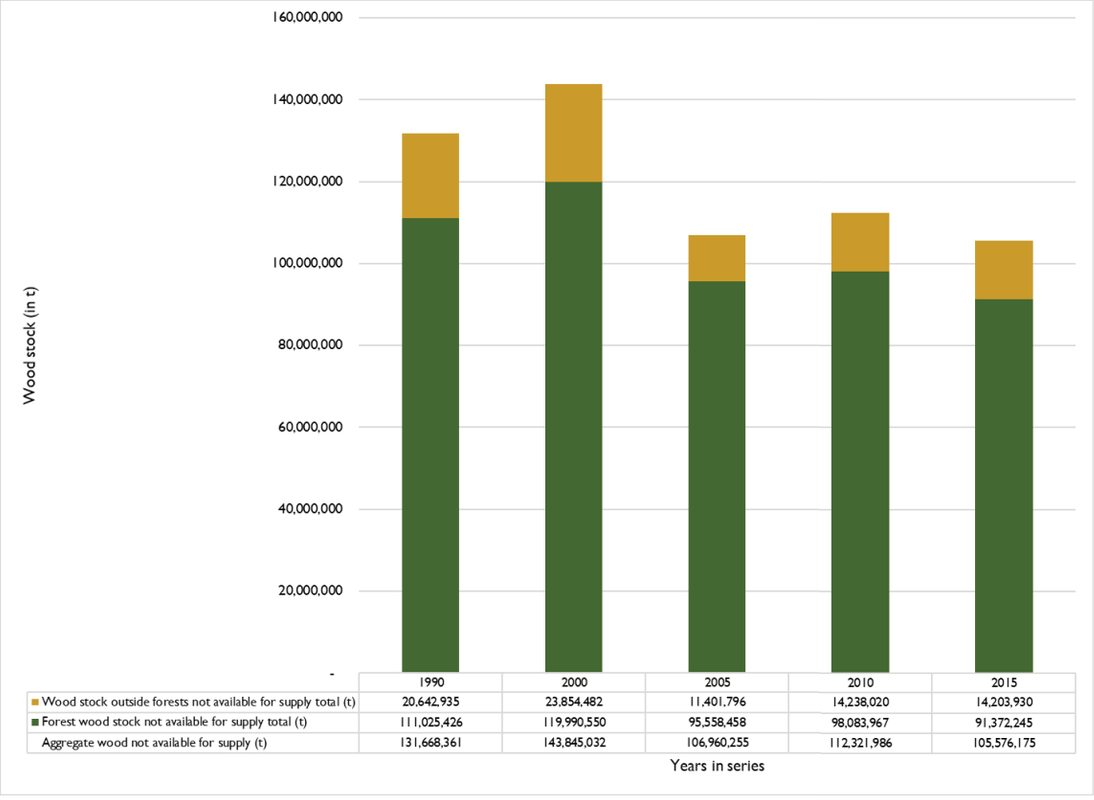
	Forest wood Available for Supply (t)						Wood outside forests available for supply (t)								Aggregate wood available for supply (t)
	Plantations		Natural wood				Wood available for supply (t)								
	Broadleaved	Coniferous	THF well-stocked	THF low-stocked	Woodlands	Sub-total	Bushlands	Grasslands	Wetlands	Small-scale farmlands	Commercial farmlands	Built-up areas	Impediments	Sub-total	
1990-2000															
Opening stock	345,316	630,416	44,902,891	9,922,331	46,223,311	102,024,266	9,248,456	26,170,486	178,897	85,236,340	219,415	733,681	-	121,787,274	223,811,540
Additions	116,960	93,768	3,641,104	11,495,369	5,367,422	20,714,624	14,021,214	4,845,284	3,254,622	9,764,655	503,823	118,698	3,583	32,511,878	53,226,503
Reductions	193,630	196,026	12,855,463	5,234,745	2,341,006	20,820,870	4,502,676	18,157,131	30,172	9,296,434	68,564	456,902	-	32,511,878	53,332,748
Net change	(76,669)	(102,258)	(9,214,359)	6,260,625	3,026,417	(106,246)	9,518,538	(13,311,847)	3,224,450	468,220	435,259	(338,203)	3,583	0	(106,246)
Closing stock	269,265	460,049	41,311,585	9,270,579	35,734,445	87,045,923	32,495,453	12,878,694	343,726	90,940,929	330,698	551,551	-	137,541,051	224,586,974
Net change to other lands	39,403	(14,519)	5,623,053	(6,912,377)	(13,515,283)	(14,779,723)	(13,728,459)	(20,055)	3,059,621	(5,236,368)	323,975	(156,074)	3,583	(15,753,777)	(30,533,500)
2000-2005															
Opening stock	269,265	460,049	41,311,585	9,270,579	35,734,445	87,045,923	32,495,453	12,878,694	343,726	90,940,929	330,698	551,551	-	137,541,051	224,586,974
Additions	143,854	301,212	938,939	8,402,574	9,401,691	19,188,270	6,766,115	15,946,754	1,664,868	9,578,891	398,074	786,371	38,672	35,179,744	54,368,015
Reductions	126,710	51,520	14,321,988	3,664,600	864,294	19,029,112	17,985,095	5,404,967	109,578	11,411,454	125,111	143,540	-	35,179,744	54,208,857
Net change	17,144	249,693	(13,383,049)	4,737,974	8,537,396	159,158	(11,218,981)	10,541,787	1,555,290	(1,832,563)	272,963	642,831	38,672	0	159,158
Closing stock	364,388	493,602	24,893,744	5,329,932	13,530,783	44,612,449	18,446,437	13,864,775	158,431	25,843,143	248,005	1,401,495	-	59,962,285	104,574,734
Net change to other lands	77,980	(216,140)	(3,034,793)	(8,678,621)	(30,741,058)	(42,592,632)	2,830,036	9,555,707	1,740,585	63,265,223	355,657	(207,112)	38,672	77,578,766	34,986,134
2005-2010															
Opening stock	364,388	493,602	24,893,744	5,329,932	13,530,783	44,612,449	18,446,437	13,864,775	158,431	25,843,143	248,005	1,401,495	-	59,962,285	104,574,734
Additions	163,641	314,099	1,437,526	2,710,083	3,593,288	8,218,637	6,316,726	13,587,113	1,588,095	5,279,888	495,167	399,856	41,233	27,708,077	35,926,714
Reductions	165,065	62,747	4,126,799	2,987,270	751,833	8,093,714	11,270,414	5,407,991	42,820	10,559,770	35,908	391,174	-	27,708,077	35,801,791
Net change	(1,424)	251,353	(2,689,273)	(277,187)	2,841,454	124,923	(4,953,688)	8,179,122	1,545,275	(5,279,882)	459,259	8,682	41,233	0	124,923
Closing stock	821,032	1,447,695	23,667,462	2,770,678	11,428,025	40,134,892	20,188,769	19,999,798	190,733	22,737,283	398,441	1,918,656	-	65,433,680	105,568,572
Net change to other lands	458,068	702,740	1,462,991	(2,282,067)	(4,944,213)	(4,602,480)	(6,696,021)	2,044,098	1,512,972	(2,174,022)	308,823	(508,479)	41,233	(5,471,395)	(10,073,875)
2010-2015															
Opening stock	821,032	1,447,695	23,667,462	2,770,678	11,428,025	40,134,892	20,188,769	19,999,798	190,733	22,737,283	398,441	1,918,656	-	65,433,680	105,568,572
Additions	759,186	133,228	319,549	2,744,006	1,223,801	5,179,770	3,096,196	8,998,870	593,126	12,784,686	820,110	237,462	16,649	26,547,101	31,726,871
Reductions	115,022	89,561	3,435,247	1,024,050	281,179	4,945,059	13,403,078	7,954,601	64,397	4,420,668	86,669	617,687	-	26,547,101	31,492,159
Net change	644,164	43,667	(3,115,698)	1,719,956	942,623	234,712	(10,306,882)	1,044,270	528,730	8,364,018	733,441	(380,225)	16,649	0	234,712
Closing stock	764,319	970,879	18,993,387	3,395,362	8,843,086	32,967,033	8,439,109	17,181,862	881,450	29,798,502	719,984	1,512,513	21,198	58,554,617	91,521,650
Net change to other lands	(700,877)	(520,483)	(1,558,377)	(1,095,272)	(3,527,562)	(7,402,571)	1,442,778	3,862,205	(161,987)	1,302,799	411,898	25,918	(4,548)	6,879,063	(523,508)

4.2.3 National wood stock not available for supply

The stock of wood not available for supply was relatively stable between 1990 and 2015, in comparison with the large reduction recorded in wood available for supply, and decreased by 20 percent from 131.7 million tonnes to 105.6 million tonnes. In 1990, only 16 percent of wood not available for supply was outside forests. This had increased to 87 percent by 2015, with the remaining 13 percent on lands outside forests (Figure 4.3 and Table 4.3).

Showing a similar trend to the aggregate wood stock, the total wood not available for supply initially increased by 9 percent between 1990 and 2000. Between 2000 and 2005, it saw its largest decline of 26 percent, from 143.8 million tonnes to 107.0 million tonnes. It then increased by 5 percent between 2005 and 2010, before a further 6 percent decline between 2010 and 2015.

Figure 4.3: Aggregate wood stock not available for supply, 1990 to 2015



	1990	2000	2005	2010	2015
Wood stock outside forests not available for supply total (t)	20,642,935	23,854,482	11,401,796	14,238,020	14,203,930
Forest wood stock not available for supply total (t)	111,025,426	119,990,550	95,558,458	98,083,967	91,372,245
Aggregate wood not available for supply (t)	131,668,361	143,845,032	106,960,255	112,321,986	105,576,175

As would be expected, wood stocks not available for supply within forests saw less decline than the equivalent wood stocks outside forests, particularly within protected area forests. The low proportion of wood stock not available for supply is associated with relatively high availability of wood for supply on private land, as well as the loss of 77 percent of its forest cover between 1990 and 2015, On the other hand, in additional to having relatively larger areas zoned as not available for production, CFRs lost only 32percent of their forest cover and National Parks and Wildlife Reserves lost 20percent of their forest cover. The large decline in forest cover on private land was likely associated with forest conversion to agriculture and settlements, due to the opportunity cost of different land uses. Uganda's high population growth rate of 3.2percent/year between 2000 and 2012 (UBOS 2014) led to a high demand for land for agriculture, which is the main livelihood in the country, as well as increased demand for biomass energy (NFA 2009 and Galabuzi et al. 2015).

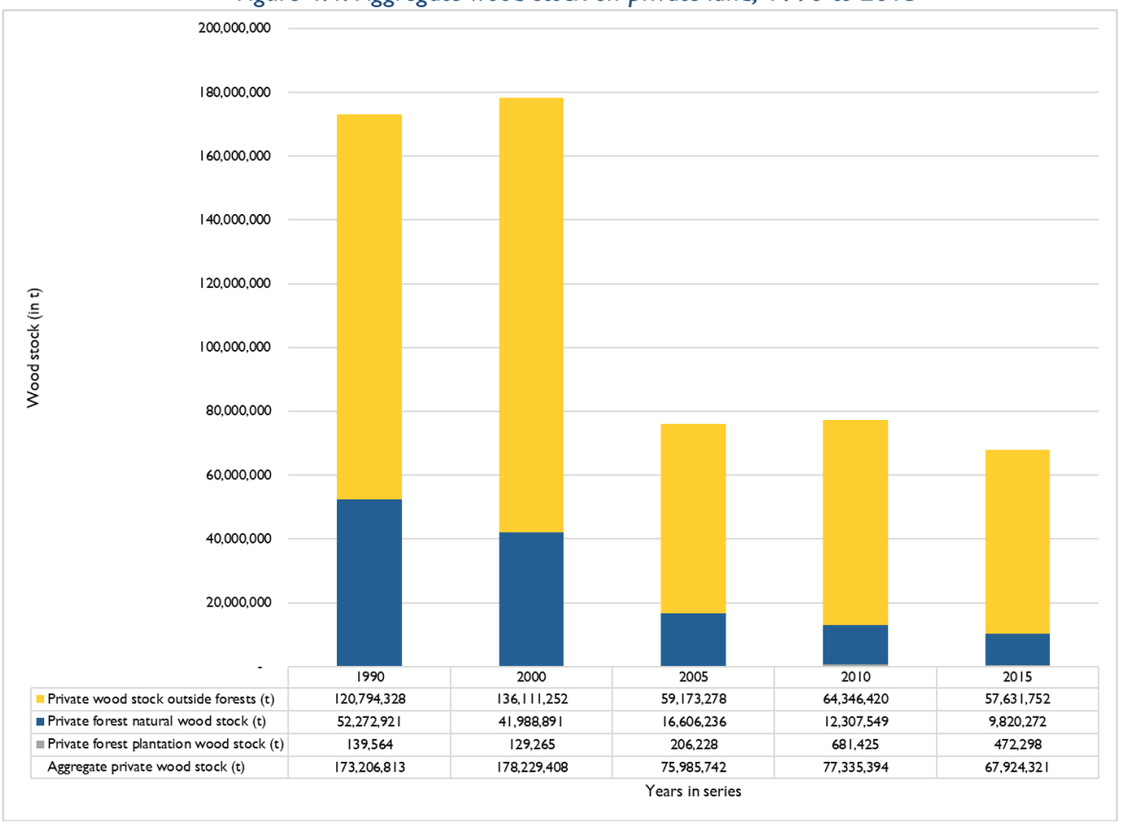
Table 4.3: Wood stock account: Wood not available for supply

	Forest wood stock not available for supply (t)				Wood stock outside forests not available for supply (t)								Aggregate wood not available for supply (t)
	THF well-stocked	THF low-stocked	Woodlands	Sub-total	Bushlands	Grasslands	Wetlands	Small-scale farmlands	Commercial farmlands	Built-up area	Impediments	Sub-total	
1990-2000													
Opening stock	87,011,648	5,600,678	18,413,100	111,025,426	7,492,008	10,973,836	18,577	2,071,714	2,533	84,268	0	20,642,935	131,668,361
Additions	4,943,979	1,986,560	2,246,961	9,177,500	6,194,264	3,327,576	114,474	562,619	11,824	8,097	170	10,219,026	19,396,526
Reductions	3,219,181	3,878,879	1,973,194	9,071,255	3,008,277	5,967,232	8,431	1,170,835	1,164	63,087	0	10,219,026	19,290,280
Net change	1,724,798	-1,892,320	273,767	106,246	3,185,987	-2,639,655	106,043	-608,216	10,660	-54,990	170	0	106,246
Closing stock	100,585,720	2,483,454	16,921,376	119,990,550	14,918,736	6,971,267	19,539	1,804,921	8,343	39,281	92,394	23,854,482	143,845,032
Net change to other lands	11,849,274	-1,224,904	-1,765,492	8,858,878	-4,240,741	1,362,913	105,081	-341,423	4,850	-10,004	-92,224	-3,211,547	5,647,331
2000-2005													
Opening stock	100,585,720	2,483,454	16,921,376	119,990,550	14,918,736	6,971,267	19,539	1,804,921	8,343	39,281	92,394	23,854,482	143,845,032
Additions	1,226,418	3,726,529	5,985,400	10,938,347	1,636,475	9,496,761	178,901	1,486,394	20,824	86,114	11,896	12,917,365	23,855,712
Reductions	8,513,804	1,836,827	746,874	11,097,505	10,063,052	2,213,389	7,124	526,139	3,187	12,532	91,941	12,917,365	24,014,870
Net change	-7,287,386	1,889,702	5,238,526	-159,158	-8,426,577	7,283,372	171,777	960,255	17,637	73,582	-80,046	0	-159,158
Closing stock	81,231,268	1,994,793	12,332,397	95,558,458	4,657,553	4,945,118	18,766	1,695,999	8,096	76,265	0	11,401,796	106,960,255
Net change to other lands	-12,067,065	-2,378,363	-9,827,506	-24,272,934	1,834,606	9,309,522	172,550	1,069,176	17,885	36,598	12,349	12,452,685	-11,820,248
2005-2010													
Opening stock	81,231,268	1,994,793	12,332,397	95,558,458	4,657,553	4,945,118	18,766	1,695,999	8,096	76,265	0	11,401,796	106,960,255
Additions	1,999,449	2,890,513	4,811,995	9,701,956	1,900,096	2,232,589	140,327	795,802	21,185	12,438	34,945	5,137,382	14,839,338
Reductions	7,111,106	1,501,285	1,214,488	9,826,879	2,267,728	2,157,155	3,023	684,107	3,164	22,204	0	5,137,382	14,964,261
Net change	-5,111,657	1,389,228	3,597,506	-124,923	-367,633	75,434	137,304	111,695	18,021	-9,767	34,945	0	-124,923
Closing stock	82,288,659	2,536,705	13,258,603	98,083,967	6,825,478	5,113,105	23,633	2,176,100	12,323	87,380	0	14,238,020	112,321,986
Net change to other lands	6,169,048	-847,317	-2,671,300	2,650,431	-2,535,558	-92,553	132,436	-368,405	13,794	-20,882	34,945	-2,836,223	-185,792
2010-2015													
Opening stock	82,288,659	2,536,705	13,258,603	98,083,967	6,825,478	5,113,105	23,633	2,176,100	12,323	87,380	0	14,238,020	112,321,986
Additions	929,889	3,497,161	1,552,274	5,979,324	716,801	3,530,789	91,687	632,786	74,373	16,634	6,904	5,069,974	11,049,298
Reductions	4,532,667	1,207,156	474,212	6,214,035	3,327,871	778,428	4,594	919,911	4,741	34,429	0	5,069,974	11,284,009
Net change	-3,602,777	2,290,004	1,078,061	-234,712	-2,611,070	2,752,361	87,092	-287,124	69,632	-17,795	6,904	0	-234,712
Closing stock	76,866,104	3,954,902	10,551,239	91,372,245	4,228,249	7,752,621	184,529	1,874,440	32,626	116,100	15,365	14,203,930	105,576,175
Net change to other lands	-1,819,778	-871,807	-3,785,425	-6,477,010	-13,841	112,845	-73,803	14,536	49,329	-46,514	-8,461	34,089	-6,442,921

4.2.4 Wood stock on private land

The wood stock on private land reduced by 61percent, from 173.2 million tonnes in 1990 to 67.9 million tonnes in 2015. This accounted for 66 percent of the total reduction in national aggregate wood stock over the same period (Table 4.1 and Figure 4.4). As a result, the wood stock on private land represented only 40 percent of the national aggregate stock by 2015, down from 50percent of the national stock in 1990. The large contribution of losses on private lands to the reduction in national aggregate wood stock is corroborated by the National Biomass Survey (NFA 2009), which indicates that most of the forest wood stock losses between 2000 and 2005 were due to deforestation and degradation on private land.

Figure 4.4: Aggregate wood stock on private land, 1990 to 2015



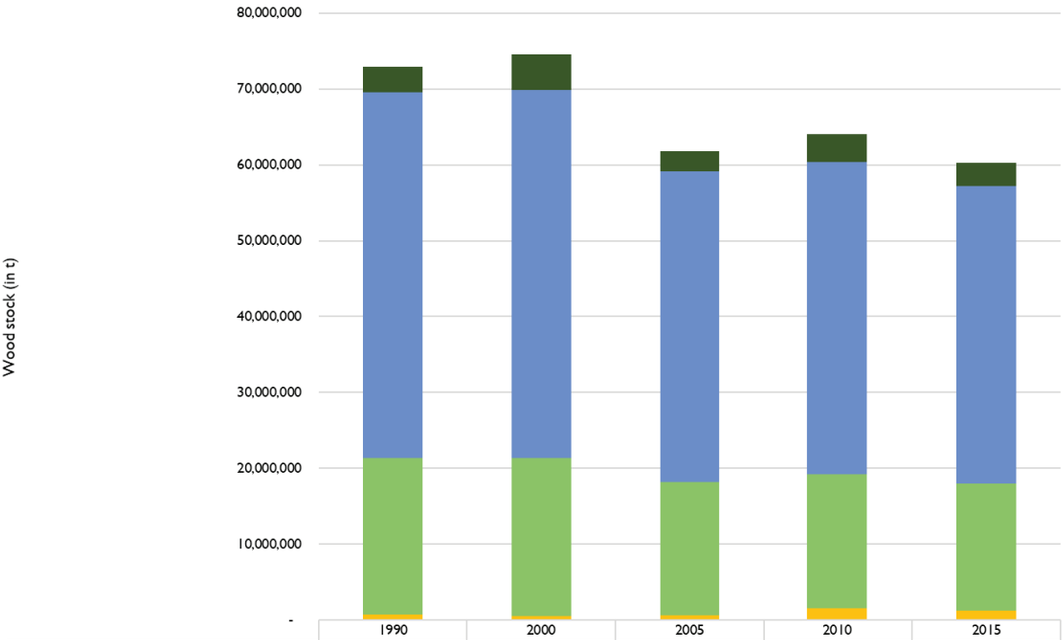
	1990	2000	2005	2010	2015
Private wood stock outside forests (t)	120,794,328	136,111,252	59,173,278	64,346,420	57,631,752
Private forest natural wood stock (t)	52,272,921	41,988,891	16,606,236	12,307,549	9,820,272
Private forest plantation wood stock (t)	139,564	129,265	206,228	681,425	472,298
Aggregate private wood stock (t)	173,206,813	178,229,408	75,985,742	77,335,394	67,924,321

The data reveal an increase of 332,734 tonnes in wood stock in forest plantations on private lands between 1990 and 2015, but this is still a tiny fraction of the total wood stocks on private land, and hugely outsized by the 105.6 million tonnes loss of wood stock that took place within and outside forests on private land. The quantity of wood stock in plantations would have needed to be at least 10 times higher than it was in 2015 to have replaced just 30 percent of the wood stock that was lost from natural wood on private lands over the preceding 25 years.

4.2.5 Wood stock in Central and Local Forest Reserves

The total wood stock in CFRs and LFRs was 15percent of the national aggregate wood stock in 1990. This rose to 23percent of the national aggregate by 2015, but the actual wood stock in CFRs and LFRs declined by 17percent, from 52.2 million tonnes to 43.5 million tonnes. Following a similar trend to the wood stocks on private land, the wood stock in CFRs and LFRs reduced particularly steeply between 2000 and 2005 (by 18percent). Stocking was more stable thereafter, with a 5 percent increase between 2005 and 2010, followed by a 9 percent decline between 2010 and 2015 (Figure 4.5).

Figure 4.5: Aggregate wood stock in CFRs and LFRs, 1990 to 2015



	1990	2000	2005	2010	2015
Wood stock outside forests in CFRs and LFRs (t)	3,309,820	4,765,996	2,630,023	3,624,200	3,076,218
Natural wood not available for harvest (t)	48,208,397	48,513,489	40,977,435	41,193,752	39,222,337
Natural wood available for harvest (t)	20,660,742	20,791,495	17,561,758	17,654,465	16,809,573
Plantation wood available for harvest (t)	730,612	550,755	602,327	1,549,502	1,203,968
Aggregate wood stock in CFRs & LFRs (t)	52,248,829	53,830,240	44,209,785	46,367,454	43,502,523

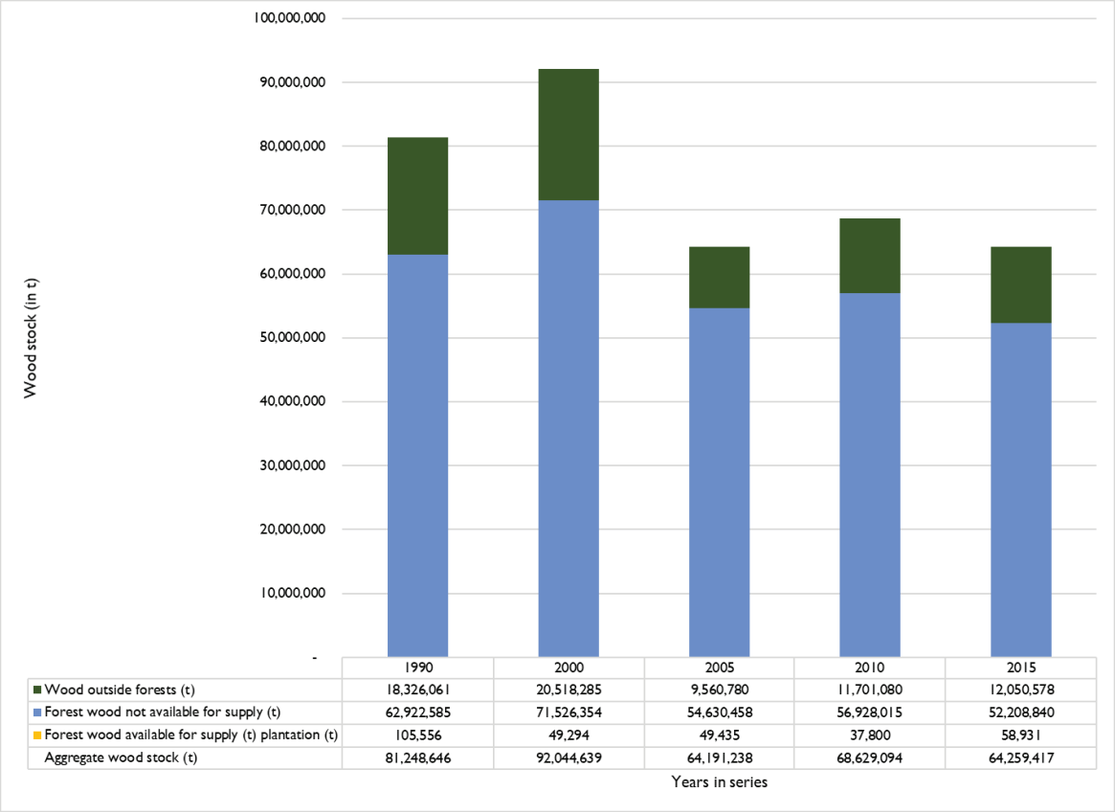
Years in series

The 8.7 million tonnes decline in the wood stock in CFRs and LFRs accounted for 6 percent of the total reduction in national aggregate wood stock. The Forestry Policy and National Forestry and Tree Planting Act (2003) strengthened the management arm for CFRs under the NFA, at the expense of forests and wood on private land. Significantly more emphasis was placed on managing and protecting the 23 percent of the country's wood stocks that lie in protected areas, than on the 40 percent that was still found on private lands in 2015.

4.2.6 Wood stock in National Parks and Wildlife Reserves

National Parks and Wildlife Reserves accounted for 23 percent of the national aggregate wood stock in 1990 (81.2 million tonnes), rising to 36 percent (64.3 million tonnes) in 2015, making it the second-largest contribution to the national total after the 40 percent on private lands (Figure 4.6). Wood stock in National Parks and Wildlife Reserves initially increased by 13 percent, from 81.2 million tonnes in 1990 to 92.0 million tonnes in 2000. In the same way as private land and in CFRs and LFRs, it then decreased significantly between 2000 and 2005, showing a 30 percent fall (from 92.0 million tonnes to 64.2 million tonnes). After a 7 percent increase from 2005 and 2010, it then fell again by 6 percent from 2010 to 2015.

Figure 4.6: Aggregate wood stock in National Parks and Wildlife Reserves, 1990 to 2015



	1990	2000	2005	2010	2015
Wood outside forests (t)	18,326,061	20,518,285	9,560,780	11,701,080	12,050,578
Forest wood not available for supply (t)	62,922,585	71,526,354	54,630,458	56,928,015	52,208,840
Forest wood available for supply (t) plantation (t)	105,556	49,294	49,435	37,800	58,931
Aggregate wood stock (t)	81,248,646	92,044,639	64,191,238	68,629,094	64,259,417

There are exceptional cases where plantation wood is produced in National Parks and Wildlife Reserves. One of these is million tonnes. Elgon National Park, which was only created in 1993 from million tonnes. Elgon Forest Reserve. The Forest Reserve had a section under plantation which has been maintained as a buffer with community farmlands and to boost the relatively low tourism revenue from the National Park (UWA Manager Research Pers. Comm. 2019). There are cases when plantation trees that were previously planted as buffers are harvested and the wood disposed of through auction. For example the routine removal of plantation trees from Semuliki National Park. The natural wood is maintained for forage, habitat and wildlife conservation (USAID EMOS 2015).

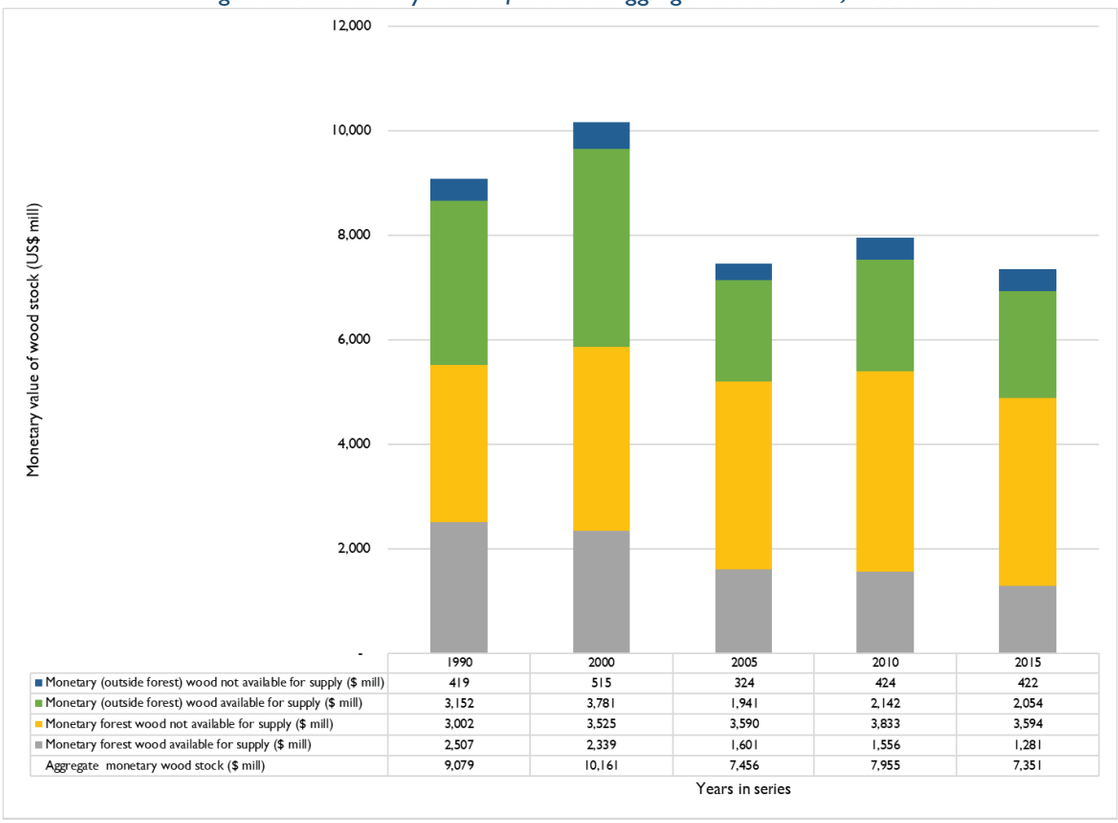
4.3 National wood stock in monetary terms

The aggregate monetary value of wood stock reduced by 19 percent, from $9.1 billion in 1990 to $7.4 billion in 2015. Between 1990 and 2000, wood available for supply outside forests made the largest contribution to the monetary value of total wood stock in the country (at 35 percent). However, this wood stock available for supply outside forests dropped by 56 percent between 2000 and 2005, from 137.5 million tonnes to 60.0 million tonnes (Figure 4.7), resulting in a 49 percent reduction in monetary value from $3.8 billion to $1.9 billion. As a result, the monetary value contributed by wood available for supply outside forests was overtaken by that from forest wood not available for supply – despite that fact this stock of forest wood not available for supply itself fell by 20 percent, from 120.0 million tonnes to 95.6 million tonnes. Both wood stock available for supply and wood stock not available for supply are valued at farm gate/stumpage wood prices. The wood not available for supply is valued at stumpage prices that represent its opportunity cost, i.e., the alternative use if the wood was not available for supply. Wood stock prices increased by 27 percent between 1990 and 2015, and this increase outweighed the decrease in wood stock (Figure 4.7). Consequently, from 2005 to 2015, forest wood stock not available for supply contributed the largest proportion of the monetary value of wood.

Compared to the wood available for supply, the stock of wood not available for supply was relatively stable, particularly in protected areas of CFR, LFRs and National Parks and Wildlife Reserves. There was a greater decline in the wood stock on private lands, where more wood was available for supply. The stability of wood stocks not available for supply is assured by conservation efforts in National Parks, Wildlife Reserves and CFRs.

The monetary value of forest wood stock available for supply halved from $2.5 billion in 1990 to $1.3 billion in 2015. But the contribution to the total monetary value reduced by a relatively smaller margin, from 28percent to 17percent, as the aggregate monetary value of the wood decreased.

Figure 4.7: Monetary value of national aggregate wood stock, 1990 to 2015



	1990	2000	2005	2010	2015
Monetary (outside forest) wood not available for supply ($ mill)	419	515	324	424	422
Monetary (outside forest) wood available for supply ($ mill)	3,152	3,781	1,941	2,142	2,054
Monetary forest wood not available for supply ($ mill)	3,002	3,525	3,590	3,833	3,594
Monetary forest wood available for supply ($ mill)	2,507	2,339	1,601	1,556	1,281
Aggregate monetary wood stock ($ mill)	9,079	10,161	7,456	7,955	7,351

Table 4.4: Monetary accounts for wood stock

	Monetary value of forests wood stock ($ mill)					Monetary value of wood stock outside Forests ($ mill)			Aggregate monetary wood stock value ($ mill)
	Wood available for supply			Wood not available for supply	Total	Wood available for supply	Wood not available for supply	Total	
	Plantations	Natural wood	Total	Natural wood					
1990-2000									
Opening stock	48	2,459	2,507	3,002	5,509	3,152	419	3,571	9,079
Additions	10	536	546	241	788	631,738	198,566	830,304	831,092
Reductions	19	562	581	241	822	445,543	140,042	585,584	586,406
Net change	(9)	(26)	(35)	1	(34)	0	0	0	(34)
Closing stock	36	2,135	2,171	3,271	5,443	1,780	36	1,817	7,259
Net change to other lands	1	(298)	(297)	269	(27)	(39,034)	(4,693)	(43,726)	(43,754)
2000-2005	-	-	-	-	-	-	-	-	-
Opening stock	39	2,301	2,339	3,525	5,864	3,781	515	4,297	10,161
Additions	24	483	507	277	784	856	287	1,143	1,927
Reductions	9	572	581	334	915	850	274	1,124	2,039
Net change	14	(88)	(74)	(57)	(131)	6	12	19	(113)
Closing stock	45	1,212	1,257	2,819	4,076	1,524	255	1,779	5,855
Net change to other lands	(8)	(1,000)	(1,008)	(649)	(1,657)	2,264	272	2,536	879
2005-2010	-	-	-	-	-	-	-	-	-
Opening stock	58	1,544	1,601	3,590	5,191	1,941	324	2,265	7,456
Additions	32	258	290	319	609	833	143	976	1,585
Reductions	15	299	314	370	684	875	145	1,020	1,703
Net change	17	(41)	(24)	(51)	(74)	(41)	(2)	(44)	(118)
Closing stock	153	1,339	1,493	3,677	5,170	2,055	406	2,461	7,630
Net change to other lands	78	(163)	(85)	138	53	(156)	(83)	(239)	(186)
2010-2015	-	-	-	-	-	-	-	-	-
Opening stock	160	1,396	1,556	3,833	5,389	2,142	424	2,566	7,955
Additions	61	159	220	224	444	925	151	1,075	1,520
Reductions	14	190	204	248	452	802	153	955	1,407
Net Change	47	(31)	16	(24)	(8)	122	(2)	120	113
Closing Stock	122	1,159	1,281	3,594	4,875	2,054	422	2,475	7,351
Net change to other lands	(85)	(206)	(291)	(215)	(506)	211	0	211	(294)

CHAPTER 5: SUPPLY AND USE TABLES

5.1 Supply and Use Tables for wood and forest resources

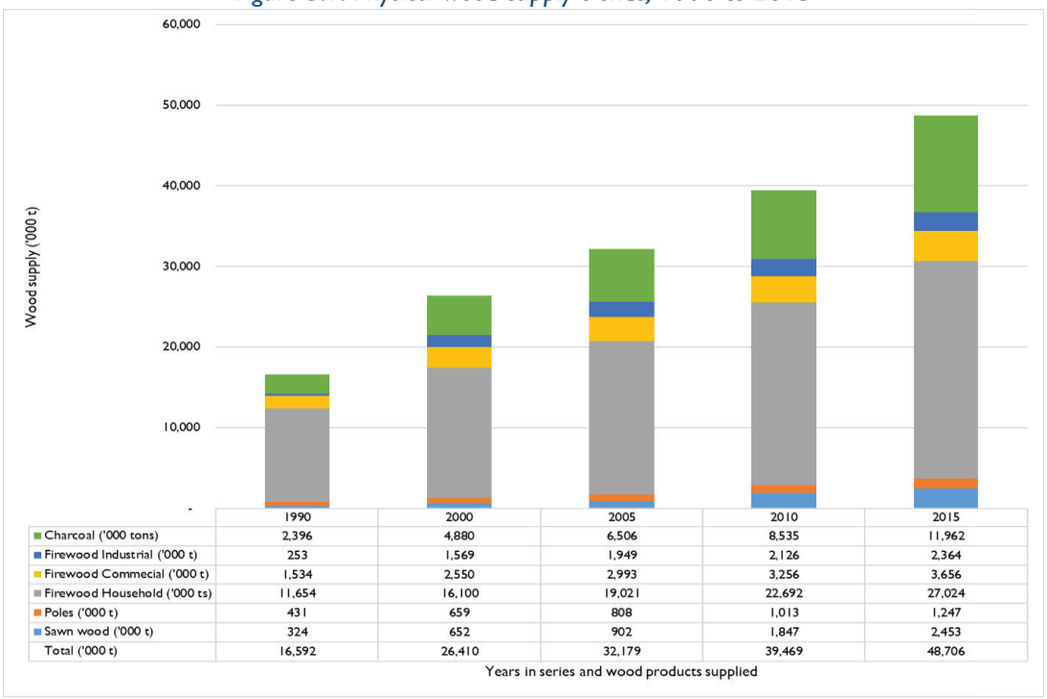
The physical and monetary flows of wood and forest resources are summarised in this chapter in supply and use tables. These are extensions of similar tables used for recording the flows of products in the monetary System of National Accounts (SNA 2008), which is a statistical framework that provides a comprehensive, consistent and flexible set of macroeconomic accounts for policymaking, analysis and research. The supply and use tables in physical terms show the flows of natural inputs, products and residuals for 1990, 2000, 2005, 2010 and 2015. The monetary supply and use tables meanwhile record all flows of products in an economy between different economic units in monetary terms, for the same years. The tables have three components. These are the natural ingredients from which the supply is derived; the two components of the supply and use; and wood products and NWFPs. The wood products considered are (i) woodfuel, (ii) timber (sawn wood and poles), (iii) traded (export and imports) wood products, (iv) sandalwood oil, (v) *Prunus africana* bark and (vi) shea butter.

5.2 Physical Supply and Use Tables

5.2.1 Wood supply trends 1990 to 2015

The aggregate total quantity of wood as a natural input increased by 2.3 times between 1990 and 2015, from 60.5 million tonnes (Table 5.1) to 139.1 million tonnes (Table 5.9). The largest share was wood to produce charcoal[7]. Between 1990 and 2015, charcoal strengthened its position as the leading form of wood product supply, increasing its proportion of supply from 58 percent to 72 percent. The quantity of wood used to manufacture charcoal increased five-fold over the same period, from 19.2 million tonnes to 95.7 million tonnes. Firewood (for household, commercial and industrial use) was the second-largest wood product.

Figure 5.1: Physical wood supply trends, 1990 to 2015



	1990	2000	2005	2010	2015
Charcoal ('000 tons)	2,396	4,880	6,506	8,535	11,962
Firewood Industrial ('000 t)	253	1,569	1,949	2,126	2,364
Firewood Commecial ('000 t)	1,534	2,550	2,993	3,256	3,656
Firewood Household ('000 ts)	11,654	16,100	19,021	22,692	27,024
Poles ('000 t)	431	659	808	1,013	1,247
Sawn wood ('000 t)	324	652	902	1,847	2,453
Total ('000 t)	16,592	26,410	32,179	39,469	48,706

[7] Charcoal product efficiency stood at only 12.5 percent (UNDP 2016)

Between 1990 and 2015, firewood supply increased by 2.5 times, from 13.4 million tonnes to 33.0 million tonnes, although the proportion of firewood in wood product supply reduced over the same period from 40.3 percent to 25 percent. The proportion of sawn wood and poles in wood supply was a combined 2.3 percent in 1990 and 2.6 percent in 2015, despite the quantities increasing substantially, by 7.6 times and 2.9 times, respectively.

5.2.2 Physical Supply and Use Tables 1990

The Physical Supply and Use Tables (PSUT) for 1990 show that the total wood available as a natural input was 60.5 million tonnes. The wood supply from the forestry sub-sector was 31.3 million tonnes, plus 3.8 million tonnes in accumulations and 3.3 million tonnes as flows to the environment. The highest supply of wood (21.1 million tonnes) was in wood used for charcoal production, followed by wood supply for household firewood (Table 5.1).

Table 5.2 (use table) shows that overall use was 33.3 million tonnes, with 3.3 million tonnes as flows to the environment and residues of 3.1 million tonnes. It shows that the largest use of wood was in the form of charcoal, with 21.1 million tonnes[8] used for this purpose in 1990, followed by 12.8 million tonnes of firewood used by households. When broken down by sector, the manufacturing sector used 253,000 tonnes of firewood, while the construction and housing sector used 324,000 tonnes of sawn wood and 108,000 tonnes of poles. The wholesale and retail sector used the entire 2.4 million tonnes of charcoal, based on the assumption that all the charcoal produced enters the value chain and is then distributed to secondary users, including the sectors indicated in the PSUT.[9] The commercial sector[10] of education, health and others used 1.5 million tonnes of firewood.

Based on discussions with the Inventory Department of the NFA, with input from Odokonyero (2005) and MWE (2016), the residues for 1990 were estimated at 10percent, based on the use of inefficient equipment such as chainsaws for wood processing, and limited use of wood shavings in the 1990s and 2000. Flows to the environment were also estimated at 10percent for both the supply side and use side of the wood value chain, including offcuts, leaves, bark and stumps left over at harvest.

[8] The conversion from wood to charcoal is in a ratio of 1:8. Therefore, eight times as much wood is used as that indicated as the charcoal supply in the table.

[9] Charcoal production occurs in rural areas and largely supplies households in urban areas. The charcoal is mostly distributed through wholesalers and then accessed via retailers to reach households (MEMD 2015), so it is classified as 'wholesale and retail' demand. Any charcoal unsold is left under flows to environment and residues.

[10] Consumption of wood in health facilities and educational establishments falls under institutional consumption. which is categorized as 'commercial' consumption in the Statistical Abstract.

Table 5.1: Physical Supply Table 1990

	Agric. production	*Forestry*	*Fishing*	*Mining & quarrying*	*Household*	*Manufacturing*	*Construction & housing*	*Wholesale & retail trade*	*Transport*	*Education, health & social work*	*Other services*	*Accum-ulations*	*Import-ations*	*Flows from the environment*	Overall total
Natural inputs															-
Seed (kg)															-
Seedlings (no.)															-
Wood available for supply															-
Broadleaved wood ('000 t)		35													35
Coniferous wood ('000 t)		63													63
THF WS wood ('000 t)		805													805
THF LS wood ('000 t)		123													123
Woodlands wood ('000 t)		501													501
Sub-total		1,527													1,527
Other land covers ('000 t)		57,469													57,469
Available wood ('000 t)		60,523													60,523
Shea nut (pods)															-
Prunus africana															-
Sandalwood															-
Wood Products ('000 t)															
Sawn wood ('000 t)		324												32	356
Poles ('000 t)		431												43	474
Firewood h/hold ('000 t)		11,654												1165	12,819
Firewood comm. ('000 t)		1,534												153	1,687
Firewood ind. ('000 t)		253												25	278
Charcoal ('000 t)		2,396												240	2,636
Sub-total ('000 t)	-	16,592	-	-	-		-	-	-	-	-			1,825	18,250
Finished products															-
Wood & articles ('000 t)															-
Cork & cork articles (t)															-
Manufacture of straw (t)															-
Pulp of wood (t)															-
Paper & paper board (t)															-
Non-wood forest products															-
Shea butter oil (t)															-
Prunus africana (kg)															-
Sandalwood															-
Residues															-
Wood residues ('000 t)		3,133													3,133

Table 5.2: Physical Use Table 1990

	Agric. production	*Forestry*	*Fishing*	*Mining & quarrying*	*Household*	*Manufacturing*	*Construction & housing*	*Wholesale & retail trade*	*Transport*	*Education, health & social work*	*Other services*	*Accum-ulations*	*Export-ations*	*Flows to the environment*	Overall total
Natural Inputs															
Seeds (kg)															
Seedlings (no.)															
Wood available for supply															
Broadleaved wood ('000 t)															
Coniferous wood ('000 t)															
THF WS wood ('000 t)															
THF LS wood ('000 t)															
Woodlands wood ('000 t)															
Other wood ('000 t)															
Wood Products															
Sawn wood ('000 t)							324							32	356
Poles ('000 t)					323		108							43	474
Firewood h/hold ('000 t)					11,656									1,166	12,822
Firewood com. ('000 t)										1,534				153	1,687
Firewood ind. ('000 t)						253								25	278
Charcoal ('000 t)								2,396						240	2,636
Sub-total	-	-	-	-	11,979	253	432	2,396	-	1,534	-		-	3,337	18,253
Finished products															-
Wood & articles ('000 t)															-
Cork & cork articles (t)															-
Manufacture of straw (t)															-
Pulp of wood (t)															-
Paper & paper board (t)															-
Non-wood forest products															-
Shea butter oil (t)															-
Prunus africana (kg)															-
Sandalwood															-
Residues ('000 t)	-	-	-	-	1,197.9	25.3	43.2	1,916.8	-	153.4	-		-	313.3	3,337

5.2.3 Physical Supply and Use Table 2000

The PSUT for 2000 shows that the wood as natural input was 63.6 million tonnes. The highest proportion of wood supply as a product was for charcoal[11], at 62 percent (equivalent to 39.0 million tonnes) - more than double the 19.2 million tonnes of wood supplied as charcoal in 1990 (Table 5.3). 19.2 million tonnes of wood produced 4,880 tonnes of charcoal supplied. This was followed by 16.1 tonnes of household firewood (29 percent), 2.6 million tonnes of commercial firewood (5 percent) and 1.6 million tonnes of industrial firewood (3 percent). Sawn wood and poles were the smallest products by percentage and tonnage, accounting for 1 percent each and 652,000 tonnes and 659,000 tonnes of supply, respectively.

The supply table also captures imports of five wood products: 74.2 million tonnes of wood and articles of wood, 10 million tonnes of cork and articles of cork, 6.1 million tonnes of straw, plaiting and basket ware, 192,000 tonnes of pulp of wood and 34.3 million tonnes of paper and paper board.

Aggregate wood product use was estimated at 56.2 million tonnes in 2000. The wholesale and retail sector was the largest user, as the sole outlet for the 39.0 million tonnes of wood supplied as charcoal - equivalent to 64 percent of the wood used. The household sector used 26 percent of the wood products as poles (452,000 t) and firewood (15.4 million tonnes). The sector of education, health and others used 4 percent of the wood products as commercial firewood, equivalent to 2.6 Million tonnes. The manufacturing and construction and housing sectors each used 3percent of the wood products, with the manufacturing sector using 1.6 million tonnes of industrial firewood and the construction and housing sector using 652,000 tonnes of sawn wood, 207,000 tonnes of poles and 678,000 tonnes of firewood (Table 5.4).

Finished product exports included 49.1 million tonnes of wood and wood articles, 2 million tonnes of straw, plaiting and basket ware and 794 million tonnes of paper and paper board. Uganda was a net exporter of paper and paper board by a margin on 15.6 million tonnes. On the other hand, Uganda was a net importer of wood and wood articles by 25.0 million tonnes, cork and articles of cork by 10.0 million tonnes, straws, plaiting and basket ware by 6.1 million tonnes and pulp of wood by 192,000 million tonnes.

[11] The conversion from wood to charcoal is in a ratio of 1:8. Therefore, eight times as much wood is used as that indicated as the charcoal supply in the table.

Table 5.3: Physical Supply Table 2000

	Agric. prod'n	*Forestry*	*Fishing*	*Mining & quarrying*	*Household*	*Manufacturing*	*Construction & housing*	*Wholesale & retail trade*	*Transport*	*Utilities (electricity)*	*Education, health & social work*	*Accum-ulations*	*Imports*	*Flows from the environment*	Overall total
Natural inputs															-
Seed (kg)															-
Seedlings (no.)															-
Wood available for supply															
Broadleaved ('000 t)		23													23
Coniferous ('000 t)		42													42
THF WS wood ('000 t)		805													805
THF LS wood ('000 t)		123													123
Woodlands ('000 t)		501													501
Forest wood available ('000 t)		1,494													1,494
From other land covers ('000 t)		41,813													41,813
Wood available ('000 t)		43,308													43,308
Other wood ('000 t)		20,291													20,291
NWFPs															
Shea nut (pods)															-
Prunus africana (bark)															-
Sandalwood oil															-
Wood Products ('000 t)															
Sawn wood ('000 t)		652												33	685
Poles ('000 t)		659												33	692
Firewood h/hold ('000 t)		16,100												805	16,905
Firewood comm. ('000 t)		2,550												128	2,678
Firewood ind. ('000 t)		1,569												78	1,647
Charcoal ('000 t)		4,880												244	5,124
Sub-total ('000 t)	-	*60,570*	-	-	-		-	-	-	-	-	-		*1,387*	*27,731*
Finished products															-
Wood & articles ('000 t)													74,159	3,708	77,867
Cork & cork articles ('000 t)													9,977	499	10,476
Straw, plaiting ('000 t)													6,136	307	6,443
Pulp of wood ('000 t)													192	10	201
Paper & board ('000 t)													34,304	1,715	36,019
Sub-total ('000 t)													*124,766*	*6,238*	*131,005*
Non-wood forest products															-
Shea butter oil (t)															-
Prunus africana (kg)															-
Sandalwood															-
Residues															-
Wood residues ('000 t)		-													-

Table 5.4: Physical Use Table 2000

	Agric. production	*Forestry*	*Fishing*	*Mining & quarrying*	*Household*	*Manufacturing*	*Construction & housing*	*Wholesale & retail trade*	*Transport*	*Utilities (electricity)*	*Education, health & social work*	*Accum-ulations*	*Export-ations*	Flows to the environment	Overall total
Inputs															
Seeds (kg)															-
Seedlings (no.)															-
Wood available for supply															-
Broadleaved wood (t)															-
Coniferous wood (t															-
THF WS wood (t)															-
THF LS wood (t)															-
Woodlands (t)															-
Other wood ('000 t)															
Wood products															
Sawn wood ('000 t)							652								652
Poles ('000 t)					452		207								659
Firewood h/hold ('000 t)					15,422		678								16,100
Firewood comm. ('000 t)											2,550				2,550
Firewood ind. ('000 t)						1,569									1,569
Charcoal ('000 t)								4,880							5,124
Sub-total	-	-	-	-	15,874	1,569	1,537	4,880	-	-	2,550		-	-	27,731
Finished products															-
Wood & articles ('000 t)													49,121	2,456	51,577
Cork & articles('000 t)														-	-
Manufacture of straw ('000 t)													2	0	2
Pulp of wood ('000 t)														-	-
Paper & paper board ('000 t)													794	40	834
Sub-total ('000 t)													*49,917*	*2,496*	*52,413*
Non-wood forest products															-
Shea butter oil (kg)															-
Prunus africana (kg)															-
Sandalwood															-
Residues ('000 t)	-	-	-	-	1,587	157	154	3,466	-	-	255		-	-	5,619

5.2.4 Physical Supply and Use Table 2005

The PSUT for 2005 (Table 5.5) shows that the wood supplied as products increased from 63.3 million tonnes to 81.6 million tonnes between 2000 and 2005. The increase meant that the wood available for supply was now only 31percent of the total wood supply, while the remaining 69percent (equivalent to 56.4 million tonnes) was supplied from wood not available for supply and from other sources. The largest natural input into wood product supply was for charcoal[12], at 67 percent (equivalent to 52.0 million tonnes of wood), followed by household firewood at 24 percent (19.0 million tonnes of wood), commercial firewood at 4 percent (3.0 Million tonnes) and industrial firewood at 3 percent (1.9 million tonnes). Sawnwood and pole supply were each 1percent of wood supply in products, at 902,000 tonnes and 808 t, respectively. However, the actual charcoal supply was just 6,506 t, one-eighth of the wood used in its manufacture.

Imports were 1,200 tonnes of wood and articles of wood, 49 tonnes of cork and articles of cork, 253,000 tonnes of straw, plaiting and basket ware, 300 tonnes of pulp of wood and 18.5 Million tonnes of paper and paper board.

Aggregate wood product use in 2005 was estimated at 74.2 million tonnes. The wholesale and retail sector was the largest user, as a conduit for the 48.6 million tonnes of wood supplied as charcoal, equivalent to 66percent of all wood used. The household sector meanwhile used 26percent of the wood products as poles (555,000 t) and firewood (19.0 million tonnes). The commercial sector of education, health and others used 4percent of the wood products as commercial firewood, equivalent to 2.9 million tonnes. The manufacturing sector used industrial firewood equivalent to 3percent of wood used in products (or 1.9 million tonnes), while the construction and housing sector used 902,000 tonnes of sawn wood and 253,000 tonnes of poles, representing 2percent of total wood use (Table 5.6).

Finished product exports included 462,000 tonnes of wood and wood articles, 8,000 tonnes of straws, plaiting and basket ware, 42,000 tonnes of pulp of wood and 3,5 million tonnes of paper and paper board. In 2005, Uganda was a net exporter of wood and wood articles by a margin of 461,020 tonnes and of pulp of wood by 41,160 t, while being a net importer of cork and articles of cork by 50 tonnes, paper and paper board by 245,090 tonnes and paper and paper board by 15.0 million tonnes.

[12] The conversion from wood to charcoal is in a ratio of 1:8. Therefore, eight times as much wood is used as that indicated as the charcoal supply in the table.

Table 5.5: Physical Supply Table 2005

	Agric. Production	*Forestry*	*Fishing*	*Mining & Quarrying*	*Household*	*Manufacturing*	*Construction & Housing*	*Wholesale & Retail trade*	*Transport*	*Education, health & social work*	*Other services*	*Accum-ulations*	*Imports*	Flows to the Environment	Overall total
Natural inputs															
Seed (kg)															-
Seedlings (no.)															-
Wood biomass available for supply															
Broadleaved wood ('000 t)		24													24
Coniferous wood ('000 t)		33													33
THF WS wood ('000 t)		580													580
THF LS wood ('000 t)		69													69
Woodlands wood ('000 t)		162													162
Forest wood available ('000 t)		869	-	-	-	-	-	-	-	-	-	-	-		869
Wood other land covers ('000 t)		38,896													38,896
Wood available ('000 t)		39,764													39,764
Wood not available ('000 t)		41,843													41,843
Shea nut (pods)															-
Prunus africana (trees>30cm DBH)															-
Sandal wood															-
Wood products ('000 t)															
Sawn wood ('000 t)		902												45.1	947
Poles ('000 t)		808												40.4	848
Firewood h/hold ('000 t)		19,021												951.05	19,972
Firewood comm. ('000 t)		2,993												149.65	3,143
Firewood ind. ('000 t)		1,949												97.45	2,046
Charcoal ('000 t)		6,506												325.30	6,831.3
Sub-total ('000 t)		*32,179*												*1,689.37*	*33,787.3*
Finished products															-
Wood & articles ('000 t)													1,202	*0*	1,202
Cork & cork articles ('000 t)													0.5	*0*	49
Manufacture of straw ('000 t)													253	*13*	252,591
Pulp of wood ('000 t)													0.3	*0*	340
Paper & paper board ('000 t)													18,502	*925*	18,501,792
Sub-total ('000 t)													*18,756*	*938*	*19,694*
Non-wood forest products															-
Shea butter oil (t)															-
Prunus africana (kg)															-
Sandalwood															-
Residues															-
Wood residues ('000 t)		3,886													3,886

Table 5.6: Physical Use Table 2005

	Agric. Production	*Forestry*	*Fishing*	*Mining & Quarrying*	*Household*	*Manufacturing*	*Construction & Housing*	*Wholesale & Retail trade*	*Transport*	*Other services*	*Education, health & social work*	*Accum-ulation*	*Export-ations*	Flows to the Environment	Overall total
Inputs															-
Seeds (kg)															-
Seedlings (no.)															-
Wood biomass available for supply															-
Broadleaved wood ('000 t)															-
Coniferous wood ('000 t															-
THF WS wood ('000 t)															-
THF LS wood ('000 t)															-
Woodlands wood ('000 t)															-
Other wood ('000 t)															
Wood products															-
Sawn wood ('000 t)							902								902
Poles ('000 t)					555		253								808
Firewood household ('000 t)					19,021										19,021
Firewood comm. ('000 t)											2,895				2,895
Firewood ind. ('000 t)						1,908									1,908
Charcoal ('000 t)								6,080							6,080
Sub-total ('000 t)	-	-	-	-	*19,576*	*1,908*	*1,155*	*6,080*	-	-	*2,895*		-	-	*31,614*
Finished products															-
Wood & articles of wood ('000 t)													462	23	485
Cork & cork articles ('000 t)														-	-
Manufacture of straw ('000 t)													8	0	8
Pulp of wood ('000 t)													42	2	44
Paper & paper board (('000 t)													3,525	176	3,701
Sub-total ('000 t)													*4,036*	*201.8*	*4,237.9*
Non-wood forest products															-
Shea butter oil (t)															-
Prunus africana (kg)															-
Sandalwood															-
Residues ('000 t)	-	-	-	-	978.80	95.40	57.75	2,432.00	-	-	144.75		-	-	3,709

5.2.5 Physical Supply and Use Table 2010

In 2010, wood as natural inputs had increased to 104.2 million tonnes, from 81.6 Million tonnes in 2005. Wood natural input into charcoal[13] manufacture was 69 percent of the total, equivalent to 68.3 million tonnes of wood, followed by household firewood at 23 percent (22.7 Million tonnes), commercial firewood at 3 percent (3.3 million tonnes) and industrial firewood at 2 percent (2.1 million tonnes). Sawn wood and pole supply were 2 percent and 1 percent of wood supply in products, at 1.8 Million tonnes and 1.0 Million tonnes, respectively (Table 5.7). Imports were 2.3 million tonnes of wood and articles of wood, 2 tonnes of cork and articles of cork, 300 tonnes of straw, plaiting and basket ware, 910 tonnes of pulp of wood and 95,850 tonnes of paper and paper board.

Aggregate wood product use in 2010 was estimated at 102.2 million tonnes. The wholesale and retail sector was the largest user, as a monopoly for the 68.2 million tonnes of wood supplied as charcoal, equivalent to 67 percent of the wood used. The household sector used 23 percent of the wood products as poles (675,000 t) and firewood (22.7 million tonnes). The commercial sector of education, health and others used 3percent of the wood products as commercial firewood, equivalent to 3.3 million tonnes. The manufacturing sector used industrial firewood equivalent to 2percent of wood used in products (or 2.1 million tonnes), while the construction and housing sector used 1.8 tonnes of sawn wood and 317,000 tonnes of poles, 2 percent of the wood use (Table 5.8).

Finished product exports included 2.7 million tonnes of wood and wood articles, 100 tonnes of cork and articles of cork, 1,210 tonnes of pulp of wood and 8,030 tonnes of paper and paper board. In 2010, Uganda was a net exporter of 311,360 tonnes of wood and wood articles, 100 tonnes of cork and articles of cork and 290 tonnes of pulp of wood, while being a net importer of 340 tonnes of straws, plaiting and basketware and 87,820 tonnes of paper and paper board.

[13] The conversion from wood to charcoal is in a ratio of 1:8. Therefore, eight times as much wood is used as that indicated as the charcoal supply in the table.

Table 5.7: Physical Supply Table 2010

	Agric. production	*Forestry*	*Fishing*	*Mining & quarrying*	*Household*	*Manufacturing*	*Construction & housing*	*Wholesale & retail trade*	*Transport*	*Education, health & social work*	*Other services*	*Accum-ulations*	*Import-ations*	*Flows to the Environment*	Overall total
Natural inputs															
Seed (kg)		793													793
Seedlings (no.)		2,144,000													2,144,000
Wood available for supply															
Broadleaved wood ('000 t)		1,131													1,131
Coniferous wood ('000 t)		2,615													2,615
THF WS wood ('000 t)		579													579
THF LS wood ('000 t)		1,117													1,117
Woodlands wood ('000 t)		4,230													4,230
Forest wood available ('000 t)		9,671													9,671
Wood from other land covers ('000 t)		45,540													45,540
Wood available ('000 t)		55,211													55,211
Wood not available ('000 t)		48,964													48,964
Shea nut (pods)	753,518													37,676	791,194
Prunus africana (bark)		22,768												1,138	23,906
Sandalwood oil															
Products															
Wood Products ('000 t)															
Sawn wood ('000 t)		1,847												92	1,939
Poles ('000 t)		1,013												51	1,064
Firewood h/hold ('000 t)		22,692												1135	23,827
Firewood com. ('000 t)		3,256												163	3,419
Firewood ind. ('000 t)		2,126												106	2,232
Charcoal ('000 t)		8,535												427	8,962
Sub-total ('000 t)		39,469												1,973	41,442
Finished products														0	
Wood & articles ('000 t)													2,339	117	2,456
Cork & cork articles ('000 t)													0.002	0	0
Manufacture of straw, ('000 t)													0.3	0	0
Pulp of wood ('000 t)													0.91	0	1
Paper & paper board ('000 t)													95.85	5	101
Sub-total ('000 t)													2,436	122	2,558
Non-wood forest products														0	
Shea butter oil (t)						1,507								75	
Prunus africana (kg)															
Sandalwood														0	
Residues														0	
Wood residues ('000 t)														126,852	

Table 5.8: Physical Use Table 2010

	Crop growing	*Forests*	*Fisheries*	*Mining & quarrying*	*Household*	*Manufacturing*	*Utilities (electricity)*	*Construction & housing*	*Wholesale & retail trade*	*Transport*	*Education, health & ocial work*	*Other services*	*Accum-ulations*	*Exportations*	*Flows to the environmen t*	Overall total
Natural inputs																-
Seed																-
Seedlings																-
Wood available for supply																-
Broadleaved wood ('000 t)																-
Coniferous wood ('000 t)																-
THF WS wood ('000 t)																
THF LS wood ('000 t)																
Woodlands ('000 t)																
Other wood ('000 t)																
Shea nut (t)																-
Prunus africana (trees)																-
Sandal wood																-
Forest products																-
Seeds (kg)	26,460														1,323	27,783
Seedlings (no.)	848	283													57	1,187
Sawn wood ('000 t)								1,847							92	
Poles ('000 t)					675		21	317							51	1,064
Firewood h/hold ('000 t)					22,691										1,135	23,826
Firewood com. ('000 t)											3,256				163	3,419
Firewood ind. ('000 t)						2,125									106	2,231
Charcoal ('000 t)									8,535						427	8,962
Sub-total ('000 t)	-	-	-	-	*23,366*	*2,125*	*21*	*2,164*	*8,535*	-	*3,256*	-		-	1,973	*39,501*
Finished products																
Wood & articles ('000 t)														2,650.56	132.53	2,783
Cork & cork articles ('000 t)														0.10	0.01	0
Manufacture of straw ('000 t)														0.00	0.00	0
Pulp of wood ('000 t)														1.21	0.06	1
Paper & paper board ('000 t)														8.03	0.40	8
Sub-total ('000 t)														2,659.90	133.00	2,793
Non-wood forest products																-
Shea butter oil (t)					1,206	301										1,507
Prunus africana (kg)														22,768		22,768
Sandalwood																-
Residues ('000 t)	-	-	-	-	1,229	121	1	108	3,414	-	163	-		600,611	-	605,647

5.2.6 Physical Supply and Use Table 2015

The wood natural input into manufacture of wood products in 2015 increased to 139.1 million tonnes, from 104.2 million tonnes in 2010. Input into charcoal[14] manufacture was 72 percent of the total, equivalent to 95.7 million tonnes of wood, followed by household firewood at 20 percent (27.0 million tonnes), commercial firewood at 3percent (3.7 million tonnes) and industrial firewood at 2 percent (2.4 million tonnes). Sawn wood and poles supply were 2 percent and 1percent of wood supply in products at 2.5 million tonnes and 1.2 million tonnes, respectively (Table 5.9). Imports were 136,500 tonnes of wood and articles of wood, 300 tonnes of cork and articles of cork, 100 tonnes of straw, plaiting and basketware, 1,300 tonnes of pulp of wood and 173,000 tonnes of paper and paper board.

Aggregate wood product use in 2015 was estimated at 132.5 million tonnes. The wholesale and retail sector was the largest user, as a monopoly for the 95.7 million tonnes of wood supplied as charcoal, equivalent to 69percent of the wood used. The household sector used 20 percent of the wood products as poles (820,000 tonnes) and firewood (27.0 million tonnes). The commercial sector of education, health and others used 3 percent of the wood products as commercial firewood, equivalent to 3.7 million tonnes. The manufacturing sector used industrial firewood equivalent to 2percent of wood used in products, or 2.4 million tonnes, while the construction and housing sector used 2.5 tonnes of sawn wood and 383,000 tonnes of poles, equivalent to 2percent of the wood used in products (Table 5.10).

Finished product exports included 15 million tonnes of wood and wood articles, 10 tonnes of cork and articles of cork, 250 tonnes of straws, plaiting and basket ware, 40 tonnes of pulp of wood and 19,770 tonnes of paper and paper board. In 2015, Uganda was a net exporter of wood and wood articles by 14.9 million tonnes and straws, plaiting and basket ware by 160 tonnes. On the other hand, the country was a net importer of cork and articles of cork by 330 tonnes, pulp of wood by 1,230 tonnes and paper and paper board by 14,700 tonnes.

[14] The conversion from wood to charcoal is in a ratio of 1:8. Therefore, eight times as much wood is used as that indicated as the charcoal supply in the table.

Table 5.9: Physical Supply Table 2015

	Agric.	*Forestry*	*Fishing*	*Mining & quarrying*	*Household*	*Manufacturing*	*Construction & housing*	*Wholesale & retail trade*	*Transport*	*Education, health & social work*	*Other services*	*Accum-ulation*	*Import-ations*	Flows to the Environment	Overall total
Natural inputs															-
Seed (kg)															-
Seedlings (no.)															-
Wood available for supply															
BL wood ('000 t)		98													98
Conifer wood ('000 t)		99													99
THF WS wood ('000 t)		525													525
THF LS wood ('000 t)		71													71
Woodlands ('000 t)		154													154
Forest wood available ('000 t)		948													948
Wood from other land covers ('000 t)		45,805													45,805
Wood available as natural inputs ('000 t)		46,753													46,753
Wood not available ('000 t)		92,309													92,309
Shea nut (pods)															-
Prunus africana (trees)															-
Sandal wood															-
Wood Products ('000 t)															
Sawn wood ('000 t)		2,453												122.65	2,576
Poles ('000 t)		1,247												62.35	1,309
Firewood h/hold (000 t)		27,024												1351.2	28,375
Firewood com ('000 t)		3,656												182.8	3,839
Firewood ind. (000 t)		2,364												118.2	2,482
Charcoal ('000 t)		11,962												598.1	12,560
Sub-total ('000 t)		48,706	-	-	-	-	-	-	-	-	-	-		2,435	51,141
Finished products														0	-
Wood & articles ('000 t)													136.5	6.83	143
Cork & cork articles ('000 t)													0.3	0.02	0
Manufacture of straw ('000 t)													0.1	0.00	0
Pulp of wood ('000 t)													1.3	0.06	1
Paper & paper board ('000 t)													34.5	1.72	36
Sub-total ('000 t)													173	8.63	181
Non-wood forest products														0	-
Shea butter oil (t)														0	-
Prunus africana (kg)														0	-
Sandalwood														0	-
Residues														0	-
Wood residues ('000 t)														8,421	8,421

Table 5.10: Physical Use Table 2015

	Agric. production	*Forestry*	*Fishing*	*Mining & quarrying*	*Household*	*Manufacturing*	*Construction & housing*	*Wholesale & retail trade*	*Transport*	*Education, health & social work*	*Other services)*	*Accum-ulations*	*Export-ations*	*Flows to the environment*	Overall total
Inputs															-
Seeds (kg)															-
Seedlings (no.)															-
Wood available for supply															-
Broadleaved wood ('000 t)															-
Conifer wood ('000 t)															-
THF WS wood ('000 t)															-
THF LS wood ('000 t)															-
Woodlands ('000 t)															-
Other wood ('000 t)															
Wood Products															-
Sawn wood ('000 t)								2,453						123	2,453
Poles ('000 t)					820		383				56			60	1,259
Firewood h/hold (000 t)					27,024									1,351	27,024
Firewood com. ('000 t)										3,656				183	3,656
Firewood ind. ('000 t)						2,364								118	2,364
Charcoal ('000 t)								11,962						598	12,560
Sub-total ('000 t)	-	-	-	-	*27,844*	*2,364*	*383*	*11,962*	-	*3,656*	*56*		-	*2,433*	*51,095*
Finished products															-
Wood & articles of wood; wood charcoal ('000 t)													15,008.31	750.42	15,759
Cork & cork articles (t)													0.01	0.00	0
Manufacture of straw ('000 t)													0.25	0.01	0
Pulp of wood ('000 t)													0.04	0.00	0
Paper & paper board ('000 t)													19.77	0.99	21
Sub-total ('000 t)													*15,028.38*	*751.42*	*15780*
None-wood forest products															-
Shea butter oil (t)					420.8								105.2		526
Prunus africana (kg)													88,089		88,089
Sandalwood oil (t)													6,400		6,400
Residuals															-
Wood residues ('000 t)	-	-	-	-	1,413	118	19	4,907	-	183	3		756,149	-	762,792

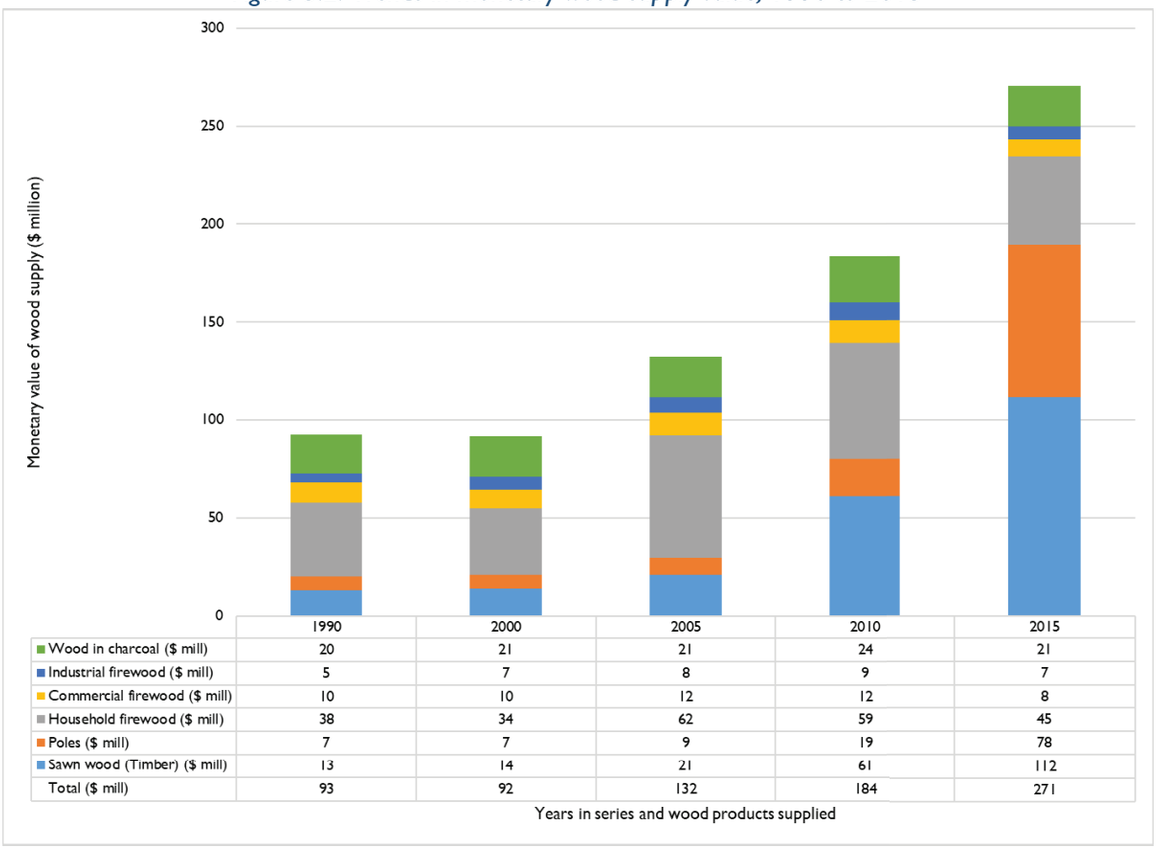
5.3 Monetary Supply and Use Tables

5.3.1 Monetary supply and use trends, 1990 to 2015

Despite being the leading product by volume of wood used in its manufacture, charcoal contributed only 21.5 percent of the total monetary value of wood products in 1990, falling to 7.7 percent in 2015. In 1990, firewood contributed the largest proportion of the value of wood products, at 57 percent, reducing to 22.1percent in 2015 (Figure 5.2). By 2015, the highest proportion of value by wood product was held by sawn timber, with 41.3 percent. The value of sawn wood and poles surged by 8.6 times and 11.1 times, respectively, from $13 million to $112 million, and from $7 million to $78 million.

These results suggest that timber and poles became increasingly distinguished as superior goods with a clear value chain, while woodfuels – especially charcoal - were increasingly seen as inferior goods and derived declining value compared with other wood products.

Figure 5.2: Trends in monetary wood supply value, 1990 to 2015



	1990	2000	2005	2010	2015
Wood in charcoal ($ mill)	20	21	21	24	21
Industrial firewood ($ mill)	5	7	8	9	7
Commercial firewood ($ mill)	10	10	12	12	8
Household firewood ($ mill)	38	34	62	59	45
Poles ($ mill)	7	7	9	19	78
Sawn wood (Timber) ($ mill)	13	14	21	61	112
Total ($ mill)	93	92	132	184	271

5.3.2 Monetary Supply and Use Table 1990

The Monetary Supply and Use Tables (MSUT) for 1990 (Table 5.11 and Table 5.12) show the monetary flows from wood products. The total outflows considered the reported wood flows in the National Statistical Abstracts and were based on data collated by the National Accounts office, linked with the estimates of the wood available for supply. The natural inputs of wood were estimated at UGX[15] 925.1 billion. However, the value of wood products was only UGX 43.7 billion. The value captured in national statistics was only 4.7 percent of the value of wood available for supply, whereas the MSUT showed that 93 percent was supplied (40.7 million tonnes out of 43.9 million tonnes) (Table 5.12).

[15] The MSUT was presented in UGX as the national currency finger used by the Uganda Bureau of Statistics for the National SUT and the System of National Accounts.

The very low total value captured in the MSUT for 1990 can be attributed to both the limited data available on forestry product value chains and the low values attributed to wood. For instance, 19.2 million tonnes of wood was supplied for charcoal production, from which 2.4 million tonnes of charcoal was produced. The charcoal would have been valued at UGX 3,558/t, leading to a monetary value of UGX 8.5 billion, and the wood used to make the charcoal would have been valued at UGX 444.8/t. The wood prices for wood used in charcoal production were in fact only 5.4percent, 3.6percent, 2.1 percent and 2.2 percent, respectively, of the average price of wood from woodlands (UGX 8,284/t), from THF (UGX 12,477/t), from broadleaved plantations (UGX 20,454/t) and from coniferous plantations (UGX 21,477/t) (see Table 5.12).

Table 5.11: Monetary Supply Table 1990

	Agric. production	*Forestry*	*Fisheries*	*Mining & quarrying*	*Household*	*Manufacturing*	*Construction & housing*	*Wholesale & retail trade*	*Transport*	*Education, health & social work*	*Other services*	*Accum-ulations*	*Import-ations*	*Flows to environment*	*Overall total*
Natural inputs															-
Seed (UGX mill)															-
Seedlings (UGX mill)															-
Wood available for supply															-
Broadleaved wood (UGX mill)		7,063													7,063
Coniferous wood (UGX mill)		13,539													13,539
THF WS wood (UGX mill)		295,945													295,945
THF LS wood (UGX mill)		45,195													45,195
Woodlands (UGX mill)		563,407													563,407
Sub-total (UGX mill)		925,149	-	-	-	-	-	-	-	-	-	-	-	-	925,149
Shea Pods (no.) (UGX mill)															-
Prunus africana (trees) (UGX mill)															-
Sandalwood (UGX mill)															-
Bamboo (UGX mill)															-
Sub-total (UGX mill)		925,149													925,149
Wood products															
Sawn wood (Timber) (UGX mill)		5,530												553	6,083
Poles (UGX mill)		3,136												314	3,450
Firewood household (UGX mill)		16,125												1,613	17,738
Firewood commercial (UGX mill)		4,380												438	4,818
Firewood industrial (UGX mill)		2,051												205	2,256
Charcoal (UGX mill)		8,526												853	9,379
Sub-total (UGX mill)		39,748												3,975	43,723
Finished products															-
Wood & articles (UGX mill)															-
Cork & cork articles (UGX mill)															-
Manufacture of straw (UGX mill)															-
Pulp of wood (UGX mill)															-
Paper & paper board (UGX mill)															-
Sub-total (UGX mill)															
Non-wood forest products															-
Shea butter oil (UGX mill)															-
Prunus africana (UGX mill)															-
Sandalwood															-
Sub-total (UGX mill)															
Residues															-
Wood residuals															-
Total (UGX mill)	**-**	**39,748**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**		**-**	**3,975**	**43,723**

Table 5.12: Monetary Use Table 1990

	Agric. production	*Forestry*	*Fisheries*	*Mining & quarrying*	*Household*	*Manufacturing*	*Construction & housing*	*Wholesale & retail trade*	*Transport*	*Education, health & social work*	*Other services*	*Accum-ulations*	*Export-ations*	*Flows to environ-ment*	*Overall total*
Description															
Natural Inputs															-
Seed (UGX mill)															-
Seedlings (UGX mill)															-
Wood available for supply															-
Broadleaved wood (UGX mill)															-
Coniferous wood (UGX mill)															-
THF WS (UGX mill)															-
THF LS wood (UGX mill)															
Woodlands (UGX mill)															
Shea pods (no.) (UGX mill)															
Prunus africana (UGX mill)															
Sandal wood (UGX mill)															
Bamboo (UGX mill)															
Wood products															-
Sawn wood (UGX mill)							5,530								5,530
Poles (UGX mill)							3,136								3,136
Firewood h/hold (UGX mill)					16,124										16,124
Firewood com. (UGX mill)										4380					4,380
Firewood ind. (UGX mill)						2,051									2,051
Charcoal (UGX mill)								8,526							8,526
Sub-total (UGX mill)	-	-	-	-	16,124	2,051	8,666	8,526	-	4,380	-		-	-	39,747
Finished products															-
Wood & articles (UGX mill)															-
Cork & cork articles (UGX mill)															-
Manufacture of straw (UGX mill)															-
Pulp of wood (UGX mill)															-
Paper & board (UGX mill)															-
Sub-total (UGX mill)															-
Non-wood forest products															-
Shea butter oil (UGX mill)															-
Prunus africana (UGX mill)															-
Sandalwood															-
Sub-total (UGX mill)															-
Residues															-
Wood residues	-	-	-	-	1,612.4	205.1	866.6	852.6	-	438.0	-		-	-	3,975
Total (UGX mill)	**-**	**-**	**-**	**-**	**17,736**	**2,256**	**9,533**	**9,379**	**-**	**4,818**	**-**		**-**	**-**	**43,722**

5.3.3 Monetary Supply and Use Table 2000

The MSUT in Table 5.13 and Table 5.14 shows the monetary flows from wood products and finished products traded as imports and exports for the year 2000. The total wood products supply as natural input was valued at UGX 2.1 trillion, comprising UGX 1.8 trillion from wood available for supply and UGX 315.7 billion from wood not available for supply and from other sources. The value of wood supply by the forestry sub-sector was UGX 198.7 billion, while the value from imports was UGX 61.2 billion. Altogether, the flows in the supply side of the MSUT 2000, including residuals, were valued at UGX 272.9 billion. There was therefore a minimum monetary value of UGX 1.9 trillion in wood flows that were not accounted for.

The calculated value is largely attributable to the low monetary value of wood products, especially in the domestic economy. Whereas the farm gate prices of wood range from UGX 34,226/t for natural wood in woodlands to UGX 88,733/t for wood from coniferous plantations, the monetary value of wood products was considerably less. The average value of wood supplied as charcoal in 2000 was UGX 2,097/t, household firewood UGX 3,440/t, commercial firewood UGX 6,205/t, industrial firewood UGX 6,948/t and poles UGX 17,547/t, which were all below the range of monetary prices for the natural inputs of wood. Only the average monetary value of sawn wood (UGX 35,552/t) was slightly higher (by 3.9 percent) than the price of wood from woodlands, the lowest price in the natural inputs price range. Considering that sawn wood was just 1.1 percent of wood flows as supplies in Uganda's forestry sector, it is likely that the low monetary value in the supply and use tables for 2000 is attributable to the low monetary value attached to wood products, as well as the dominant use of wood for woodfuel.

The monetary value for wood used domestically was UGX 150.9 billion, including UGX 57.7 billion as accumulations. The household sector had the highest use, with UGX 63.1 billion from the use of poles and firewood, followed by the wholesale and retail sector with UGX 34.0 billion use of charcoal in the value chain, UGX 27.0 billion use of sawn wood and poles by the construction and housing sector, UGX 15.8 billion use of firewood by the commercial sector of education, health and social work, and UGX 10.9 billion used in the manufacturing sector for industrial firewood. Finished wood product exports were valued at UGX 866.1 million. Compared to the imports, which were valued at UGX 60.2 billion, Uganda had a trade deficit of UGX 60.3 billion in wood product flows in 2000.

Table 5.13: Monetary Supply Table 2000

	Agric. production	*Forestry*	*Fishing*	*Mining & quarrying*	*Household*	*Manufacturing*	*Construction & housing*	*Wholesale & retail trade*	*Transport*	*Education, health & social work*	*Other services*	*Accum-ulations*	*Import-ations*	*Flows to environ-ment*	*Overall total*
Natural inputs															-
Forest sand (UGX mill)															-
Seed (UGX mill)															-
Seedlings (UGX mill)															-
Wood available for supply															-
Broadleaved wood (UGX mill)		22,755													22,755
Coniferous wood (UGX mill)		40,822													40,822
THF WS wood (UGX mill)		1,204,008													1,204,008
THF LS wood (UGX mill)		158,011													158,011
Woodlands (UGX mill)		404,908													404,908
Sub-total (UGX milli)		1,830,504													1,830,504
Other wood (UGX mill)		315,667													315,667
Shea pods (UGX mill)															-
Prunus africana (UGX mill)															-
Sandalwood (UGX mill)															-
Sub-total (UGX mill)		2,146,171													2,146,171
Wood products															
Sawn wood (timber) (UGX mill)		23,180												1,159	24,339
Poles (UGX mill)		11,564												578	12,142
Firewood h/hold (UGX mill)		55,383												2,769	58,152
Firewood com. (UGX mill)		15,822												791	16,613
Firewood ind. (UGX mill)		10,902												545	11,447
Charcoal (UGX mill)		81,881												4,094	85,975
Sub-total (UGX mill)	-	*198,732*	-	-	-		-	-	-	-	-	-	-	*9,937*	*208,669*
Finished products														-	-
Wood & articles (UGX mill))													10,594	530	11,124
Cork & cork articles (UGX mill)													9,977	499	10,476
Manufacture of straw (UGX mill)													6,136	307	6,443
Pulp of wood (UGX mill)													192	10	201
Paper & paper board (UGX mill)													34,304	1,715	36,019
Sub-total (UGX mill)	-	-	-	-	-	-	-	-	-	-	-		*61,202*	*3,060*	*64,262*
Non-wood forest products														-	-
Shea butter oil (UGX mill)														-	-
Prunus africana (UGX mill)														-	-
Sandalwood (UGX mill)														-	-
Sub-total (UGX mill)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Residues															-
Wood residuals (UGX mill)															-
Total (UGX mill)	-	397,464	-	-	-	-	-	-	-	-	-			25,993	272,931

Table 5.14: Monetary Supply and Use Table 2000

	Agric. production	*Forestry*	*Fishing*	*Mining & quarrying*	*Household*	*Manufacturing*	*Construction & housing*	*Wholesale & retail trade*	*Transport*	*Education, health & social work*	*Other services*	*Accum-ulations*	*Exportations*	*Flows to environ-ment*	*Overall total*
Natural Inputs															-
Forest soils/sand (UGX)															-
Seed (UGX)															-
Seedlings (UGX)															-
Wood available for supply															-
Broadleaved wood (UGX mill)															-
Coniferous wood (UGX mill)															-
THF WS wood (UGX mill)															-
THF LS wood (UGX mill)															
Woodlands (UGX mill)															
Seedlings (UGX mill)															-
Forest Products															-
Sawn wood (UGX mill)							23,180								23,180
Poles (UGX mill)					7,723		3,842								11,565
Firewood h/hold (UGX mill)					55,384										55,384
Firewood com. (UGX mill)										15823					15,823
Firewood ind. (UGX mill)						10,903									10,903
Charcoal (UGX mill)								34,070							34,070
Sub-total (UGX mill)	-	-	-	-	*63,107*	*10,903*	*27,022*	*34,070*	-	*15,823*	-	*57,744*	-	-	*150,925*
Finished products															-
Wood & articles of wood (UGX mill)													70	4	74
Cork & cork articles (UGX mill)														-	-
Manufacture of straw (UGX mill)													2	0	2
Pulp of wood (UGX mill)														-	-
Paper & paper board (UGX mill)													794	40	834
Sub-total (UGX mill)	-	-	-	-	-	-	-	-	-	-	-	*63,353*	*866*	*43*	*64,262*
Non-wood forest products															-
Shea butter oil (UGX mill)															-
Prunus africana (UGX mill)															-
Sandalwood (UGX mill)															
Sub-total (UGX mill)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Residues															
Wood residues	-	-	-	-	3,155	545	1,351	1,704	-	791	-	50,152	43	2	57,744
Total (UGX mill)	-	-	-	-	129,369	22,351	55,395	69,844	-	32,437	-		1,776	89	272,931

5.3.4 Monetary Supply and Use Table 2005

The MSUT in Table 5.15 and Table 5.16 shows the monetary flows from wood products and finished products traded as imports and exports for 2005. The total wood supply as natural input was valued at UGX 2.5 trillion, comprising UGX 1.7 trillion from wood available for supply and UGX 762.7 billion from wood not available for supply and from other sources. Wood products in the supply table were valued at UGX 235.2 billion. Imports were valued at UGX 302.0 billion. The combined flows in the supply side of the MSUT 2000, including residuals, were valued at UGX 592.3 billion. There was therefore a minimum monetary value of UGX 1.9 trillion in wood flows not accounted for in the MSUT 2005.

The largest monetary value for wood products supplied was household firewood at UGX 111.1 billion, followed by sawn wood with a value of UGX 37.6 billion, charcoal with a value of UGX 36.5 billion, commercial firewood with a value of UGX 20.9 billion, poles valued at UGX 15.1 billion and industrial firewood at UGX 13.8 billion. Based on the volume of wood supplied, the average price of wood in the wood products was UGX 41,700/t of sawn wood, UGX 18,783/t of poles, UGX 5,842/t of household firewood, UGX 6,992/t of commercial firewood, UGX 7,075/t of industrial firewood and UGX 702.1/t of wood for charcoal. In contrast, the price of wood as natural inputs at the farm gate ranged between UGX 47,197/t and UGX 122,400/t. None of the average prices of wood, including for sawn wood, covered the farm gate price of wood.

The monetary value for wood used domestically was UGX 245.0 billion, including UGX 12.8 billion for flows to the environment and UGX 9.8 billion as accumulations. The household sector had the highest use, with UGX 115.7 billion from the use of poles and firewood, followed by the construction and housing sector with UGX 48.2 billion from sawn wood, poles and firewood, the wholesale and retail sector with UGX 36.5 billion used as charcoal, the commercial sector of education, health and social work with UGX 20.9 billion used as firewood and the manufacturing sector with UGX 13.8 billion used as industrial firewood. Finished wood product exports were valued at UGX 8.9 billion. Compared to the imports, which were valued at UGX 302.0 billion, Uganda had a trade deficit of UGX 293.1 billion in wood product flows in 2005.

Table 5.15: Monetary Supply Table 2005

	Agric. production	*Forestry*	*Fisheries*	*Mining & quarrying*	*Household*	*Manufacturing*	*Construction & housing*	*Wholesale & retail trade*	*Transport*	*Education, health & social work*	*Other services*	*Accumu-lations*	*Import-ations*	*Flows to environment*	*Overall total*
Natural inputs															-
Forest sand (UGX mill)															-
Seed (UGX mill)															-
Seedlings (UGX mill)															-
Wood available for supply															-
Broadleaved wood (UGX mill)		42,464													42,464
Coniferous wood (UGX mill)		60,398													60,398
THF WS wood (UGX mill)		1,215,551													1,215,551
THF LS wood (UGX mill)		143,896													
Woodlands (UGX mill)		229,785													
Sub-total (UGX mill)		1,692,094													
Wood not available for supply & other (UGX mill)		762,727													
Shea pods (UGX mill)															-
Prunus africana (UGX mill)															-
Sandal wood (UGX mill)															-
Bamboo (UGX mill)															-
Sub-total (UGX mill)		2,454,821													2,454,821
Wood products															
Sawn wood (UGX mill)		37,648												1,882	39,530
Poles (UGX mill)		15,177												759	15,936
Firewood h/hold (UGX mill)		111,117												5,556	116,673
Firewood com. (UGX mill)		20,926												1,046	21,972
Firewood ind. (UGX mill)		13,789												689	14,478
Charcoal (UGX mill)		36,545												1,827	38,372
Sub-total	-	*235,202*	-	-	-	-	-	-	-	-	-	-	-	11,760	*246,962*
Finished products														-	-
Wood & articles (UGX mill)													1,919	96	2,015
Cork & cork articles (UGX mill)													1,873	94	1,966
Manufacture of straw (UGX mill)													1,579	79	1,658
Pulp of wood or other (UGX mill)													137	7	144
Paper & paper board (UGX mill)													296,519	14,826	311,345
Sub-total (UGX mill)	-	-	-	-	-	-	-	-	-	-	-	-	*302,027*	*15,101*	*317,128*
Non-wood forest products															-
Shea butter oil (UGX mill)															-
Prunus africana (UGX mill)															-
Sandalwood (UGX mill)															-
Sub-total	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Residues															-
Wood residuals (UGX mill)	-	11,760	-	-	-	-	-	-	-	-	-	-	15,101	1,343	28,204
Total (UGX mill)	-	246,962	-	-	-	-	-	-	-	-	-	-	317,128	28,204	592,294

Table 5.16: Monetary Use Table 2005

	Agric. production	*Forestry*	*Fishing*	*Mining & quarrying*	*Household*	*Manufacturing*	*Construction & housing*	*Wholesale & retail trade*	*Transport*	*Education, health & other*	*Other services*	*Accum-ulations*	*Export-ations*	*Flows to environment*	*Overall total*
Inputs															-
Seed															-
Seedlings															-
Wood available for supply															-
Broadleaved wood (UGX mill)															-
Coniferous wood (UGX mill)															-
THF WS wood (UGX mill)															-
THF LS wood (UGX mill)															
Woodlands (UGX mill)															
Forest Products															-
Sawn wood (UGX mill)							37,648							1882.4	39,530
Poles (UGX mill)					10,419		4,758							758.85	15,936
Firewood h/hold (UGX mill)					105,323		5,794							5555.85	116,673
Firewood com. (UGX mill)										20925				1046.25	21,971
Firewood ind. (UGX mill)						13,789								689.45	14,478
Charcoal (UGX mill)								36,545						1827.25	38,372
Sub-total (UGX mill)	-	-	-	-	*115,742*	*13,789*	*48,200*	*36,545*	-	*20,925*	-		-	*11,760*	*246,961*
Finished products															-
Wood & articles (UGX mill)													3,506	175	3,682
Cork & cork articles (UGX mill)														0	-
Manufacture of straw (UGX mill)													12	1	13
Pulp of wood (UGX mill)													49	2	51
Paper & paper board (UGX mill)													5,304	265	5,569
Sub-total (UGX mill)	-	-	-	-	-	-	-	-	-	-	-	*293,155*	*8,872*	*444*	*302,470*
Non-wood forest products															-
Shea butter oil (UGX mill)															-
Prunus africana (UGX mill)															-
Sandalwood (UGX mill)															-
Sub-total (UGX mill)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Residues															-
Wood residues (UGX mill)	-	-	-	-	5,787	689	2,410	1,827	-	1,046	-	29,584	887	632	42,863
Total (UGX mill)	-	-	-	-	121,529	14,478	50,610	38,372	-	21,971	-	293,155	9,759	12,836	592,294

5.3.5 Monetary Supply and Use Table 2010

The MSUT in Table 5.17 and Table 5.18 shows the monetary flows from wood products and finished products traded as imports and exports for the year 2010. The total wood supply as natural input was valued at UGX 3.5 trillion, comprising UGX 2.4 trillion from wood available for supply and UGX 1.1 trillion from wood not available for supply and from other sources. Wood products in the supply table were valued at UGX 419.6 billion, including flows to the environment. Imports were valued at UGX 327.1 billion. Altogether, the flows in the supply side of the MSUT 2000, including residuals, were valued at UGX 1.0 trillion. There was therefore a minimum monetary value of UGX 2.5 trillion in wood flows that were not accounted for.

The largest monetary value for wood products supplied was sawn wood, with a value of UGX 132.7 billion, followed by household firewood at UGX 128.9 billion, charcoal at UGX 51.2 billion, poles at UGX 41.4 billion, commercial firewood at UGX 25.2 billion and industrial firewood at UGX 20.1 billion. Based on the volume of wood supplied, the average price of wood in the wood products was UGX 71,834/t of sawn wood, UGX 40,900/t of poles, UGX 5,681/t of household firewood, UGX 7,747/t of commercial firewood, UGX 9,500/t of industrial firewood and UGX 750.0/t of wood for charcoal produced. In contrast, the price of wood as natural inputs at the farm gate ranged between UGX 60,200/t and UGX 156,00/t. Only sawn wood prices were higher, by 19.4percent, then the lower range price of UGX 60,200/t for wood, based on farm gate prices (See Table 3.15). All the other wood products and/or the wood used in their supply were valued at less than the farm gate price of wood.

The monetary value for wood products used domestically was UGX 423.9 billion, including UGX 20.2 billion for flows to the environment. The construction and housing sector had the largest use, with UGX 160.1 billion from the use of sawn wood and poles, followed by the household sector with UGX 141.1 billion from the use of poles and firewood. The wholesale and retail sector used UGX 51.2 billion of charcoal for its value chain, the commercial sector of education, health and social work use UGX 25.2 billion of firewood, accumulation was UGX 4.4 billion and use by the agricultural production and forestry sectors was UGX 3.2 billion and UGX 910.0 million, respectively. Finished wood product exports were valued at UGX 10.8 billion, compared to imports of UGX 327.1 billion. Uganda therefore had a finished wood product trade deficit of UGX 316.3 billion in 2010.

Table 5.17: Monetary Supply Table 2010

	Agric. prod'n	*Forestry*	*Fishing*	*Mining & quarrying*	*Household*	*Manufacturing*	*Construction & housing*	*Wholesale & retail trade*	*Transport*	*Education, health & other*	*Other services*	*Accum-ulations*	*Importations*	*Flows to environ-ment*	*Overall total*
Natural inputs															-
Seed (UGX mill)		506													506
Seedlings (UGX mill)		3,640,000													3,640,000
Wood available for supply															-
Broadleaved plantations wood (UGX mill)		168,003													168,003
Coniferous wood (UGX mill)		407,838													407,838
THF WS wood (UGX mill)		1,545,471													1,545,471
THF LS wood (UGX mill)		99,432													99,432
Woodlands (UGX mill)		254,495													254,495
Sub-total (UGX mill)		2,475,238													2,475,238
Wood not available (UGX mill)		1,050,884													1,050,884
Shea pods (UGX mill)															-
Prunus africana (UGX mill)															-
Sandalwood (UGX mill)															-
Bamboo (UGX mill)															
Sub-total (UGX mill)	-	3,526,122													3,526,122
Wood products (UGX mill)															
Sawn wood (UGX mill)		132,677												6,634	139,311
Poles (UGX mill)		41,438												2,072	43,510
Firewood h/hold (UGX mill)		128,916												6,446	135,362
Firewood com. (UGX mill)		25,228												1,261	26,489
Firewood ind. (UGX mill)		20,130												1,007	21,137
Charcoal (UGX mill)		51,210												2,561	53,771
Sub-total (UGX mill)	-	*399,599*	-	-	-	-	-	-	-	-	-	-	-	*19,980*	*419,579*
Finished products														-	-
Wood & articles (UGX mill)													5,129	256	5,386
Cork & articles (UGX mill)													61,472	3,074	64,546
Manufacture of straw (UGX mill)													28,958	1,448	30,406
Pulp of wood (UGX mill)													38,806	1,940	40,747
Paper & board (UGX mill)													192,766	9,638	202,405
Sub-total (UGX mill)	-	-	-	-	-	-	-	-	-	-	-	-	*327,132*	*16,357*	*343,489*
Non-wood forest products														-	-
Shea butter oil (UGX mill)	14,553													728	15,281
Prunus africana (UGX mill)	252,567													12,628	265,195
Sandalwood (UGX mill)														-	-
Sub-total (UGX mill)	*267,120*	-	-	-	-	-	-	-	-	-	-	-	-	*13,356*	*280,476*
Residues														-	-
Wood residuals (UGX mill)														-	-
Total (UGX mill)	**534,241**	**799,198**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**		**654,265**	**99,385**	**1,043,544**

Table 5.18: Monetary Use Table 2010

	Agric. prod'n	Forests	Fishing	Mining & quarrying	Household	Manufa-cturing	Construction & housing	Wholesale & retail trade	Trans-port	Education, health & social work	*Other services*	Accum-ulations	Export-ations	Flows to environment	Overall total
Natural Inputs															-
Forest soils/sand (UGX)															-
Seed (UGX)															-
Seedlings (UGX)															-
Wood available for supply															-
Broadleaved wood (UGX mill)															-
Coniferous wood (UGX mill)															-
THF WS wood (UGX mill)															-
THF LS wood (UGX mill)															
Woodlands wood (UGX mill)															
Shea pods (UGX mill)															-
Prunus africana (UGX mill)															-
Sandal wood (UGX mill)															-
Forest Products															-
Seed (UGX mill)	506													25	531
Seedlings (UGX mill)	2,730	910												182	3,822
Sawn wood ('000 t)							132,677				1,817			6,725	141,219
Poles (UGX mill)					12,188		27,433							1,981	41,602
Firewood h/hold (UGX mill)					128,916									6,446	135,362
Firewood com. (UGX mill)										25228				1,261	26,489
Firewood ind. (UGX mill)						20,130								1,007	21,137
Charcoal (UGX mill)								51,210						2,561	53,771
Sub-total	3,236	910	-	-	141,104	20,130	160,110	51,210	-	25,228	1,817	4,353	-	20,187	423,932
Finished products															-
Wood & articles (UGX mill)													16,786	839	17,626
Cork & articles (UGX mill)													80	4	84
Manufacture of straw (UGX mill)													28	1	30
Pulp of wood (UGX mill)													665	33	698
Paper & board (UGX mill)													23,236	1,162	24,398
Sub-total	-	-	-	-	-	-	-	-	-	-	-	*260,716*	*40,796*	*2,040*	*303,552*
Non-wood forest products															-
Shea butter oil (litres)					11,643	2,911									14,553
Prunus africana													252,567	12,628	265,195
Sandalwood															-
Sub-total	-	-	-	-	*11,643*	*2,911*	-	-	-	-	-	-	*252,567*	*12,628*	*279,749*
Residues															-
Wood residues	161.79	45.50	-	-	7,637.34	1,152.03	8,005.50	2,560.50	-	1,261.40	90.85	12,818.17	2,039.80	1,742.77	37,516
Total (UGX mill)	3,398	956	-	-	160,384	24,193	168,116	53,771	-	26,489	1,908	269,182	295,403	36,598	1,040,396

5.3.6 Monetary Supply and Use Table 2015

The MSUT in Table 5.19 and Table 5.20 shows the monetary flows from wood products and finished products traded as imports and exports for the year 2015. The total wood supply as natural input was valued at UGX 3.8 trillion, comprising UGX 2.2 trillion from wood available for supply and UGX 1.5 trillion from wood not available for supply and from other sources. Wood products in the supply table were valued at UGX 920.6 billion. Imports were valued at UGX 380.1 billion. The combined flows in the supply side of the MSUT 2015, including residuals, were valued at UGX 1.1 trillion. There was therefore a minimum monetary value of UGX 2.7 trillion in wood flows that were not accounted for. The largest monetary value for wood products supplied was sawn wood, with a value of UGX 362.0 billion, followed by poles at UGX 251.8 billion, household firewood at UGX 146.8 billion, charcoal at UGX 66.9 billion, commercial firewood at UGX 27.5 billion and industrial firewood at UGX 21.9 billion.

The average price of wood in the wood products supplied was UGX 147,600/t of sawn wood, UGX 201,900/t of poles, UGX 5,400/t of household firewood, UGX 7,528/t of commercial firewood, UGX 9,250/t of industrial firewood and UGX 699.0/t of wood for charcoal produced. The price of wood as natural inputs at the farm gate ranged between UGX 57,900/t and UGX 150,000/t. The price for poles exceeded the lower and upper range of the farm gate price of wood by 2.5 times and by 34.6percent, respectively, reflecting an integration of value-added from the natural inputs to the poles supplied. Similarly, the average monetary value of sawn wood exceeded the lower range of farm gate wood prices and those for THF natural wood (UGX 85,600/t) and broadleaved plantation wood (UGX 142,900/t) by 1.5 times, 72.4percent and 3.3percent, respectively. But the sawn wood price was 1.6percent less than the upper range of the farm gate price for 2015 (See Table 3.15). Poles were likely viable to supply from all wood sources, while sawn wood was likely viable to supply from broadleaved plantations, THF and woodland, but not from coniferous plantations. Fuelwood was unlikely to be viably produced from any of the wood sources. Despite the low value associated with fuelwood, 97percent of all wood supplied in 2015 was for fuelwood.

The monetary value for wood products used domestically was UGX 920.6 billion, including UGX 43.8 billion for flows to the environment. The construction and housing sector had the largest use with UGX 599.7 billion from the use of sawn wood and poles, followed by the household sector with UGX 160.8 billion from the use of poles and firewood, the wholesale and retail sector using UGX 66.9 billion of charcoal for its value chain, UGX 27.5 billion for the use of firewood by the commercial sector of education, health and social work, and UGX 21.9 billion of firewood used by the manufacturing sector. Finished wood product exports were valued at UGX 140.0 billion compared to imports of UGX 146.8 billion. Uganda therefore had a much-reduced finished wood products trade deficit of UGX 6.8 billion in wood product flows in 2015.

Table 5.19: Monetary Supply Table 2015

	Agric. production	*Forestry*	*Fishing*	*Mining & quarrying*	*Household*	*Manufacturing*	*Construction & housing*	*Wholesale & retail trade*	*Transport*	*Education, health & social work*	*Other services*	*Accum-ulation*	*Import-ations*	*Flows to environment*	*Overall total*
Natural inputs															
Seed (UGX mill)															
Seedlings (UGX mill)															
Wood available for supply															-
BL wood (UGX mill)		219,779													219,779
Coniferous wood (UGX mill)		223,704													223,704
THF WS wood (UGX mill)		1,348,337													1,348,337
THF LS wood (UGX mill)		182,889													182,889
Woodlands (UGX mill)		268,068													268,068
Sub-total (UGX mill)		2,242,778													
Wood not available for supply & other (UGX mill)		1,535,832													
Shea pods (UGX mill)															-
Prunus africana (UGX mill)															-
Sandalwood (UGX mill)															-
Bamboo (UGX mill)															-
Sub-total (UGX mill)		3,778,610													3,778,610
Forest Products															-
Sawn wood ('000 t)							361,976							18,099	380,075
Poles (UGX mill)					14,075		237,718							12,590	264,383
Firewood h/hold (UGX mill)					146,752									7,338	154,090
Firewood Com. (UGX mill)										27523				1,376	28,899
Firewood Ind. (UGX mill)						21,867								1,093	22,960
Charcoal (UGX mill)								66,894						3,345	70,239
Sub-total (UGX mill)	-	-	-	-	*160,827*	*21,867*	*599,694*	*66,894*	-	*27,523*	-	-	-	*43,840*	*920,645*
Wood products															-
Wood articles (UGX mill)													1,815	91	1,906
Cork articles (UGX mill)													55	3	58
Straw, plaiting (UGX mill)													140	7	147
Pulp of wood (UGX mill)													87,817	4,391	92,208
Paper & board (UGX mill)													57,009	2,850	59,859
Sub-total (UGX mill)	-	-	-	-	-	-	-	-	-	-	-	*33,982*	*146,837*	*7,342*	*188,161*
Non-wood forest products														0	-
Shea butter oil (litres)	758													38	796
Prunus africana (UGX mill)	-													0	-
Sandalwood (UGX mill)						1,685								84	1,770
Sub-total (UGX mill)	*758*	-	-	-	-	*1,685*	-	-	-	-	-	-	-	*122*	2,565
Residuals															-
Wood residues (UGX mill)		1,620				162									1,782
Total (UGX mill)	1,516	1,755,230	-	-	-	3,533	-	-	-	-	-		293,673	102,609	1,113,154

Table 5.20: Monetary Use Table 2015

	Agric. production	*Forestry*	*Fishing*	*Mining & quarrying*	*Household*	*Manufacturing*	*Construction & housing*	*Wholesale & retail trade*	*Transport*	*Utilities (electricity)*	*Education, health & social work*	*Accum-ulations*	*Exportations*	*Flows to environment*	Overall total
Natural Inputs															
Seed (UGX mill)															
Seedlings (UGX mill)															
Wood available for supply															-
Broadleaved wood (UGX mill)															-
Coniferous wood (UGX mill)															-
THF WS wood (UGX mill)															-
THF LS wood (UGX mill)															-
Woodlands wood (UGX mill)															-
Forest Products															-
Sawn wood ('000 t)							361,976							18,099	380,075
Poles (UGX mill)					14,075		237,718							12,590	264,383
Firewood household (UGX mill)					146,752									7,338	154,090
Firewood comm. (UGX mill)										27523				1,376	28,899
Firewood industrial (UGX mill)						21,867								1,093	22,960
Charcoal (UGX mill)								66,894						3,345	70,239
Sub-total (UGX mill)	-	-	-	-	*160,827*	*21,867*	*599,694*	*66,894*	-	*27,523*	-	-	-	*43,840*	*920,645*
Finished products															-
Wood articles (UGX mill)													47,805	1,195	49,000
Cork articles (UGX mill)													21	1	22
Straw, plaiting (UGX mill)													351	18	369
Pulp of wood (UGX mill)													62	3	65
Paper & board (UGX mill)													91,744	4,587	96,331
Sub-total (UGX mill)	-	-	-	-	-	-	-	-	-	-	-		*139,984*	6,999	*146,983*
Non-wood forest products															-
Shea butter oil (UGX mill)					11,643								2,911		14,554-
Prunus africana (UGX mill)													758		758
Sandalwood (UGX/million)													927		927
Sub-total (UGX mill)	-	-	-	-	*11,643*	*2,911*	-	-	-	-	-	-	*4,596*	-	*16,239*
Residuals															-
wood use residues	-	-	-	-	8,041	1,093	29,985	3,345	-	1,376	-	-			43,840
Total (UGX mill)	-	-	-	-	329,695	44,827	1,229,373	137,133	-	56,422	-		283,338	100,484	1,113,154

CHAPTER 6: SCENARIO ANALYSIS

6.1 Purpose of the scenario analysis

A key finding from the wood asset accounts is the 45 percent reduction in wood stocks between 1990 and 2015. While the particularly drastic reduction between 2000 and 2005 may be linked to policy failures, there are underlying concerns about the long-term trend and the sustainability of the national wood stock, and the wood stock available for supply and not available for supply. The purpose of the scenario analysis is to evaluate how the drivers of wood consumption in Uganda are likely to affect wood demand, consumption and the sustainability of supply in the future. The analysis considers two factors: population growth and changing land cover/land use.

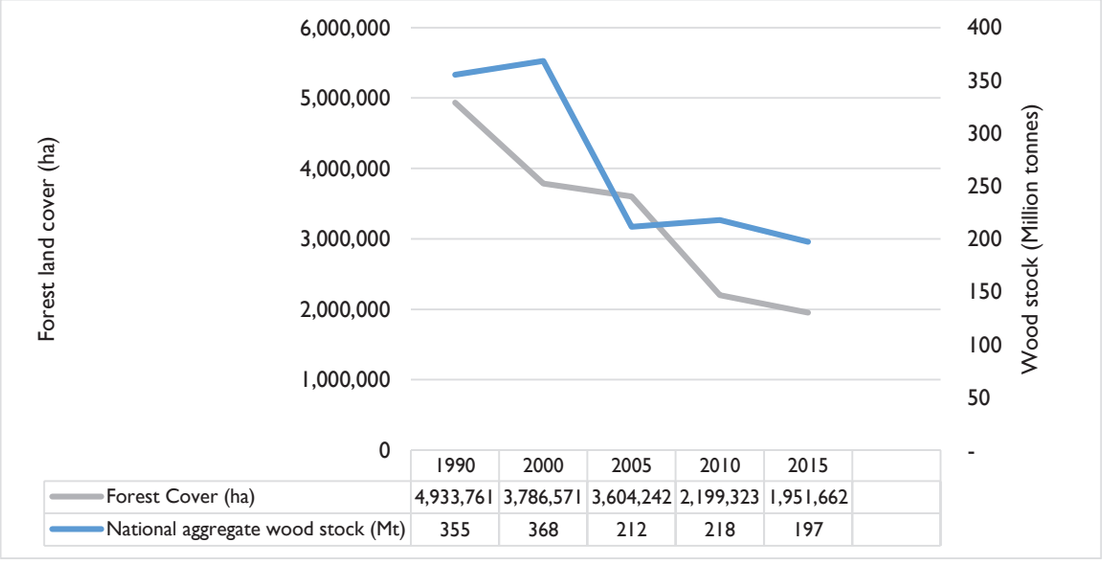
The scenario includes the following assumptions: (i) wood consumption and demand will rise in direct proportion to population growth (MEMD 2015); (ii) there are differences in fuel preference between urban and rural areas, with a higher preference for charcoal in urban areas and for firewood in rural areas; (iii) there is a linear increase in sawn wood and poles consumption, based on the sawn wood projections developed by Odokonyero (2005); and (iv) land is the major productive asset for the rural poor in Uganda, and their preference is to convert it to agriculture to increase farm output for their subsistence livelihoods and cash income (UBOS 2019).

6.2 Determinants of the decline in national wood stock

Loss of forest cover is the core challenge to forest management in Uganda, according to the conclusions of the National Biomass Survey 2005 (NFA 2009) and the National State of Forest Resources Report (MWE 2016), which was adopted in Vision 2040 and NDP-II. These Wood Assets and Forest Resources Accounts corroborate the finding of the Land Physical Accounts for Uganda (UBOS 2019) that Uganda's forest land cover reduced from 4.93 million ha in 1990 to 1.95 million ha in 2015, a loss of 60percent of area, equivalent to an average forest cover loss of 119,200 ha/year over the 25 year period (Figure 6.1).

Whereas the trends of wood stock reduction and forest cover loss head in the same direction, the trajectories do not fully match, especially between 1990 and 2005, and between 2010 and 2015 (Figure 6.1). This mismatch suggests that changes in forest land cover alone do not adequately explain the reduction in national aggregate wood stock.

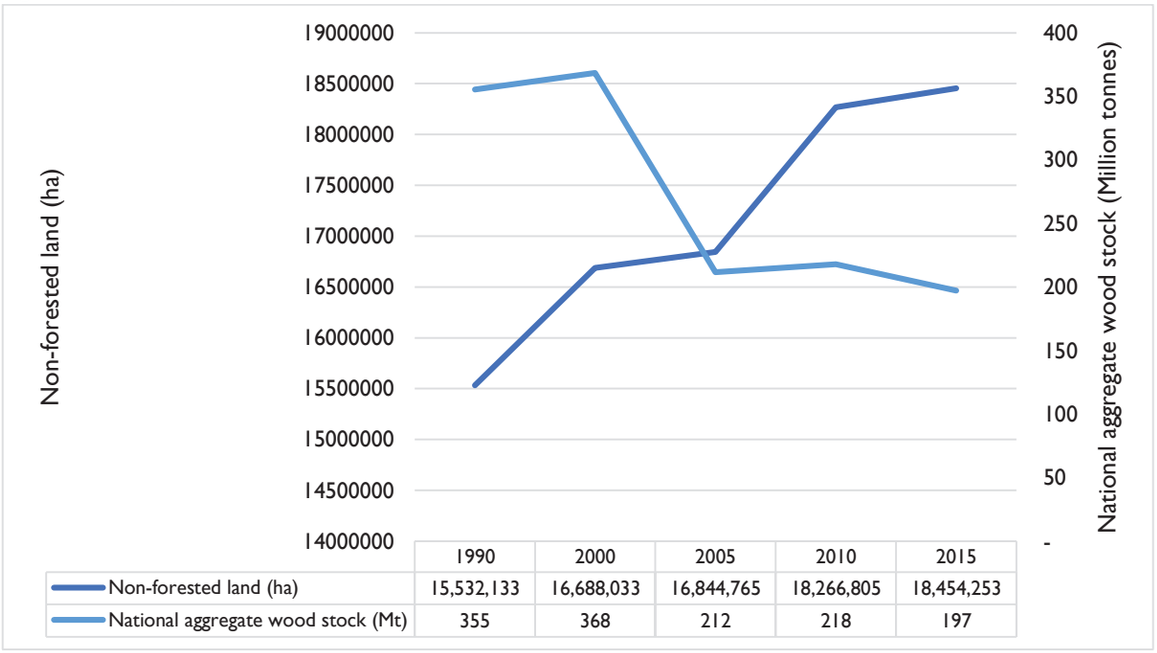
Figure 6.1: Trends of national wood stock and forest cover, 1990 to 2015



	1990	2000	2005	2010	2015
Forest Cover (ha)	4,933,761	3,786,571	3,604,242	2,199,323	1,951,662
National aggregate wood stock (Mt)	355	368	212	218	197

The trends in non-forest land area and national aggregate wood stock between 1990 and 2015 have an inverse relationship, which provides an improved explanation for the observed trends in national aggregate wood stock (Figure 6.2). Between 1990 and 2000, non-forest land increased rapidly - an indication of a fast rate of forest land conversion. Despite the loss of forest cover, the national wood stock initially nudged upwards, before declining after the year 2000. Between 2005 and 2010, the area of non-forest land again increased rapidly, yet the national wood stock rose slightly. The two periods of greatest wood stock decline were 2000 to 2005, and 2010 to 2015, which occurred when the loss of forest cover was relatively slower. These trends, which are illustrated in Figure 6.2, show that the depletion of wood stock cannot be attributed to land cover change alone.

Figure 6.2: Comparison between trends of national wood stock and non-forest land cover, 1990 and 2015



The trends of non-forest land area and the poverty rate on the one hand, and forest cover and poverty on the other, indicate a plausible relationship between 1990 and 2015 (Figure 6.3 and Figure 6.4). Poverty reduced as the area of non-forest land increased, and the forest cover reduced. It is possible that by reducing forest cover, the population was able to convert the natural capital into income and that this led to a reduction in their income poverty, and/or that the new use to which the land was put resulted in poverty reduction (e.g., from farming). Whether or not the relationship between poverty and forest cover is as described, if poverty continues to reduce as forest cover reduces, there is a risk of a perverse incentive where forest depletion is seen as a means of reducing poverty and creating wealth. The continued loss of wood assets as a tool for poverty reduction is not sustainable for many reasons, including that energy security based on the widespread use of woodfuels is itself a pillar of livelihoods, wellbeing and poverty reduction.

Figure 6.3: Comparison between poverty trends and non-forest land cover, 1990 to 2015

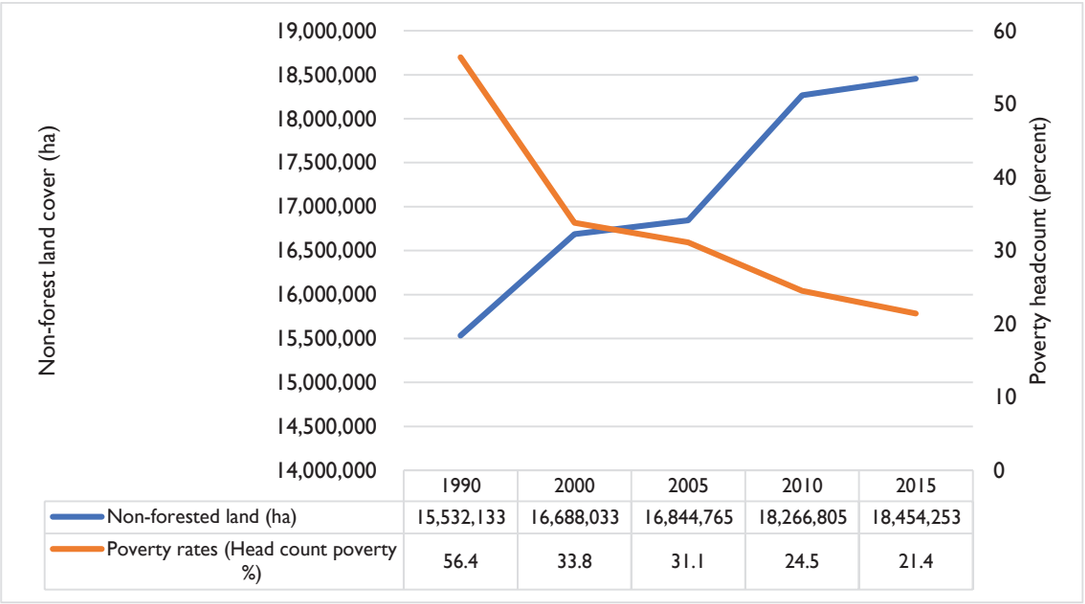
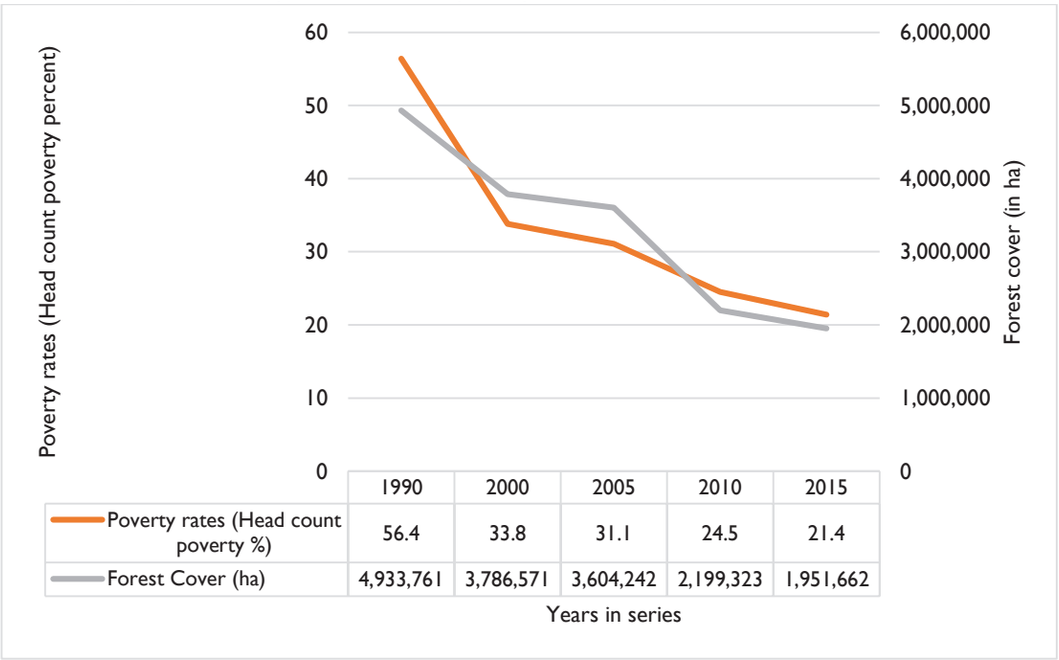
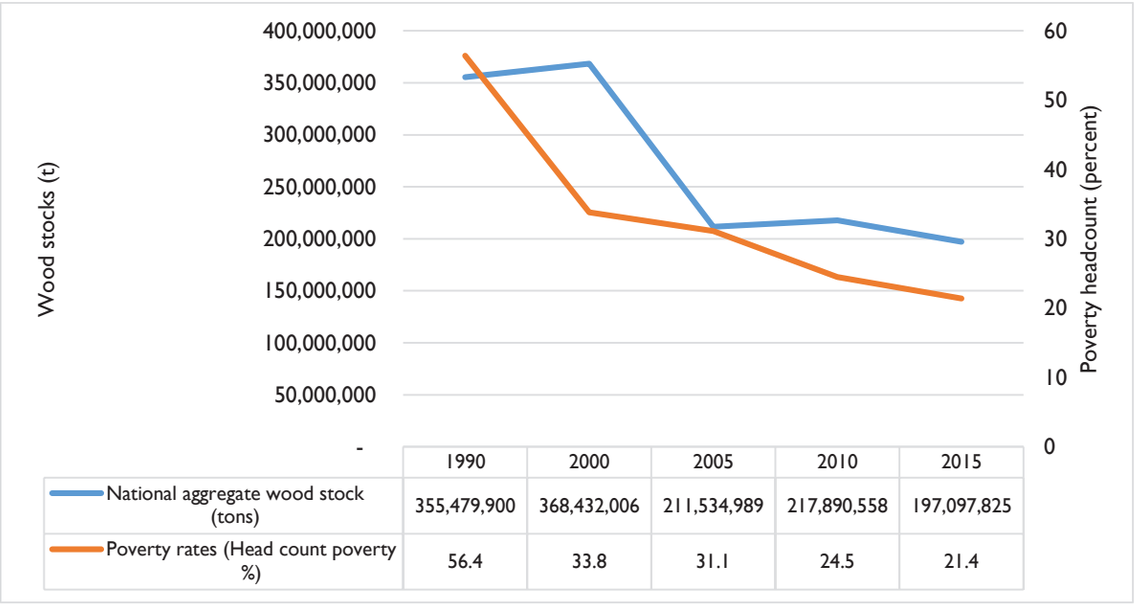


Figure 6.4: Comparison between poverty trends and forest cover, 1990 to 2015



The trends in Figure 6.4 mirror those in Figure 6.5. There seems to be a link between the poverty rate and the national wood stock, where the trend in poverty reduction generally matches the reduction in national wood stock. Given that the wood stock contributed to supply of woodfuel and timber for the construction sector, it can be construed that wood supply may have contributed to poverty reduction, but this will have been at the expense of a reduction in the aggregate wood stock in the country.

Figure 6.5: Comparison between poverty trends and forest cover, 1990 to 2015



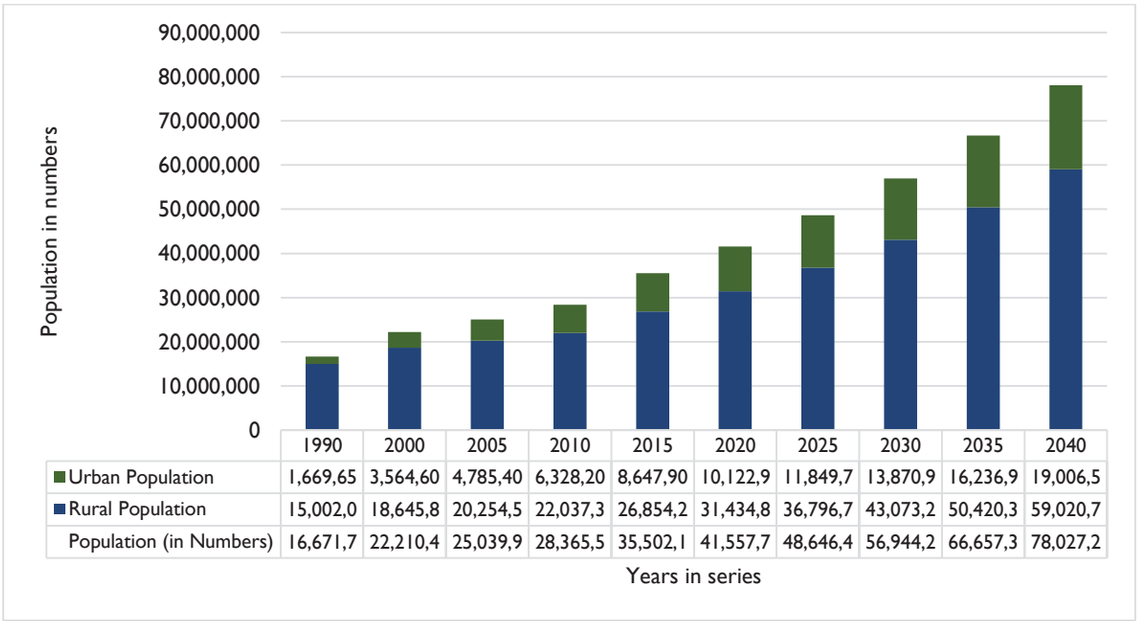
	1990	2000	2005	2010	2015
National aggregate wood stock (tons)	355,479,900	368,432,006	211,534,989	217,890,558	197,097,825
Poverty rates (Head count poverty %)	56.4	33.8	31.1	24.5	21.4

6.3 Impact of population growth on wood demand and supply

Population growth is a key driver of wood demand for both woodfuel (MEMD 2007; GoU/UGGDS 2017) and timber (Odokonyero 2005). Based on 3.2percent annual population growth and the evolving distribution of population between urban and rural areas (UBOS 2014, 2016), the projections in Figure 6.6 show that Uganda's population will increase to 66.7 million people by 2040, from 35.5 million in 2015, of which 16.2 million will be urban and 50.4 million will be rural.

According to the Ministry of Energy and Mineral Development (MEMD 2007), Uganda's average annual per capita consumption of charcoal is estimated at 4 kg for rural populations and 120 kg for urban populations, while annual per capita firewood consumption averages 680 kg for the rural population and 240 kg for the urban population.

Figure 6.6: Actual and projected population for Uganda, 1990 - 2040

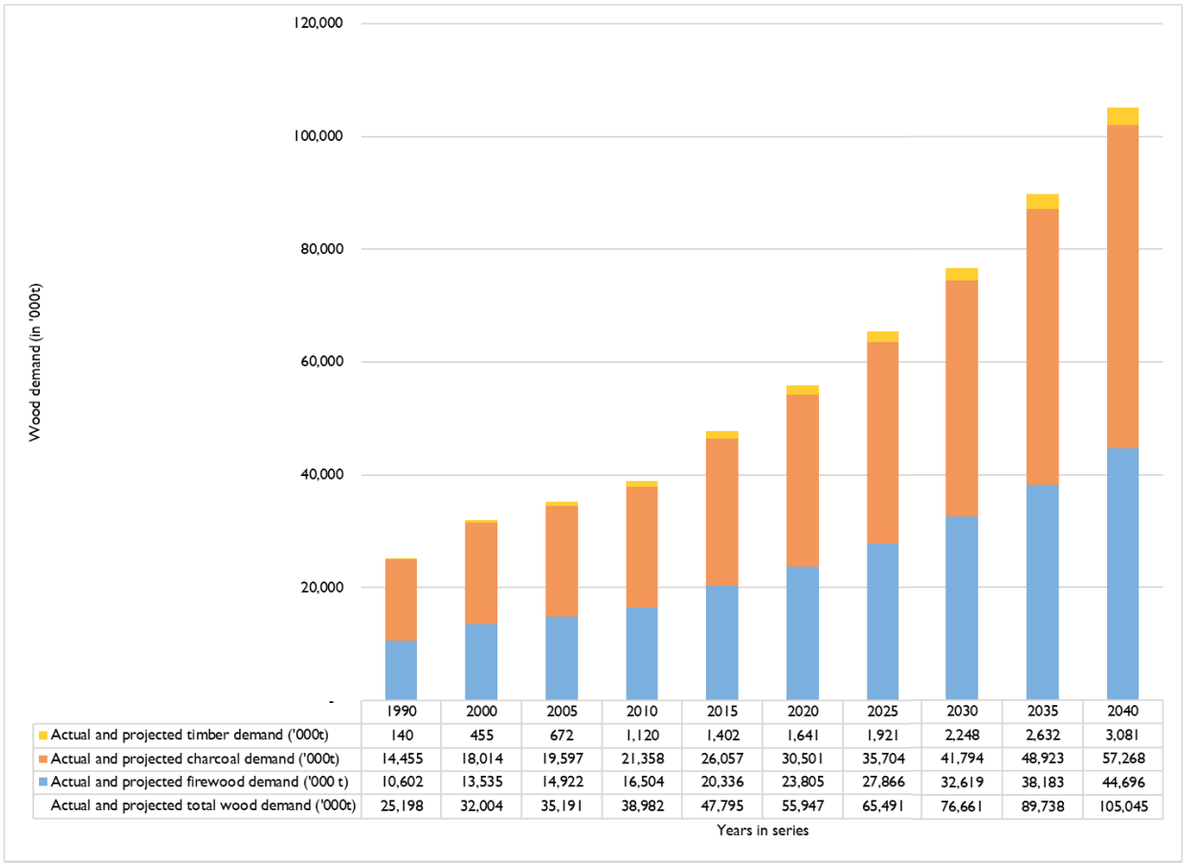


	1990	2000	2005	2010	2015	2020	2025	2030	2035	2040
Urban Population	1,669,65	3,564,60	4,785,40	6,328,20	8,647,90	10,122,9	11,849,7	13,870,9	16,236,9	19,006,5
Rural Population	15,002,0	18,645,8	20,254,5	22,037,3	26,854,2	31,434,8	36,796,7	43,073,2	50,420,3	59,020,7
Population (in Numbers)	16,671,7	22,210,4	25,039,9	28,365,5	35,502,1	41,557,7	48,646,4	56,944,2	66,657,3	78,027,2

Source: adapted from UBOS (2014)

The total wood demand for timber and woodfuel (firewood and charcoal) increased by 90percent between 1990 and 2015, from 25.2 million tonnes to 47.8 million tonnes (Figure 6.7). Under the scenario modelled, this is projected to increase by a further 88percent by 2040, to 89.7 million tonnes. The proportion of charcoal in wood consumed was 42percent in 1990, while the proportion of firewood was 36percent and that of sawlogs was 0.6percent. Between 2015 and 2040, the total wood supply converted to charcoal is projected to increase to 54percent, compared to 43percent for firewood and 3percent for sawlogs.

Figure 6.7: Actual and projected domestic wood demand for Uganda, 1990 – 2040



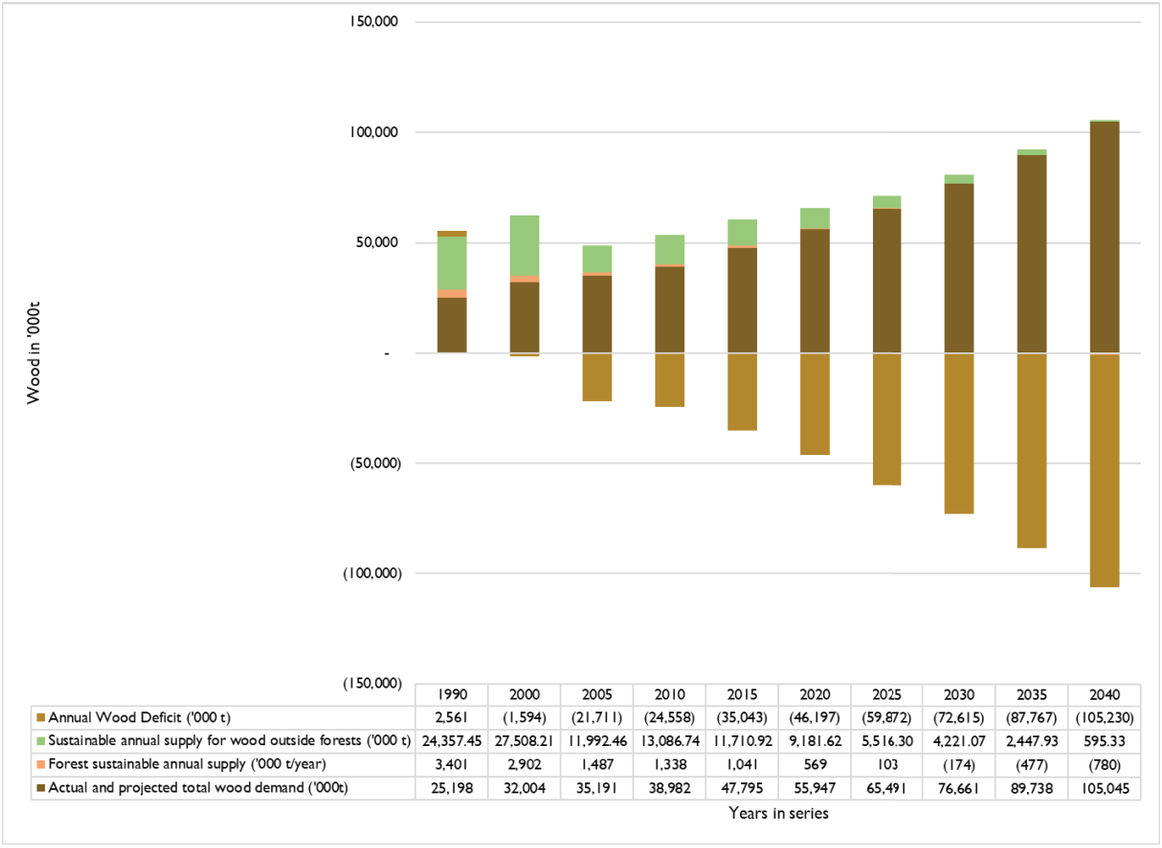
	1990	2000	2005	2010	2015	2020	2025	2030	2035	2040
Actual and projected timber demand ('000t)	140	455	672	1,120	1,402	1,641	1,921	2,248	2,632	3,081
Actual and projected charcoal demand ('000t)	14,455	18,014	19,597	21,358	26,057	30,501	35,704	41,794	48,923	57,268
Actual and projected firewood demand ('000 t)	10,602	13,535	14,922	16,504	20,336	23,805	27,866	32,619	38,183	44,696
Actual and projected total wood demand ('000t)	25,198	32,004	35,191	38,982	47,795	55,947	65,491	76,661	89,738	105,045

Source: adapted from MEMD (2007) and Odokonyero (2005)

Uganda had a deficit in sustainable wood supply every year between 1990 and 2015, with the exception of 2000. Such deficits lead to unsustainable production to fill the gap, which disrupts the wood production cycle for existing wood assets and reduces the remaining wood stocks both available and not available for supply.

Natural wood production for Uganda is based on a 30-year cycle and plantation wood production is based on a 15-year cycle (NFA 2009). Shorter rotation trees, can, however, be sustainably harvested in a seven-year cycle for woodfuel (SPGS 2016). Woodfuel is the dominant use of wood from outside forests (MWE 2016). A sustainable level of wood supply may be set, based on the available wood stock and the NFA's estimated sustainable yield from CFRs using the ISSMI approach. For wood outside CFRs, National Parks and Wildlife Reserves, the FSSD works with the District Forest Offices to estimate the sustainable wood supply. These estimates do not include commercial wood plantations, whose production cycle is established in their management plans (Principal Forest Officer-FSSD pers.com. 2019).

Figure 6.8: Actual and projected wood supply deficit against sustainable wood supplies, 1990 – 2040

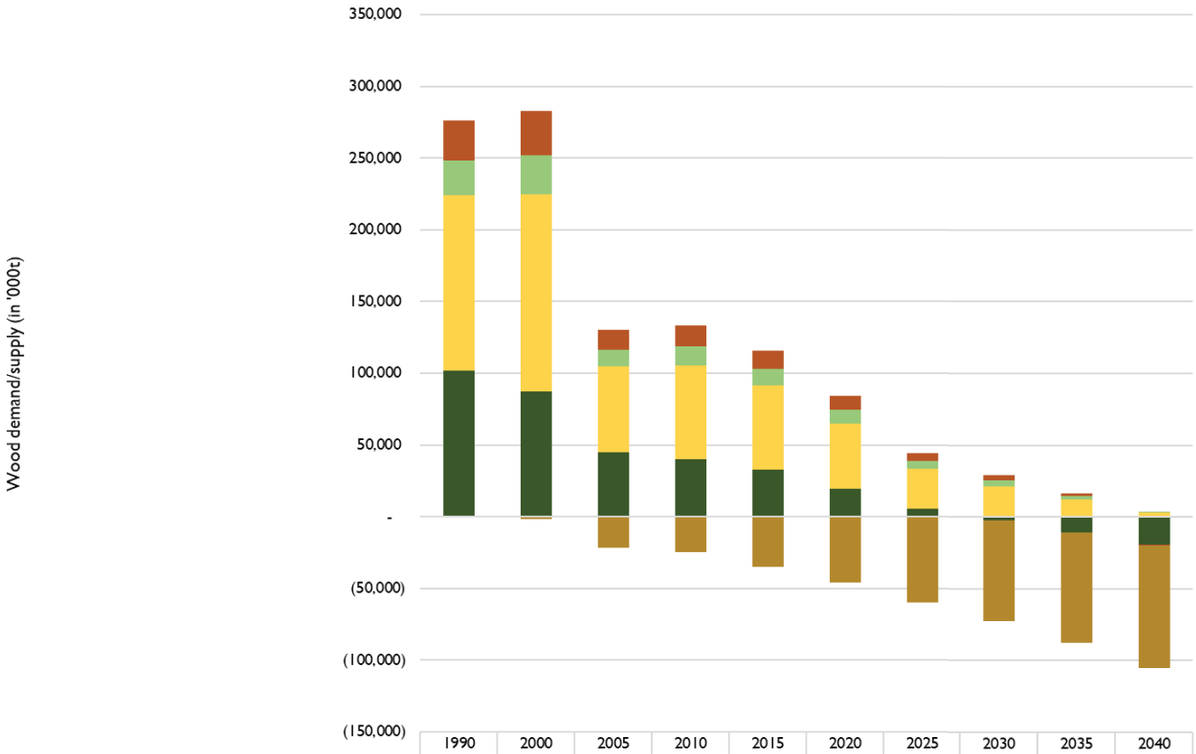


	1990	2000	2005	2010	2015	2020	2025	2030	2035	2040
Annual Wood Deficit ('000 t)	2,561	(1,594)	(21,711)	(24,558)	(35,043)	(46,197)	(59,872)	(72,615)	(87,767)	(105,230)
Sustainable annual supply for wood outside forests ('000 t)	24,357.45	27,508.21	11,992.46	13,086.74	11,710.92	9,181.62	5,516.30	4,221.07	2,447.93	595.33
Forest sustainable annual supply ('000 t/year)	3,401	2,902	1,487	1,338	1,041	569	103	(174)	(477)	(780)
Actual and projected total wood demand ('000t)	25,198	32,004	35,191	38,982	47,795	55,947	65,491	76,661	89,738	105,045

Source: adapted from MEMD (2007) and Odokonyero (2005)

Throughout the assessment period, the only time the wood supply was in surplus coincided with the highest recorded wood stocks available for supply outside Forest Reserves (Figure 6.8 and Figure 6.9). When the wood available for supply reduced by 73percent between 2000 and 2005, in a situation of rising wood demand, there was increasing pressure on wood not available for supply. The supply deficit due to depleted wood stocks was compounded by an increasing population and increasing demand for woodfuel and saw logs for timber. Under the future scenario, the wood supply deficit is projected to get worse between 2015 and 2040, with an annual deficit between demand and sustainable supply of more than 90 million tonnes by 2040. Supplies from areas defined as forest will be fully depleted by 2025, leaving an annual wood supply deficit of 72,615 tonnes by 2030. Wood available for supply from outside forests will reduce to just 3.0 million tonnes by 2040. Consequently, most of the future wood production will then have to shift to the wood from areas that have been reserved for forest and wildlife conservation.

Figure 6.9: Actual and projected wood supply trends, 1990 – 2040



	1990	2000	2005	2010	2015	2020	2025	2030	2035	2040
Annual Wood Deficit ('000 t)	2,561	(1,594)	(21,711)	(24,558)	(35,043)	(46,197)	(59,872)	(72,615)	(87,767)	(105,230)
Total Sustainable Supply ('000 t)	27,758	30,410	13,480	14,425	12,752	9,751	5,619	4,047	1,971	(185)
Sustainable annual supply for wood outside forests ('000 t)	24,357.45	27,508.21	11,992.46	13,086.74	11,710.92	9,181.62	5,516.30	4,221.07	2,447.93	595.33
Current wood available for supply outside forests ('000 t)	121,787	137,541	59,962	65,434	58,555	45,908	27,581	21,105	12,240	2,977
Current wood available for supply forests ('000 t)	102,024	87,046	44,612	40,135	32,967	19,156	5,578	(2,229)	(10,702)	(19,436)

Source: adapted from NFA (2017)

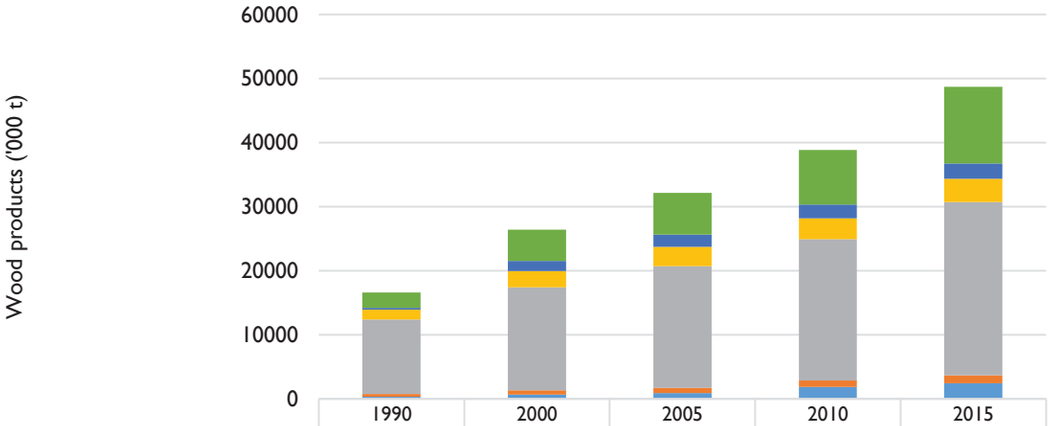
6.4 Wood products supply and use and capturing resource rents

The wood products supply captured in the supply and use tables for the period 1990 to 2015 includes sawn wood, poles, firewood and charcoal (Figure 6.10). Wood for charcoal was the dominant form of wood supply by final product, because the wood used to make the charcoal was eight times more than the weight of the charcoal itself, due to the average 12.5percent conversion efficiency of charcoal kilns in Uganda (MEMD 2016). The wood supplied in charcoal was 59 times more than the wood supplied as sawn wood, 44 times more than the wood supplied as poles and two-fifths more than the wood supplied as firewood in 1990. The quantity of wood used for charcoal is often underestimated due to huge uncertainty over the quantity consumed, the quantity exported (especially to Kenya) and the conversion efficiency of the kilns. The European Commission (2014) found that the harvest of charcoal, especially from woodlands, is not only unregulated, but also that no system exists for determining the sustainable fuel harvest to propose to charcoal producers.

Figure 6.11 shows the monetary value of wood products. The highest value between 1990 and 2005 was from household firewood, although this was overtaken by sawn wood from 2010 onwards. The monetary value of household firewood increased by two-thirds, from $37.6 million in 1990 to $62.4 million in 2005, before declining by 27percent to $45.3 million by 2015. On the other hand, the monetary value of sawn wood increased by 8.7 times over the same period, from $12.9 million to $111.7 million. The value of poles surged by 4 times, from $19.0 million in 2010 to $77.7 million in 2015, likely on the back of mature poles harvested from forests planted under the SPGS project (NFA pers. Comm. 2020), having started with a much lower value of $7.3 million in 1990. Commercial and industrial firewood and charcoal contributed the lowest value between 1990 and 2015. Charcoal

contributed a value of $19.9 million in 1990 and that had increased by just one fifth in 2015, despite a much larger increase in weight terms.

Figure 6.10: Wood products in the physical supply table, 1990 – 2040

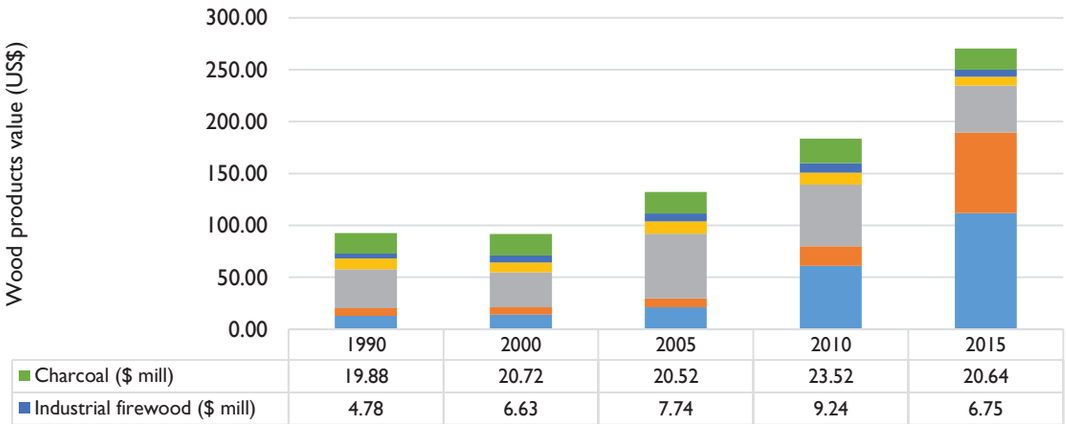


	1990	2000	2005	2010	2015
Charcoal ('000 tons)	2,396	4,880	6,506	8,535	11,962
Industrial firewood ('000 tons)	253	1,569	1,949	2,126	2,364
Commercial firewood ('000 tons)	1,534	2,550	2,993	3,256	3,656
Household firewood ('000 tons)	11,654	16,100	19,021	22,092	27,024
Poles ('000 tons)	431	659	808	1,013	1,247
Sawn wood ('000 tons)	324	652	902	1,847	2,453
Total ('000 tons)	16592	26410	32179	38869	48706

Years in series

Source: adapted from UBOS (1994, 1998, 2002, 2007, 2013, 2017)

Figure 6.11: Wood products in the monetary supply table, 1990 – 2040



	1990	2000	2005	2010	2015
Charcoal ($ mill)	19.88	20.72	20.52	23.52	20.64
Industrial firewood ($ mill)	4.78	6.63	7.74	9.24	6.75
Commercial firewood ($ mill)	10.21	9.62	11.75	11.59	8.49
Household firewood ($ mill)	37.60	33.68	62.41	59.20	45.28
Poles ($ mill)	7.31	7.03	8.52	19.03	77.70
Sawn wood ($ mill)	12.89	14.10	21.14	60.93	111.70
Total ($ mill)	92.68	91.77	132.09	183.51	270.56

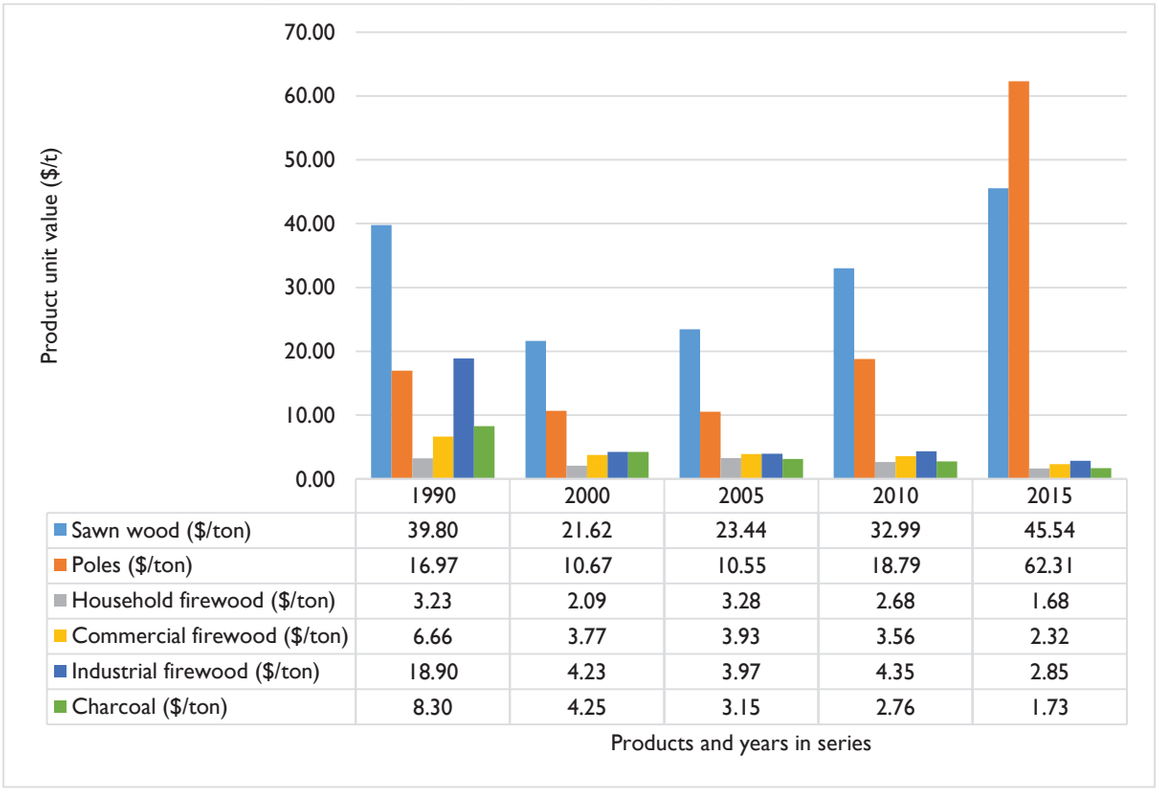
Years in series

Source: adapted from UBOS (1994, 1998, 2002, 2007, 2013, 2017)

In terms of wood product prices, household firewood had the lowest unit value, which decreased from $3.23/t in 1990 to $1.68/t in 2015, followed by charcoal prices which reduced by 4.8 times from $8.3/t to $1.7/t over the same period. In contrast, the product value of sawn wood and poles increased

over the same period by just over one-eighth and by 3.7 times, respectively. Most of the increase for poles occurred between 2010 and 2015, where the price increased by 3.3 times from $18.8/t to $62.3/t (Figure 6.12). The low price of charcoal might also be associated with the fact that a lot of charcoal is produced as part of land clearing for eventual use for agricultural production, and is therefore often is a by-product of an entirely different process.

Figure 6.12: Wood products in the supply table, 1990 – 2040



	1990	2000	2005	2010	2015
Sawn wood ($/ton)	39.80	21.62	23.44	32.99	45.54
Poles ($/ton)	16.97	10.67	10.55	18.79	62.31
Household firewood ($/ton)	3.23	2.09	3.28	2.68	1.68
Commercial firewood ($/ton)	6.66	3.77	3.93	3.56	2.32
Industrial firewood ($/ton)	18.90	4.23	3.97	4.35	2.85
Charcoal ($/ton)	8.30	4.25	3.15	2.76	1.73

Source: adapted from UBOS (1994, 1998, 2002, 2007, 2013, 2017)

Whereas charcoal cost more than household firewood and commercial firewood between 1990 and 2000, the price of charcoal was generally low and only marginally higher than the price of household firewood. The fact that the prices of wood for charcoal are this low, despite the manufacturing process for charcoal which means that eight times as much wood is used as the charcoal produced, raises important questions on the resource rents in wood product value chains. The resource rent of a natural resource is the total revenue that can be generated from the extraction of that resource, less the cost of its extraction, including a normal return on investment to the extractive enterprise (Bostock et al. 2004). The wood value chain involves cutting of trees and extraction of logs for sawn wood or poles. The trees that not are valued for timber or poles are used for firewood and charcoal. The lowest-valued wood, which in this case is industrial firewood, is what would be processed into charcoal. Even if the prices captured for industrial firewood included some transportation costs, it is very unlikely that the charcoal price would be able to meet or even exceed the acquisition and extraction cost for wood. The only way charcoal can be sold in a value chain is when the extraction cost is absent and only labour costs, other input costs and a very small return are considered by the charcoal makers. It is very unlikely, therefore, that charcoal production is undertaken through a process of legally extracting wood and integrating extraction costs. The charcoal value chain more likely consists of subsistence charcoal makers who expand by acquiring wood at no extraction cost and/or illegally and sell to middlemen at extremely low prices.

The structure of such a market means that even though technologies to improve the efficiency of wood used in charcoal production exist, they are constrained by the very low value of the charcoal production component of the value chain. The charcoal value chain does not allow producers to retain income to invest in any improved technology, as there is an assumption of negligible extraction value on the wood used for charcoal production. The charcoal value chain would have to be reformed to allow charcoal producers retain more revenue, pay an extraction value for wood, and therefore capture wood flow information that would make investment in more efficient charcoal production methods viable. Any value chain actor at the level of woodfuel producer would be better off selling industrial firewood, commercial firewood, or household firewood. The charcoal producers likely participate in the charcoal value chain because their scale of production is higher and returns to scale outweigh income from the sale of firewood, or because access to firewood markets is limited, which could be the case for remote communities since charcoal has a higher energy density than firewood and can be transported further to meet the high demand in urban areas (European Commission 2014; MEMD 2016; MWE and IUCN 2019).

CHAPTER 7: CONCLUSIONS AND EMERGING ISSUES

7.1 Conclusions

The results of the assessment of wood assets show that national aggregate wood stock in Uganda reduced by 45percent between 1990 and 2015, from 355 million tonnes to 197 million tonnes. After an initial 4percent increase in wood biomass between 1990 and 2000, the national wood stock suffered a dramatic reduction of 42percent from 2000 to 2005. There was a modest 3percent recovery between 2005 and 2010, followed by a further decrease of 9percent between 2010 and 2015.

Whereas a reduction in the area of forest cover was an important factor in this decline in wood stock, an increase in wood biomass stocking within forest areas seemed to outweigh the loss until around 2000. The decrease in forest land cover up to that point was largely due to a reduction in woodland cover, which is the lowest stocked forest cover category. The area of THF well-stocked, whose wood stock density is 20 times higher than woodlands, actually increased up to 2000. In addition, the small-scale farmlands, bushlands, grasslands to which the forest was converted still retained a wood density equivalent to 80percent that of woodlands.

From around 2000 onwards, the adverse impacts of factors such as reforms in forest governance and associated reductions in technical and regulatory support for forests on private land and CFRs located in remote areas, resulted in the drastic decline recorded in the national aggregate wood stock between 2000 and 2015. This led to a 53percent reduction in the wood available for supply (Figure 4.2). The reduction in wood available widened the relatively small deficit in wood supply of 1.6 Million tonnes in 2000, to 21.7 million tonnes by 2015 (Figure 6.9). With such a large wood supply deficit, additional policy instruments are now needed to restore the wood stocks, alongside other instruments to minimize growth in wood demand, because the projections outlined in this report illustrate that the utilization rate of the country's national aggregate wood stocks is increasingly unsustainable.

In 2004, the GoU, with support from the European Union, started implementing the SPGS to reduce the supply deficit of sawn wood and woodfuel that had been reported in the National Biomass Survey (2002) and Odokonyero (2005). The combination of supply from SPGS-supported plantations and other plantation wood led to a doubling in plantation wood stock, from 0.86 million tonnes in 2005 to 1.7 million tonnes in 2015. Despite such efforts to increase forest plantations, the national aggregate wood stock reduced by 14.4 million tonnes over the same 10-year period and the wood stock from plantations only reduced the scale of this loss by 6percent. Therefore, in addition to the efforts of wood stock enhancement through wood plantations, much greater effort needs to be directed to natural forests and wood outside forests.

Under a realistic forward scenario, wood demand is projected to increase by 2.2 times between 2015 and 2040, from 48 million tonnes to 105 million tonnes. Based on a continuation of current supply trends and per capita extraction rates from forests, sustainable wood supply from forest land will be zero by 2025, and there will be a wood supply deficit of 174,000 tonnes in 2030. The actual wood supply deficit increased by 22 times from 1.6 million tonnes to 35.0 million tonnes between 2000 and 2015, and is projected to reach 105.2 million tonnes in 2040. All the sustainable wood supply outside and inside forests will then have been depleted by 2035, and any additional harvest will then deplete the conservation wood stock inside protected areas. The exploitation and depletion of the conservation wood stock is, however, assumed to have already started from 2025, when the forest wood available for supply is projected to have run out.

Two-thirds of the recorded reduction in national wood stock between 1990 and 2015 occurred on private land. Despite this large reduction, private land still contained 40percent of the national aggregate wood stock in 2015. Under the former National Forestry Policy (1988) and the Forest Act, Cap. 246, forest production on both public land and private land was regulated by the Forest

Department, and District Forest Officers implemented a unified forest management system. The decentralized management system brought in with the Uganda Forestry Policy (2001) and the National Forestry and Tree Planting Act (2003) gave back the management of forest resources on private land to private individuals, with the technical and supervisory support of Local Governments through the District Forest Service. A national structure under the FSSD provides technical support to the District Forest Service on the determination of quotas for commercial harvest of saw logs within the local government for both LFRs and natural forest on private land. However, a lot of the wood harvest in communities is for subsistence use and is based on the need for woodfuel, construction materials and timber within the community and neighbouring areas. The regulation of production and trade in woodfuel is a responsibility of local governments. The prohibitively high cost of cooking gas and electricity and the associated cooking appliances, as well as cultural preferences, continue to drive woodfuel demand. In addition, the limited financial and human capacity at the disposal of local governments means that the bulk of woodfuel production and transportation is effectively illegal (European Commission 2014), given the challenge of enforcing complex regulations pertaining to the harvesting, processing, transport and sale of woodfuels and other wood products.

The supply and use tables show the supply of sawn wood, poles, charcoal and commercial, household and industrial firewood to various sectors of the economy. The supply tables show that between 1990 and 2015, whereas the quantity of wood used to produce charcoal was 40 to 60 times, 45 to 75 times and 1.4 to 3 times greater than the supply of wood used as sawn wood, poles and firewood, respectively. The total value of charcoal was only one-third higher than that of sawn wood in 1990, and by 2015 the monetary value of sawn wood supplied was 5.4 times higher than that of charcoal. Similarly, poles were valued at 3.8 times more than charcoal in 2015, from just two-thirds of the value of charcoal in 1990. However, the monetary value of firewood was higher than the value of charcoal throughout the assessment period of 1990 to 2015.

Farm gate prices of wood for making charcoal were lower than the prices of all other wood inputs, including the three categories of firewood. Even the prices of industrial wood (the cheapest category of firewood) were between 3.3 times and 18 times higher than the prices of wood supplied in charcoal. The very low prices in the wood for charcoal suggest that the prospects of capturing resource rents for charcoal are very low or absent. Instead, charcoal as the leading product of the wood supply chain is likely one of the leading causes of wood stock depletion in the country. A study on forest financial analyses in the Northern Moist landscape showed strong viability of sawn wood, poles and firewood, indicating the significant potential of economic resource rents from some of the products of sawn wood and poles (IUCN and MWE 2018).

The supply and use tables also showed that Uganda's wood product trade deficit reduced by almost 90percent, from UGX 63 billion in 2000 to UGX 7 billion in 2015, as Ugandan companies increased their paper product processing capacity. The leading wood-based import was paper and paper board, which reduced from a peak of UGX 193 billion in 2010 to UGX 57 billion in 2015. On the other hand, Uganda's leading wood product export, which was also paper and paper board, surged to UGX 92 billion in 2015 from UGX 23 billion in 2010. The economic activity related to the NWFPs of shea oil and *Prunus africana* bark was only recorded in 2010, while sandalwood oil was also recorded in 2015. The combined economic activity for these NWFPs was valued at UGX 280 billion, of which UGX 15 billion was for exports.

7.2 Emerging issues

1. The adverse impacts of poor forest governance and wood use, the wood supply deficit that started between 2000 and 2005, and the high and growing demand for wood, were as much the cause of the drastic decline in the national aggregate wood stock as the decrease in forest land cover. The prospects for reversing losses of forest land cover, or indeed for restoring forest cover to 1990 levels in line

with Vision 2040, would be enhanced by concurrently addressing the drivers of deforestation and wood stock depletion, especially land conversion for agriculture, low efficiency in woodfuel production and use (especially charcoal), and the rising demands for agricultural land and energy associated with a high population growth rate.

2. Wood stock outside forests, particularly on private land, is an important category of wood that has not been fully integrated into national policy and regulation. These Wood Asset and Forest Resources Accounts show that wood outside forests was the country's leading source of wood supply from 1990 to 2015. In addition to new guidelines on tree production and silvicultural management on such lands, efforts are needed to incentivize forest development on small-scale farmlands, grasslands and other land covers, alongside the recovery of large landscapes for reforestation and afforestation.

3. The high demand for wood is largely an outcome of the large volume of wood used for the production of charcoal. Since the 1970s, it has been documented that Uganda's charcoal kilns are inefficient (MWLE/FD 1991; MWE 2016). However, the adoption of more efficient carbonization methods has been negligible. The analysis in these accounts shows that there are few economic incentives for the adoption of improved kilns because, based on the price, wood used for charcoal has a much lower value than it does as firewood. A new market structure needs to be created that includes the extraction cost and resource rents for charcoal, in the same way as sawn wood and poles can.

4. Efforts to support tree planting through mechanisms like the SPGS are relatively small compared to the scale of wood demand in the country. Wood production in order to reduce the supply deficit has to take place at a much larger, landscape-scale, with a stronger focus on natural forest cover as well as plantations. The trends in forest cover versus wood stock between 1990 and 2000 show that improvement in forest management and wood production practices can increase the stocking density of wood, even when the increases in forest land cover are relatively small.

5. The next steps in the improvement of the forest accounts are to elaborate the scale of supply and demand for NWFPs, to quantify their contribution more accurately, and to revise the accounts to reflect the new information acquired, particularly on wood assets, in order to inform revisions to the natural capital contributions in the estimates of Gross Domestic Product and Gross National Income. There are also opportunities to start thinking beyond the forest accounts and into the Social Accounting Matrix (SAM)[16], and analyses on how forestry investments can be used to leverage poverty reduction, e.g., by enhancing energy security and ecosystem services that improve food security and the attainment of basic needs of shelter and good health, among others.

[16] A SAM is a comprehensive economy-wide database that records transactions between economic agents for a specified period of time.

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ANNEXES

ANNEX 1: Forest land by Forest Landscape Restoration zones

Annex 1.1: Afro-montane FLR zone

The Afromontane landscape is the smallest of Uganda's seven forest restoration landscapes and covers 1.4 million ha, equivalent to 6percent of the country's area. Forest covered 260,762 ha (or 18.6percent) of this landscape in 1990. THF well-stocked made up 57.8percent of the forest land, followed by woodlands with 31.4percent and THF low-stocked with 9.3percent. From 1990 to 2015, the forest area within the Afro-montane landscape reduced by just 2,841 ha. The areas of THF well-stocked increased by 23.8percent and plantations by 81.7percent, while the area of woodland decreased by 40percent and THF low-stocked by 37percent.

Forest land in the Afro-montane FLR zone, 1990 to 2015 (in hectares)

	Forest land (ha)					
	Broadleaved plantations	Coniferous plantations	THF well-stocked	THF low-stocked	Woodlands	**Total**
1990 - 2000						
Opening stock (1 Jan 1990)	244	3,542	150,759	24,169	82,048	**260,762**
Additions	653	70	55,324	1,917	3,603	**61,567**
Reductions	34	1,073	3,495	17,006	39,959	**61,567**
Net change	619	(1,003)	51,829	(15,089)	(36,356)	**-**
Closing stock (31 Dec 1999)	863	2,539	202,588	9,080	45,692	**260,762**
2000 - 2005						**-**
Opening stock (1 Jan 2000)	581	2,509	197,599	6,181	44,504	**251,374**
Additions	68	466	13,757	-	8,917	**23,209**
Reductions	152	120	4,111	6,178	12,648	**23,209**
Net change	(84)	346	9,646	(6,178)	(3,730)	**-**
Closing stock (31 Dec 2004)	496	2,855	207,245	3	40,774	**251,373**
2005 - 2010						**-**
Opening stock (1 Jan 2005)	624	4,062	202,175	-	29,993	**236,854**
Additions	90	130	5,937	9,331	17,452	**32,940**
Reductions	139	400	23,353	-	9,046	**32,940**
Net change	(49)	(271)	(17,417)	9,331	8,406	**-**
Closing stock (31 Dec 2009)	575	3,791	184,758	9,331	38,399	**236,854**
2010-2015						**-**
Opening stock (1 Jan 2010)	2,155	5,044	187,647	11,619	51,456	**257,921**
Additions	295	121	6,315	7,143	4,290	**18,164**
Reductions	546	192	7,332	3,539	6,556	**18,164**
Net change	(251)	(71)	(1,017)	3,604	(2,266)	
Closing stock (31 Dec 2014)	1,904	4,974	186,630	15,223	49,190	**257,921**

Annex 1.2: Karamoja FLR zone

While the Karamoja FLR zone covers a significant area of 2.8 million ha, or 11percent of the national surface area, forest land covered only 3.5percent of this landscape in 1990, all of which was woodlands. Between 1990 and 2015, the forest area increased by 44.3percent (43,698 ha). The woodland area increased by 44.2percent and there was minor regeneration of THF low-stocked from zero in 1990 to 184 ha by 2000, though all of this was lost by 2015. Between 2005 and 2010, there was also regeneration of THF well-stocked, which peaked at 264 ha in 2010 before reducing to 45 ha by 2015. Broadleaved plantations covered just 33 ha by 2015, as a result of planting activity between 2005 and 2015.

Forest land in the Karamoja FLR zone, 1990 to 2015 (in hectares)

	Forest land (ha)					
	Broadleaved plantations	Coniferous plantations	THF well-stocked	THF low-stocked	Woodlands	**Total**
1990 - 2000						
Opening stock (1 Jan 1990)	-	-	-	-	98,601	**98,601**
Additions	-	-	-	184	-	**184**
Reductions	-	-	-	-	184	**184**
Net change	-	-	-	184	(184)	**-**

	Forest land (ha)					
	Broadleaved plantations	Coniferous plantations	THF well-stocked	THF low-stocked	Woodlands	**Total**
Closing stock (31 Dec 1999)	-	-	-	184	98,417	**98,601**
2000 - 2005						**-**
Opening stock (1 Jan 2000)	-	-	-	588	107,036	**107,624**
Additions	-	-	-	-	588	**588**
Reductions	-	-	-	588	-	**588**
Net change	-	-	-	(588)	588	**-**
Closing stock (31 Dec 2004)	-	-	-	-	107,624	**107,624**
2005 - 2010						**-**
Opening stock (1 Jan 2005)	-	-	-	-	103,784	**103,784**
Additions	2	4	107	9	-	**122**
Reductions	-	-	-	-	123	**123**
Net change	2	4	107	9	103,661	**103,783**
Closing stock (31 Dec 2009)	2	4	107	9	(123)	**(1)**
2010-2015						**-**
Opening stock (1 Jan 2010)	16	1	264	2	142,014	**142,297**
Additions	17	-	-	-	209	**226**
Reductions	-	1	219	2	3	**225**
Net change	33	-	45	-	142,221	**142,299**
Closing stock (31 Dec 2014)	17	(1)	(219)	(2)	206	**1**

Annex 1.3: Lake Victoria Crescent FLR zone

The Lake Victoria crescent occupies an area of 5.2 million ha, or 22percent of the country's surface. However, forest land was just 4.6percent of this landscape in 1990. THF well-stocked, woodlands and THF low-stocked accounted for 42.2percent, 29.32percent and 27.4percent of the forest land, respectively. Woodlands accounted of just 1.1percent of the forest in the landscape. Between 1990 and 2015, the forest land reduced by 38.0percent, from 237,342 ha to 147,138. The largest reduction was for THF well-stocked, which reduced by 49.0percent from 100,090 ha in 1990 to 51,093 ha in 2015. The THF low-stocked reduced by 51.5percent from 64,944 to 31,467 ha, while woodlands reduced by 35.4percent from 69,599 to 51,943 ha. Broadleaved plantations reduced from 2,266 ha to 1,842 ha, while coniferous plantations increased from 444 ha to 718 ha.

Forest land in the Lake Victoria Crescent FLR zone, 1990 to 2015 (in hectares)

	Forest land (ha)					
	Broadleaved plantations	Coniferous plantations	THF well-stocked	THF low-stocked	Woodlands	**Total**
1990 - 2000						
Opening stock (1 Jan 1990)	2,266	444	100,090	64,944	69,599	**237,343**
Additions	407	231	36,171	13,027	16,401	**66,237**
Reductions	1,166	430	13,160	44,313	7,169	**66,238**
Net change	(759)	(200)	23,012	(31,285)	9,232	**-**
Closing stock (31 Dec 1999)	1,507	244	123,102	33,658	78,831	**237,342**
2000 - 2005						**-**
Opening stock (1 Jan 2000)	1,216	372	121,832	27,671	64,192	**215,283**
Additions	1,049	1,244	4,301	30,644	32,170	**69,408**
Reductions	498	151	49,281	13,465	6,014	**69,409**
Net change	551	1,094	(44,980)	17,179	26,157	**1**
Closing stock (31 Dec 2004)	1,767	1,466	76,852	44,850	90,349	**215,284**
2005 - 2010						**-**
Opening stock (1 Jan 2005)	1,518	2,406	67,259	33,769	47,874	**152,826**
Additions	1,358	643	16,782	14,259	13,705	**46,747**
Reductions	800	188	13,723	21,662	10,374	**46,747**
Net change	558	456	3,059	(7,403)	3,330	**-**
Closing stock (31 Dec 2009)	2,076	2,862	70,318	26,366	51,204	**152,826**
2010-2015						**-**
Opening stock (1 Jan 2010)	4,145	5,930	65,633	22,783	48,646	**147,137**
Additions	2,238	913	2,297	15,491	7,445	**28,384**
Reductions	396	196	16,838	6,807	4,148	**28,385**
Net change	1,842	718	(14,541)	8,684	3,297	**-**
Closing stock (31 Dec 2014)	5,987	6,648	51,093	31,467	51,943	**147,138**

Annex 1.4: Northern Moist Farmlands FLR zone

The largest FLR zone in Uganda is the Northern Moist. The landscape covers 5.7 million ha, equivalent to 24percent of Uganda's surface area. Forest land covered 16.5percent in 1990, nearly all of it in woodlands. THF well-stocked and plantations covered only 0.15percent and 0.16percent, respectively. The forest area in the Northern Moist decreased by 75percent from 942,924 ha in 1990 to 237,145 ha in 2015. The dominant woodlands decreased by 76percent from 939,986 ha to 229,509 ha, over the same period. THF low-stocked increased to 2,001 ha, the THF well-stocked reduced from 1,417 ha to 240 ha, while forest plantations increased from 1,521 ha to 5,395 ha.

Forest land in the Northern Moist Farmlands FLR zone, 1990 to 2015 (in hectares)

	Forest land (ha)					
	Broadleaved plantations	Coniferous plantations	THF well-stocked	THF low-stocked	Woodlands	**Total**
1990 - 2000						
Opening stock (1 Jan 1990)	668	853	1,417	-	939,986	**942,924**
Additions	495	112	282	473	463	**1,825**
Reductions	352	396	232	-	844	**1,824**
Net change	142	(283)	49	473	(382)	**(1)**
Closing stock (31 Dec 1999)	810	570	1,466	473	939,604	**942,923**
2000 - 2005						**-**
Opening stock (1 Jan 2000)	663	438	1,938	521	718,007	**721,567**
Additions	275	410	824	90	1,133	**2,732**
Reductions	391	13	602	518	1,208	**2,732**
Net change	(116)	397	222	(428)	(75)	**-**
Closing stock (31 Dec 2004)	547	835	2,160	93	717,932	**721,567**
2005 - 2010						**-**
Opening stock (1 Jan 2005)	1,251	521	1,558	52	319,941	**323,323**
Additions	388	140	486	444	405	**1,863**
Reductions	176	49	150	52	1,435	**1,862**
Net change	212	91	336	392	(1,030)	**1**
Closing stock (31 Dec 2009)	1,463	611	1,894	444	318,911	**323,323**
2010-2015						**-**
Opening stock (1 Jan 2010)	1,681	3,439	1,988	550	229,486	**237,144**
Additions	406	133	21	1,569	551	**2,680**
Reductions	117	147	1,769	118	528	**2,679**
Net change	289	(14)	(1,748)	1,450	23	**-**
Closing stock (31 Dec 2014)	1,970	3,425	240	2,001	229,509	**237,145**

Annex 1.5: South East Lake Kyoga Flood Plains FLR zone

The South East Lake Kyoga Flood Plains *FLR zone* covers 2.2 million ha, or 9percent of Uganda's surface area. But just 3.2percent of this landscape is forest, the lowest among the seven forest landscapes. Despite its small size, the forest land area for the South East Lake. Kyoga landscape still reduced by 44.4percent from 7,139 ha in 1990 to 3,966 ha in 2015. The woodlands, which are the main forest land type in this landscape, decreased from 6,880 ha to 3,449 ha. THF well-stocked regenerated between 2000 and 2015 to reach 155 ha, while coniferous plantations saw a slight increase from 252 to 291 ha and broadleaved plantations increased tenfold from a small base of 7 ha in 1990 to 71 ha in 2015.

Forest land in the South East Lake Kyoga Flood Plains FLR zone, 1990 to 2015 (in hectares)

	Forest land (ha)					
	Broadleaved plantations	Coniferous plantations	THF well-stocked	THF low-stocked	Woodlands	**Total**
1990 - 2000						
Opening stock (1 Jan 1990)	7	252	-	-	6,880	**7,139**
Additions	-	257	-	-	15	**272**
Reductions	3	13	-	-	257	**273**
Net change	(3)	244	-	-	(242)	**(1)**
Closing stock (31 Dec 1999)	4	496	-	-	6,639	**7,139**
2000 - 2005						**-**
Opening stock (1 Jan 2000)	198	334	144	-	4,191	**4,867**
Additions	-	16	-	-	263	**279**
Reductions	119	-	144	-	16	**279**

Net change	(119)	16	(144)	-	248	**1**
Closing stock (31 Dec 2004)	79	349	-	-	4,438	**4,866**
2005 - 2010						**-**
Opening stock (1 Jan 2005)	19	9	-	-	2,239	**2,267**
Additions	41	3	144	-	16	**204**
Reductions	19	-	-	-	185	**204**
Net change	22	3	144	-	(169)	**-**
Closing stock (31 Dec 2009)	41	12	144	-	2,070	**2,267**
2010-2015						**-**
Opening stock (1 Jan 2010)	60	284	148	-	3,474	**3,966**
Additions	11	7	7	-	-	**25**
Reductions	-	-	-	-	25	**25**
Net change	11	7	7	-	(25)	**-**
Closing stock (31 Dec 2014)	71	291	155	-	3,449	**3,966**

Annex 1.6: Southwest Rangelands FLR zone

The Southwest Rangelands *FLR zone* covers 3.2 million ha, equivalent to 13percent of country's surface area. The forest area was 10.2percent of the landscape, of which the largest proportion was woodlands (covering 84percent). THF well-stocked (9.0percent) and THF low-stocked (6.1percent) were the other main forest lands. Between 1990 and 2015, the forest land area in the Southwest Rangelands halved from 327,014 ha to 162,641 ha. The forest area of woodlands reduced by 59percent from 275,496 to 112,525 ha, THF well-stocked reduced by 30.3percent from 29,957 to 20,497 ha, while THF low-stocked reduced by 71percent from 19,957 to 5,754 ha over the same period.

Forest land in the Southwest Rangelands FLR zone, 1990 to 2015 (in hectares)

	Forest land (ha)					
	Broadleaved plantations	Coniferous plantations	THF well-stocked	THF low-stocked	Woodlands	**Total**
1990 - 2000						
Opening stock (1 Jan 1990)	202	1,964	29,395	19,957	275,496	**327,014**
Additions	153	332	9,108	35,328	5,763	**50,684**
Reductions	199	227	9,066	5,971	35,221	**50,684**
Net change	(46)	105	42	29,357	(29,458)	**-**
Closing stock (31 Dec 1999)	155	2,069	29,437	49,314	246,038	**327,013**
2000 - 2005						**-**
Opening stock (1 Jan 2000)	200	2,015	28,276	33,185	226,782	**290,458**
Additions	244	628	1,851	15,438	13,987	**32,148**
Reductions	200	94	7,573	12,465	11,816	**32,148**
Net change	43	534	(5,722)	2,974	2,171	**-**
Closing stock (31 Dec 2004)	244	2,549	22,554	36,159	228,954	**290,460**
2005 - 2010						**-**
Opening stock (1 Jan 2005)	198	2,267	20,439	12,887	109,398	**145,189**
Additions	639	5,444	2,920	1,290	6,674	**16,967**
Reductions	161	36	1,448	6,879	8,443	**16,967**
Net change	478	5,408	1,472	(5,589)	(1,769)	**-**
Closing stock (31 Dec 2009)	676	7,674	21,911	7,298	107,629	**145,188**
2010-2015						**-**
Opening stock (1 Jan 2010)	1,142	18,234	20,977	4,766	117,522	**162,641**
Additions	2,564	2,871	518	3,439	414	**9,806**
Reductions	-	478	999	2,451	5,879	**9,807**
Net change	2,564	2,393	(480)	988	(5,465)	**-**
Closing stock (31 Dec 2014)	3,706	20,627	20,497	5,754	112,057	**162,641**

Annex 1.7: Western Mid-Altitude Farmlands FLR zone

The Western Mid-Altitude Farmlands is the third largest landscape after the Northern Moist and Lake Victoria Crescent, cover 3.7 million ha (15percent of Uganda's surface area). In 1990, the forest land was 20.1percent of this landscape, dominated by woodlands (50.3percent) and THF well-stocked (41.4percent), while THF low-stocked covered 7.6percent. The forest area decreased by one third from 743,747 ha to 494,813 ha between 1990 and 2015, due to a 46percent decrease in woodlands from 374,263 ha to 202,503 ha and a 17.8percent reduction in THF well-stocked area from 308,107 ha to 2353,398 ha. The THF low-stocked area halved from 56,561 ha to 28,485 ha, while the area of forest plantations increased by 2.2 times from 4,816 ha to 10,427 ha.

Forest land in the Western Mid-Altitude Farmlands FLR zone, 1990 to 2015 (in hectares)

	Forest land (ha)					
	Broadleaved plantations	Coniferous plantations	THF well-stocked	THF low-stocked	Woodlands	Total
1990 - 2000						
Opening stock (1 Jan 1990)	679	4,137	308,107	56,561	374,263	743,747
Additions	0	617	32,974	56,869	26,911	117,371
Reductions	525	1,342	45,914	29,953	39,637	117,371
Net change	(525)	(725)	(12,941)	26,916	(12,726)	(1)
Closing stock (31 Dec 1999)	154	3,412	295,166	83,478	361,537	743,747
2000 - 2005						-
Opening stock (1 Jan 2000)	313	2,499	284,611	57,270	339,839	684,532
Additions	818	120	16,219	26,301	37,420	80,878
Reductions	132	537	40,384	25,487	14,337	80,877
Net change	999	2,081	260,446	58,083	362,922	684,531
Closing stock (31 Dec 2004)	686	(418)	(24,165)	813	23,083	(1)
2005 - 2010						-
Opening stock (1 Jan 2005)	961	1,974	243,743	31,597	219,491	497,766
Additions	644	779	29,421	25,892	16,553	73,289
Reductions	741	532	19,452	19,451	33,114	73,290
Net change	(97)	247	9,969	6,442	(16,560)	1
Closing stock (31 Dec 2009)	864	2,221	253,712	38,039	202,930	497,766
2010-2015						-
Opening stock (1 Jan 2010)	2,264	4,756	252,760	29,287	205,747	494,814
Additions	3,594	837	11,726	12,611	6,492	35,260
Reductions	296	728	11,088	13,412	9,736	35,260
Net change	3,298	109	638	(801)	(3,244)	-
Closing stock (31 Dec 2014)	5,562	4,865	253,398	28,485	202,503	494,813

ANNEX 2: Wood biomass by *FLR zone*

Annex 2.1: Wood biomass for the Afro-montane FLR zone

Despite covering only 6percent of Uganda's surface area, the aggregate wood biomass in the Afromontane landscape was 17.4percent of the national aggregate in 1990, equivalent to 37.2 Million tonnes. This landscape's wood biomass reduced by 24.6percent from 37.2 Million tonnes to 29.9 Million tonnes between 1990 and 2015, but the contribution to the national aggregate wood biomass remained steady at 17.2percent.

In 1990, the wood biomass in this landscape was concentrated in National Parks and Wildlife Reserves, which contributed 87percent of total biomass with 32.4 Million tonnes. There were also relatively large contributions from CFRs (3.4 Million tonnes) and private lands (1.5 Million tonnes). Whereas their wood biomass reduced by 29percent from 32.4 million in 1990 tonnes to 25.0 Million tonnes in 2015, National Parks and Wildlife Reserves remained the main source of wood biomass (with 83.7percent of the landscape total). The biomass from CFRs and private land was stable in 1990 and 2015. The wood available for supply increased by 44percent from 1.1 Million tonnes in 1990 to 1.5 Million tonnes in 2015, while wood not available for supply also increased by 40.9percent, over the same period.

Physical wood asset account for the Afro-montane FLR zone

	Total wood biomass (t)				Wood available for supply (t)		Wood not available for supply (t)	Aggregate wood (t)
	Private	CFR	UWA	LFR	Plantations	Natural wood	Natural wood	
1990-2000								
Opening stock	1,469,631	3,372,583	32,374,922	3,388	189,313	936,140	2,322,224	37,220,524
Additions	239,189	50,465	3,487,390	648	38,658	434,532	1,077,916	3,777,693
Reductions	239,189	50,465	3,487,390	648	40,914	77,396	191,991	3,777,693
Net change	-	-	-	-	(2,256)	423,263	1,049,963	-
Closing stock	1,469,631	3,372,583	32,374,922	3,388	187,057	1,008,602	2,501,975	37,220,524
2000-2005								
Opening stock	1,792,038	3,514,508	40,663,817	4,802	172,614	1,487,638	3,690,290	45,975,164
Additions	79,823	169,633	2,982,217	426	19,996	67,911	168,463	3,232,099
Reductions	79,823	169,633	2,982,217	426	10,878	69,472	172,334	3,232,099
Net change	-	-	-	-	9,118	(1,561)	(3,871)	-
Closing stock	1,792,038	3,514,508	40,663,817	4,802	181,732	1,486,078	3,686,419	45,975,164
2005-2010								
Opening stock	1,413,145	3,464,915	25,889,210	1,548	199,991	1,357,550	3,367,589	30,768,818
Additions	203,257	153,657	3,172,258	120	5,406	101,024	250,604	3,529,292
Reductions	203,257	153,657	3,172,258	120	22,624	99,115	245,869	3,529,292
Net change	-	-	-	-	(17,218)	1,909	4,735	-
Closing stock	1,413,145	3,464,915	25,889,210	1,548	182,773	1,359,459	3,372,324	30,768,818
2010-2015								
Opening stock	1,424,590	3,421,193	25,008,081	1,700	311,971	1,312,737	3,256,424	29,855,565
Additions	250,177	80,833	1,084,009	-	14,414	91,119	226,034	1,415,019
Reductions	250,177	80,833	1,084,009	-	37,714	84,408	209,385	1,415,019
Net change	-	-	(0)	-	(23,301)	6,712	16,650	(0)
Closing stock	1,424,590	3,421,193	25,008,081	1,700	288,670	1,319,449	3,273,074	29,855,565

Annex 2.2: Karamoja FLR zone

The Karamoja FLR zone covers 11percent of the country's surface area but contained only 0.8percent of the wood biomass in 1990. 64percent of this was in CFRs in 1990, with 19.6percent in National Parks and Wildlife Reserves, and 16.3percent on private lands. The wood available for supply was 397,084 t, while 1.3 Million tonnes was not available for supply. The wood in National Parks and Wildlife Reserves increased by 4.3 times from 337,089 tonnes in 1990 to 1.5 Million tonnes in 2015, while the wood in CFRs increased by 4.4percent from 1.1 Million tonnes to 1.2 Million tonnes. The result of the increase of wood in the protected areas was an overall 73.4percent increase in wood not available for supply, from 1.3 Million tonnes to 2.3 Million tonnes.

Given that most wood in the Karamoja landscape was in protected areas, there were larger and increasing volumes of wood not available for supply, while the wood available for supply marginally decreased. In order to increase wood available for supply in this landscape, efforts are needed to increase forest cover on private lands, especially through supported/enhanced natural regeneration.

Physical wood asset account for the Karamoja FLR zone

	Total wood (t)				Wood available for supply (t)		Wood Not Available	
	Private	CFR	UWA	LFR	Plantations	Natural wood	Natural wood	Aggregate wood (t)
1990-2000								
Opening stock	280,778	1,101,329	337,089		-	397,084	1,322,111	1,719,196
Additions	-	5,638	801		-	1,620	4,819	6,439
Reductions	-	5,638	801		-	1,620	4,819	6,439
Net change	-	-	-		-	-	-	-
Closing stock	280,778	1,101,329	337,089		-	397,084	1,322,111	1,719,196
2000-2005								
Opening stock	197,351	1,394,230	603,742		-	457,267	1,738,056	2,195,323
Additions	-	18,673	1,901		-	5,365	15,209	20,574
Reductions	-	18,673	1,901		-	5,365	15,209	20,574
Net change	-	-	-		-	-	-	-
Closing stock	197,351	1,394,230	603,742		-	457,267	1,738,056	2,195,323
2005-2010								
Opening stock	43,083	1,062,918	705,314		-	317,758	1,493,557	1,811,315
Additions	-	1,219	3,065		211	290	3,783	4,284
Reductions	-	1,219	3,065		-	350	3,934	4,284
Net change	-	-	-		211	(61)	(150)	-
Closing stock	43,083	1,062,918	705,314		211	317,698	1,493,406	1,811,315
2010-2015								
Opening stock	14,871	1,150,662	1,461,751		76	334,840	2,292,368	2,627,285
Additions	-	4,120	45,294		2,972	330	46,112	49,414
Reductions	-	4,120	45,294		76	1,162	48,176	49,414
Net change	-	-	-		2,896	(832)	(2,064)	-
Closing stock	14,871	1,150,662	1,461,751		2,972	334,008	2,290,305	2,627,285

Annex 2.3: Lake Victoria Crescent FLR zone

The Lake Victoria Crescent is the second largest FLR zone in the country with 22percent of the country's surface area. However, 54percent of the area is water (UBOS 2019; NFA 2015). The total wood biomass within the landscape was 31.1 million tonnes in 1990, which was 15.6percent of the national aggregate. However, by 2015, the wood biomass had reduced by 71.8percent to 18.1 million tonnes, equivalent to 10.4percent of the national aggregate.

The wood available for supply was 9.0 million tonnes, equivalent to 20.8percent of the national total in 1990, but had reduced by 40.4percent to 5.4 Million tonnes (equivalent to 22.3percent) in 2015. The wood not available for supply reduced by 77.0percent from 22.0 million tonnes to 12.4 million tonnes. The landscape was an importance source of wood available for supply (Table 4.11).

Physical wood asset account for the Lake Victoria Crescent FLR zone

	Total wood (t)				Wood available for supply (t)		Wood not available for supply (t)	Aggregate wood (t)
	Private	CFR	UWA	LFR	Plantations	Natural wood	Natural wood	
1990-2000								
Opening stock	15,104,354	15,949,422	1,185	71,573	266,011	8,866,095	21,993,565	31,126,535
Additions	3,678,135	3,750,350	325	-	49,844	2,119,912	5,258,732	7,428,810
Reductions	3,678,135	3,750,350	325	136,924	171,811	2,124,300	5,269,619	7,565,734
Net change	-	-	-	(136,924)	(121,967)	(4,389)	(10,886)	(136,924)
Closing stock	15,104,354	15,949,422	1,185	71,573	145,018	8,900,765	22,079,569	31,126,535
2000-2005								
Opening stock	11,501,991	13,238,625	2,880	44,110	108,933	7,089,447	17,586,346	24,787,606
Additions	2,794,871	2,310,080	783	13,173	159,178	1,424,949	3,534,780	5,118,907
Reductions	2,794,871	2,310,080	783	13,173	35,460	1,460,268	3,622,396	5,118,907
Net change	-	-	-	-	123,718	(35,320)	(87,616)	-
Closing stock	11,501,991	13,238,625	2,880	44,110	232,651	7,054,127	17,498,731	24,787,606

Physical wood asset account for the Lake Victoria Crescent FLR zone

	Total wood (t)				Wood available for supply (t)		Wood not available for supply (t)	Aggregate wood (t)
	Private	CFR	UWA	LFR	Plantations	Natural wood	Natural wood	
2005-2010								
Opening stock	7,927,001	11,515,713	4,399	36,591	225,469	5,532,171	13,723,310	19,483,704
Additions	3,016,496	2,500,174	991	2,919	112,432	1,553,496	3,853,661	5,520,581
Reductions	3,016,496	2,500,174	991	2,919	73,992	1,564,825	3,881,763	5,520,581
Net change	-	-	-	-	38,440	(11,329)	(28,102)	-
Closing stock	7,927,001	11,515,713	4,399	36,591	263,908	5,520,843	13,695,208	19,483,704
2010-2015								
Opening stock	6,653,442	11,424,971	4,261	4,261	507,923	5,049,454	12,525,863	18,086,935
Additions	2,064,914	2,403,961	357	357	178,750	1,232,774	3,058,065	4,469,589
Reductions	2,064,914	2,403,961	357	357	41,668	1,272,056	3,155,508	4,469,589
Net change	-	-	-	-	137,081	(39,281)	(97,443)	-
Closing stock	6,653,442	11,424,971	4,261	4,261	645,005	5,010,172	12,428,420	18,086,935

Annex 2.4: Northern Moist FLR zone

The Northern Moist FLR zone is the largest forest landscape in the country and occupies 24percent of the surface area. However, it contributed only 13.2percent (28.17 Million tonnes) of the country's biomass in 1990 and 3.6percent (6.73 t) in 2015 (Table 4.10). The large reduction in total biomass by landscape was due to the 6-fold decline in wood biomass on private land within this landscape and a halving in wood biomass in CFRs, National Parks and Wildlife Reserves. The wood available for supply reduced by nearly 5 times, from 7.2 million tonnes in 1990 to 1.5 million tonnes between 1990 and 2015, while the wood not available for supply reduced by just over five times from 17.8 million tonnes to 3.4 million tonnes over the same period. The Northern Moist landscape had the largest decline in wood biomass of all forest landscapes. Given its size, the landscape represents the largest opportunity for forest biomass restoration in the country.

Physical wood asset account for the North Moist FLR zone

	Total wood (t)				Wood available for supply (t)		Wood not available (t)	
	PVT	CFR	UWA	LFR	Plantations	Natural wood	Natural wood	Aggregate wood (t)
1990-2000								
Opening stock	21,651,028	3,300,162	3,219,122		19,379	7,163,002	17,768,809	28,170,312
Additions	7,386	32,768	2,247		8,126	9,202	22,826	42,401
Reductions	7,386	32,768	2,247		5,703	9,898	24,553	42,401
Net change	-	-	-		2,423	(696)	(1,727)	-
Closing stock	21,651,028	3,300,162	3,219,122		21,802	7,162,306	17,767,082	28,170,312
2000-2005								
Opening stock	2,998,001	2,998,001	3,264,991		20,621	1,716,749	4,258,632	9,260,993
Additions	47,375	47,375	143,108		-	27,222	67,528	237,857
Reductions	47,375	47,375	143,108		752	27,006	66,992	237,857
Net change	-	-	-		(752)	216	536	-
Closing stock	2,998,001	2,998,001	3,264,991		19,869	1,716,965	4,259,168	9,260,993
2005-2010								
Opening stock	5,447,182	1,490,587	2,035,734	7,398	49,337	1,981,198	4,914,632	8,980,901
Additions	12,563	32,383	20,337	1,260	12,091	9,801	24,314	66,543
Reductions	12,563	32,383	20,337	1,260	1,800	12,758	31,648	66,543
Net change	-	-	-	-	10,291	(2,957)	(7,334)	-
Closing stock	5,447,182	1,490,587	2,035,734	7,398	59,628	1,978,241	4,907,298	8,980,901
2010-2015								
Opening stock	3,526,938	1,573,067	1,615,874	14,950	234,411	1,402,198	3,478,345	6,730,829
Additions	52,076	335,695	37,238	-	6,889	109,429	271,453	425,008
Reductions	52,076	335,695	37,238	-	8,516	108,961	270,293	425,008
Net change	-	-	-	-	(1,628)	468	1,160	-
Closing stock	3,526,938	1,573,067	1,615,874	14,950	232,783	1,402,666	3,479,505	6,730,829

Annex 2.5: South East Lake Kyoga Flood Plains FLR zone

The total wood biomass in the South East Lake Kyoga Flood Plains FLR zone was only 217,166 tonnes in 1990. 66percent of the wood biomass in this landscape was on private land and 32.4percent was in CFRs, with less than 1percent in LFRs. The wood available for supply was 63,100 tonnes in 1990, equivalent to 29.1percent of all the biomass in the landscape, while 144,422 tonnes was not available

for supply. The wood available for supply in this landscape in 1990 was just 0.15percent of the national total (Table 4.9).

By 2015, total wood biomass in this landscape had reduced by 35.7percent to 160,043 t. The total available for supply was 50,942 and a further 101,372 tonnes was not available for supply. The wood available for supply from the landscape had risen only slightly to 0.2percent of national wood biomass available for supply, and only 0.09percent of national wood not available. Considering that the landscape occupies 9percent of the country's surface area, the wood aggregates were relatively low and therefore the region is not a major source of wood for the country. Rather, it is likely to be a wood deficit area requiring supplies from elsewhere.

Physical wood account for South East L. Kyoga Flood Plain

	Total wood (t)				Wood available (t)		Wood not available (t)	
	PVT	CFR	UWA	LFR	Plantations	Natural wood	Natural wood	Aggregate wood (t)
1990-2000								
Opening stock	144,494	70,689.3		1,983	14,525	58,220	144,422	217,166
Additions	179	8,812.2		707	8,991	203	504	9,698
Reductions	179	8,812.2		707	707	2,583	6,408	9,698
Closing stock	144,494	70,689.3		1,983	22,809	55,840	138,518	217,166
Change	-	-		-	2,380	(2,380)	(5,904)	-
2000-2005								
Opening stock	113,958	57,428		810	29,694	40,941	101,561	172,196
Additions	5,416	3,854		810	871	2,646	6,563	10,080
Reductions	5,416	3,854		810	4,159	1,701	4,220	10,080
Closing stock	113,958	57,428		810	26,406	41,886	103,904	172,196
Change	-	-		-	(3,288)	945	2,343	-
2005-2010								
Opening stock	22,194	26,351		1,534	487	14,248	35,344	50,079
Additions	5,427	-		1,057	1,434	1,451	3,599	6,484
Reductions	5,427	-		1,057	-	1,863	4,621	6,484
Closing stock	22,194	26,351		1,534	1,921	13,836	34,322	50,079
Change	-	-		-	1,434	(412)	(1,022)	-
2010-2015								
Opening stock	134,018	15,677		10,348	17,769	40,876	101,399	160,043
Additions	243	97		-	101	69	171	340
Reductions	243	97		-	-	98	242	340
Closing stock	134,018	15,677		10,348	17,869	40,847	101,327	160,043
Change	-	-		-	101	(29)	(72)	-

Annex 2.6: South Western Rangelands FLR zone

The South Western Rangelands, which covers 13percent of Uganda's surface area, contained 8.3percent of national wood biomass in 1990 - equivalent to 17.6 million tonnes. By 2015, this had reduced by 61.4percent to 6.8 million tonnes, equivalent to 4.9percent of the total national wood biomass (Table 4.7). In 1990, 67.2percent and 32.8percent of the wood in the landscape was on private land and in CFRs, respectively. Between 1990 and 2015, there was a switchover: by 2015, 4.8 million tonnes (70.4percent of the landscape's wood biomass) was in CFRs while 27.6percent, (equivalent to 1.9 million tonnes) was on private lands. The wood biomass in CFRs reduced by 16.7percent from 5.8 million tonnes to 4.8 million tonnes, while the wood biomass on private land reduced by 84percent from 11.8 million tonnes to 1.9 million tonnes.

The largest change in wood biomass by source for the South Western Rangelands was the six-fold decline in wood biomass from private lands. The wood biomass from CFRs reduced by considerably less (by 20.5percent). There was a 25-fold increase in forest biomass from National Parks and Wildlife Reserves, from a low base of 5,219 ha to 130,606 ha. The aggregate wood available for supply reduced by 59percent from 5.1 million tonnes in 1990 to 2.1 million tonnes in 2015. The wood available for supply from plantations increased nine-fold from 42,050 tonnes to 373,181 tonnes while the wood available from the natural forest in the landscape reduced by 66percent from 5.0 million tonnes to

1.72 million tonnes between 1990 and 2015. The aggregate wood not available for supply reduced by 65percent from 12.4 million tonnes to 4.3 million tonnes.

Physical wood account for the South Western Rangelands

	Total wood (t)				Wood available for supply (t)		Wood not available (t)	
	PVT	CFR	UWA	LFR	Cultivated	Natural wood	Natural wood	Aggregate wood (t)
1990-2000								
Opening stock	11,845,193	5,778,960	5,219	7,721	124,568	5,029,914	12,477,392	17,637,094
Additions	2,862,878	821,884	-	1,298	11,649	1,055,672	2,618,740	3,686,061
Reductions	2,862,878	821,884	-	1,298	26,721	1,051,342	2,607,998	3,686,061
Net change	-	(0)	-	-	(15,072)	4,330	10,742	(0)
Closing stock	11,845,193	5,778,960	5,219	7,721	109,496	5,034,245	12,488,134	17,637,094
2000-2005								
Opening stock	10,373,022	5,322,680	18,297	1,231	115,765	4,476,528	11,104,641	15,715,231
Additions	2,003,830	358,554	-	717	48,734	664,926	1,649,441	2,363,101
Reductions	2,003,830	358,554	-	717	7,522	676,767	1,678,812	2,363,101
Net change	-	0	-	-	41,212	(11,840)	(29,371)	
Closing stock	10,373,022	5,322,680	18,297	1,231	156,977	4,464,687	11,075,270	15,715,231
2005-2010								
Opening stock	2,286,411	4,582,679	22,872	122	31,345	1,964,545	4,873,323	6,892,084
Additions	665,118	498,118	-	122	223,546	270,011	669,800	1,163,358
Reductions	665,118	498,118	-	122	5,475	332,664	825,219	1,163,358
Net change	-	-	-	-	218,072	(62,653)	(155,419)	-
Closing stock	2,286,411	4,582,679	22,872	122	249,417	1,901,892	4,717,904	6,892,084
2010-2015								
Opening stock	1,881,067	4,792,397	130,606	154	451,204	1,787,723	4,434,692	6,804,224
Additions	314,972	254,196	7,197	154	253,406	90,764	225,152	576,520
Reductions	314,972	254,196	7,197	154	20,532	157,670	391,121	576,520
Net change	-	-	-	-	232,875	(66,906)	(165,969)	-
Closing stock	1,881,067	4,792,397	130,606	154	684,078	1,720,817	4,268,723	6,804,224

Annex 2.7: Western Mid-Altitude Farmlands FLR zone

The Western Mid-Altitude Farmlands cover 15percent of Uganda's surface area and contained 51.3 million tonnes of wood biomass in 1990, equivalent to 24.1percent of total national wood biomass. The wood biomass was largely concentrated in CFRs and National Parks and Wildlife Reserves (Table 4.8). The aggregate wood biomass for the landscape declined by only 5.4percent between 1990 and 2015, from 51.3 million tonnes to 48.6 million tonnes. The wood available for supply declined by 11.2percent from 9.0 to 8.1 million tonnes, while the wood not available for supply reduced by only 3.5percent. The landscape contributed just under one quarter of national biomass in 1990 and 28.6percent of the national wood volume (48.6 million tonnes) in 2015. The contribution to national wood available for supply was 20.8percent (or 9.0 million tonnes) in 1990, but had risen to 33.5percent (or 8.1 million tonnes) in 2015. The limiting factor to expanding wood supplies in this landscape is the concentration of wood supplies in protected areas, and relatively low wood biomass on private land (only 13percent of the total, equivalent to 6.8 million tonnes).

Physical wood account for the Mid-Western Farmlands

	Total wood (t)				Wood available		Wood Not Available	
	PVT	CFR	UWA	LFR	Plantations	Natural wood	Natural wood	Aggregate wood (t)
1990-2000								
Opening stock	6,753,908	24,465,393	20,047,670	1,895	254,962	8,908,510	42,360,356	51,268,866
Additions	1,415,831	878,664	2,939,975	-	44,428	649,839	4,584,632	5,234,471
Reductions	1,415,831	878,664	2,939,975	-	104,230	640,497	4,593,974	5,234,471
Net change	-	-	-	-	(59,802)	9,342	(9,342)	-
Closing stock	6,753,908	24,465,393	20,047,670	1,895	195,160	8,917,852	42,351,014	51,268,866
2000-2005								
Opening stock	5,519,211	24,105,058	20,346,712	1,552	160,961	8,467,635	41,504,898	49,972,532
Additions	866,658	1,405,152	1,321,844	-	57,560	636,236	2,957,418	3,593,654
Reductions	866,658	1,405,152	1,321,844	-	43,217	641,978	2,951,675	3,593,654
Net change	-	-	-	-	14,343	(5,742)	5,742	-
Closing stock	5,519,211	24,105,058	20,346,712	1,552	175,303	8,461,892	41,510,640	49,972,532
2005-2010								
Opening stock	2,938,431	23,840,249	18,646,000	4	182,736	7,641,767	37,782,918	45,424,685
Additions	633,086	1,557,747	1,884,873	-	89,952	604,267	3,471,439	4,075,706

Physical wood account for the Mid-Western Farmlands

	Total wood (t)				Wood available		Wood Not Available	
	PVT	CFR	UWA	LFR	Plantations	Natural wood	Natural wood	Aggregate wood (t)
Reductions	633,086	1,557,747	1,884,873	-	90,326	603,981	3,471,725	4,075,706
Net change	-	-	-	-	(374)	286	(286)	-
Closing stock	2,938,431	23,840,249	18,646,000	4	182,362	7,642,053	37,782,632	45,424,685
2010-2015								
Opening stock	2,754,531	24,797,108	21,097,775	287	377,839	7,807,541	40,842,160	48,649,702
Additions	402,240	1,443,207	1,253,713	-	338,810	432,872	2,666,288	3,099,160
Reductions	402,240	1,443,207	1,253,713	-	59,565	513,190	2,585,970	3,099,160
Net change	-	-	-	-	279,245	(80,319)	80,319	-
Closing stock	2,754,531	24,797,108	21,097,775	287	657,084	7,727,223	40,922,479	48,649,702

ANNEX 3: Accounts for wood stock by forest land management system

Annex 3.1: Wood stocks on private land, 1990 to 2015 (in m^3)

	Broadleaved	*Coniferous*	*THF well-stocked*	*THF low-stocked*	*Woodland*	*Total*
1990 - 2000						
Opening stock (1/01/1990)	119,029	20,534	28,114,871	8,672,138	43,600,783	80,527,356
Additions	26,596	25,198	2,881,714	10,708,708	4,797,098	18,439,313
Reductions	94,956	2,319	16,429,790	4,422,633	12,362,593	33,312,291
Closing stock (31/12/1999)	104,551	24,714	23,536,223	8,587,331	33,401,560	65,654,379
Net gain/reduction	(14,479)	4,180	(4,578,648)	(84,807)	(10,199,224)	(14,872,977)
2000-2005						
Opening stock (1/01/2000)	104,551	24,714	23,536,223	8,587,331	33,401,560	65,654,379
Additions	68,336	27,096	721,525	6,822,273	8,225,827	15,865,056
Reductions	(42,114)	14,560	25,727,510	7,297,676	22,122,873	55,120,506
Closing stock (31/12/2004)	184,444	21,783	9,586,465	4,539,175	12,067,062	26,398,929
Net gain/reduction	79,894	(2,931)	(13,949,758)	(4,048,156)	(21,334,498)	(39,255,450)
2005-2010						
Opening stock (1/01/2005)	184,444	21,783	9,586,465	4,539,175	12,067,062	26,398,929
Additions	101,937	53,800	834,089	2,001,662	3,128,130	6,119,617
Reductions	(215,747)	(170,566)	4,754,600	4,617,739	2,639,395	11,625,422
Closing stock (31/12/2009)	478,677	202,747	7,904,151	2,291,352	10,016,197	20,893,124
Net gain/reduction	294,233	180,964	(1,682,314)	(2,247,822)	(2,050,865)	(5,505,805)
2010-2015						
Opening stock (1/01/2010)	478,677	202,747	7,904,151	2,291,352	10,016,197	20,893,124
Additions	456,694	30,633	166,884	1,740,547	970,108	3,364,866
Reductions	(142,500)	29,299	5,758,128	166,216	(5,207,305)	603,837
Closing stock (31/12/2014)	710,953	202,345	4,361,925	2,930,007	15,448,924	23,654,154
Net gain/reduction	232,275	(402)	(3,542,226)	638,654	5,432,727	2,761,029
1990-2015						
Opening stock (1/01/1990)	119,029	20,534	28,114,871	8,672,138	43,600,783	80,527,356
Additions	641,940	191,376	458,270	2,154,054	2,929,924	6,375,563
Reductions	(526,494)	(177,957)	27,877,375	7,213,868	28,861,973	63,248,765
Closing stock (31/12/2014)	710,953	202,345	4,361,925	2,930,007	15,448,924	23,654,154

Annex 3.2: Wood stocks in Central Forest Reserves, 1990 to 2015 (in m^3)

	Broadleaved	*Coniferous*	*THF well-stocked*	*THF low-stocked*	*Woodland*
1990 - 2000					
Opening stock (1 Jan 1990)	215,106	505,728	55,905,934	4,147,076	8,733,972
Additions	62,228	50,991	2,515,053	2,610,990	1,881,728
Reductions	104,879	127,870	3,325,253	2,970,937	592,051
Closing stock (31 Dec 1999)	172,455	428,849	55,095,733	3,787,129	10,023,649
Net reductions	42,651	76,879	810,201	359,947	-1,289,677
2000-2005					
Opening stock (1 Jan 2000)	150,826	391,249	59,172,775	2,270,057	7,768,914
Additions	74,297	247,850	723,191	5,265,487	3,860,507
Reductions	82,979	34,203	8,425,228	1,377,675	251,247
Closing stock (31 Dec 2004)	142,143	604,896	51,470,738	6,157,869	11,378,175
Net reductions	8,683	-213,647	7,702,037	-3,887,812	-3,609,260
2005-2010					
Opening stock (1 Jan 2005)	159,973	425,022	50,998,534	2,632,274	4,868,222
Additions	59,174	256,699	2,011,073	2,356,042	1,550,131
Reductions	82,768	41,515	3,510,199	2,057,417	541,220
Closing stock (31 Dec 2009)	136,379	640,206	49,499,408	2,930,898	5,877,133
Net reductions	23,594	-215,184	1,499,126	-298,625	-1,008,911
2010-2015					
Opening stock (1 Jan 2010)	312,745	1,201,707	52,523,689	1,593,579	4,700,204
Additions	262,139	101,867	508,882	3,343,986	831,528
Reductions	21,926	59,820	4,051,144	729,657	185,855
Closing stock (31 Dec 2014)	552,959	1,243,753	48,981,427	4,207,907	5,345,878
Net reductions	-240,214	-42,046	3,542,262	-2,614,329	-645,674
1990-2015					
Opening stock (1 Jan 1990)	246,067	522,865	48,997,020	2,892,514	5,254,001
Additions	496,227	1,275,960	1,679,749	3,159,390	1,453,818
Reductions	147,343	97,272	4,752,050	2,034,336	1,034,143
Closing stock (31 Dec 2014)	594,952	1,701,553	45,924,718	4,017,567	5,673,676

Annex 3.3: Wood stocks in Community Wildlife Reserves, 1990 to 2015 (in m^3)

	Broadleaved plantations	*Coniferous plantations*	*THF well-stocked*	*THF Low-stocked*	*Woodland*
1990-2000					
Opening stock (1 Jan 1990)	-	-	-	4,142	290,574
Additions	-	-	-	801	4,142
Reductions	-	-	-	4,142	801
Closing stock (31 Dec 1999)	-	-	-	801	293,914
Net reductions	-	-	-	3,341	-3,341
2000-2005					
Opening stock (1 Jan 2000)	-	-	-	5,091	571,743
Additions	-	-	-	-	5,091
Reductions	-	-	-	5,091	-
Closing stock (31 Dec 2004)	-	-	-	-	576,834
Net reductions	-	-	-	5,091	-5,091
2005-2010					
Opening stock (1 Jan 2005)	-	-	-	-	778,819
Additions	-	-	3,065	-	-
Reductions	-	-	-	-	3,065
Closing stock (31 Dec 2009)	-	-	3,065	-	775,754
Net reductions	-	-	-3,065	-	3,065
2010-2015					
Opening stock (1 Jan 2010)	-	-	43,321	-	1,139,375
Additions	-	-	-	-	33,296
Reductions	-	-	33,296	-	-
Closing stock (31 Dec 2014)	-	-	10,025	-	1,172,671
Net reductions	-	-	33,296	-	-33,296
1990-2015					
Opening stock (1 Jan 1990)	-	-	-	4,160	256,099
Additions	21	-	-	-	4,160
Reductions	-	-	-	4,160	21
Closing stock (31 Dec 2014)	21	-	-	-	260,238
Net reductions	-21	-	-	4,160	-4,139

Annex 3.4: Wood stocks in National Parks, 1990 to 2015 (in m^3)

	Broadleaved plantations	*Coniferous plantations*	*THF well-stocked*	*THF Low-stocked*	*Woodland*
1990-2000					
Opening stock (1 Jan 1990)	1,787	103,448	41,027,576	2,588,674	6,472,792
Additions	27,158	17,152	3,114,368	119,449	553,394
Reductions	1,787	60,951	560,627	1,714,732	1,493,423
Closing stock (31 Dec 1999)	27,158	59,649	43,581,316	993,391	5,532,762
Net reductions	-25,371	43,799	-2,553,740	1,595,283	940,029
2000-2005					
Opening stock (1 Jan 2000)	-	5,490	43,803	52,275,117	860,914
Additions	105	64,161	51,167,329	54,078	7,625,361
Reductions	-	5,490	42,883	52,250,180	161,532
Closing stock (31 Dec 2004)	105	-	421,239	8,239	5,296,125
Net reductions	-105	-58,670	-51,124,446	52,196,102	-7,463,828
2005-2010					
Opening stock (1 Jan 2005)	1,567	46,223	38,790,353	147,186	4,510,554
Additions	-	2,352	400,233	1,109,542	2,963,473
Reductions	1,567	10,738	3,858,877	58,287	546,130
Closing stock (31 Dec 2009)	-	37,836	35,331,709	1,198,440	6,927,897
Net reductions	1,567	8,387	3,458,644	-1,051,255	-2,417,343
2010-2015					
Opening stock (1 Jan 2010)	-	34,780	38,278,614	1,026,036	4,830,789
Additions	40,012	558	515,775	765,650	560,625
Reductions	-	844	1,158,012	470,387	253,377
Closing stock (31 Dec 2014)	40,012	34,493	37,636,377	1,321,298	5,138,037
Net reductions	-40,012	286	642,237	-295,263	-307,248
1990-2015					
Opening stock (1 Jan 1990)	2,064	114,955	40,519,188	2,643,002	5,786,604
Additions	43,211	35,537	2,936,468	976,375	983,286
Reductions	2,064	44,774	1,707,965	1,825,518	1,394,556
Closing stock (31 Dec 2014)	43,211	105,718	41,747,692	1,793,859	5,375,334
Net reductions	-41,147	9,237	-1,228,504	849,143	411,271

Annex 3.5: Wood stocks in Dual Joint Management zones, 1990 to 2015 (in m^3)

	Broadleaved plantations	*Coniferous plantations*	*THF well-stocked*	*THF Low-stocked*	*Woodland*
1990-2000					
Opening stock (1 Jan 1990)	-	-	6,190,849	90,744	853,809
Additions	-	-	33,137	5,184	304,985
Reductions	-	-	256,705	67,196	19,405
Closing stock (31 Dec 1999)	-	-	5,967,281	28,731	1,139,389
Net reductions	-	-	223,568	62,012	-285,580
2000-2005					
Opening stock (1 Jan 2000)	-	-	6,075,714	13,159	759,879
Additions	-	-	109,635	5,982	792,884
Reductions	-	-	792,646	13,159	102,696
Closing stock (31 Dec 2004)	-	-	5,392,703	5,982	1,450,067
Net reductions	-	-	683,011	7,177	-690,188
2005-2010					
Opening stock (1 Jan 2005)	-	-	5,946,979	2,506	664,928
Additions	-	-	124,210	60,790	665,254
Reductions	-	-	692,398	2,506	155,350
Closing stock (31 Dec 2009)	-	-	5,378,791	60,790	1,174,831
Net reductions	-	-	568,188	-58,284	-509,904
2010-2015					
Opening stock (1 Jan 2010)	-	-	6,108,888	124,143	766,730
Additions	-	-	43,499	100,403	45,796
Reductions	-	-	115,565	46,939	27,194
Closing stock (31 Dec 2014)	-	-	6,036,823	177,607	785,332
Net reductions	-	-	72,065	-53,464	-18,602
1990-2015					
Opening stock (1 Jan 1990)	-	-	6,143,049	110,370	724,871
Additions	-	-	38,404	88,727	254,856
Reductions	-	-	255,138	59,982	66,867
Closing stock (31 Dec 2014)	-	-	5,926,315	139,116	912,860
Net reductions	-	-	216,734	-28,745	-187,989

Annex 3.6: Wood stocks in Wildlife Reserves, 1990 to 2015 (in m^3)

	Broadleaved plantations	*Coniferous plantations*	*THF well-stocked*	*THF Low-stocked*	*Woodland*
1990-2000					
Opening stock (1 Jan 1990)	-	-	621,177	-	4,672,256
Additions	-	-	24,563	25,366	53,363
Reductions	-	-	58,431	-	44,861
Closing stock (31 Dec 1999)	-	-	587,308	25,366	4,680,758
Net reductions	-	-	33,868	-25,366	-8,502
2000-2005					
Opening stock (1 Jan 2000)	-	-	759,043	10,031	4,401,315
Additions	-	-	46,692	-	114,494
Reductions	-	-	114,029	10,031	37,126
Closing stock (31 Dec 2004)	-	-	691,707	-	4,478,682
Net reductions	-	-	67,336	10,031	-77,367
2005-2010					
Opening stock (1 Jan 2005)	-	-	776,954	-	2,950,445
Additions	179	-	63,919	65,572	96,907
Reductions	-	-	99,301	-	127,276
Closing stock (31 Dec 2009)	179	-	741,572	65,572	2,920,076
Net reductions	-179	-	35,381	-65,572	30,369
2010-2015					
Opening stock (1 Jan 2010)	2455	-	1,076,777	259,842	3,215,319
Additions	-	-	14,397	289,703	312,349
Reductions	2455	-	380,655	170,153	63,186
Closing stock (31 Dec 2014)	-	-	710,519	379,392	3,464,482
Net reductions	2455	-	366,258	-119,550	-249,163
1990-2015					
Opening stock (1 Jan 1990)	-	-	587,977	-	2,769,360
Additions	-	-	27,912	150,717	51,897
Reductions	-	-	114,029	-	116,498
Closing stock (31 Dec 2014)	-	-	501,860	150,717	2,704,760
Net reductions	-	-	86,117	-150,717	64,600

Annex 3.7: Wood stocks in Wildlife Sanctuaries, 1990 to 2015 (in m^3)

	Broadleaved plantations	*Coniferous plantations*	*THF well-stocked*	*THF Low-stocked*	*Woodland*
1990-2000					
Opening stock (1 Jan 1990)	322	-	-	-	4439
Additions	3	-	-	216	322
Reductions	322	-	-	-	220
Closing stock (31 Dec 1999)	3	-	-	216	4541
Net reductions	318	-	-	-216	-102
2000-2005					
Opening stock (1 Jan 2000)	-	-	-	12	19333
Additions	322	-	-	-	12
Reductions	-	-	-	12	322
Closing stock (31 Dec 2004)	322	-	-	-	19022
Net reductions	-322	-	-	12	310
2005-2010					
Opening stock (1 Jan 2005)	1645	-	-	-	12301
Additions	-	-	-	1626	991
Reductions	991	-	-	-	1626
Closing stock (31 Dec 2009)	654	-	-	1626	11667
Net reductions	991	-	-	-1626	634
2010-2015					
Opening stock (1 Jan 2010)	459	106	-	8257	12124
Additions	185	171	-	-	8257
Reductions	-	-	-	8257	357
Closing stock (31 Dec 2014)	645	278	-	-	20024
Net reductions	-185	-171	-	8257	-7900
1990-2015					
Opening stock (1 Jan 1990)	305	-	-	-	4965
Additions	99	-	-	-	-
Reductions	-	-	-	-	99
Closing stock (31 Dec 2014)	405	-	-	-	4866
Net reductions	-99	-	-	-	99

Annex 3.8: Wood stocks in Local Forest Reserves, 1990 to 2015 (in m^3)

	Broadleaved plantations	*Coniferous plantations*	*THF well-stocked*	*THF Low-stocked*	*Woodland*
1990-2000					
Opening stock (1 Jan 1990)	9,072	707	54,133	20,236	7,787
Additions	975	427	16,249	11,214	19,353
Reductions	6,165	707	22,486	18,791	70
Closing stock (31 Dec 1999)	3,882	427	47,896	12,660	27,070
Net reductions	5,190	279	6,237	7,576	-19,283
2000-2005					
Opening stock (1 Jan 2000)	8,398	282	78,433	7,438	7,368
Additions	794	503	1,523	2,185	59,039
Reductions	461	282	55,559	5,925	1,817
Closing stock (31 Dec 2004)	8,731	503	24,396	3,698	64,591
Net reductions	-333	-221	54,036	3,740	-57,222
2005-2010					
Opening stock (1 Jan 2005)	16,759	573	25,728	3,585	10,851
Additions	2,350	1,250	386	5,363	396
Reductions	1,252	96	4,844	427	3,125
Closing stock (31 Dec 2009)	17,857	1,727	21,270	8,520	8,122
Net reductions	-1,098	-1,154	4,458	-4,935	2,729
2010-2015					
Opening stock (1 Jan 2010)	26,695	8,355	20,682	4,174	5,889
Additions	154	-	-	878	14,116
Reductions	866	-	13,339	943	-
Closing stock (31 Dec 2014)	25,983	8,355	7,343	4,109	20,005
Net reductions	712	-	13,339	65	-14,116
1990-2015					
Opening stock (1 Jan 1990)	6,047	710	11,500	13,588	4,780
Additions	1,292	2,771	2,996	1,966	20,289
Reductions	1,970	-	11,500	12,677	3,167
Closing stock (31 Dec 2014)	5,369	3,481	2,996	2,878	21,902
Net reductions	678	-2,771	8,505	10,711	-17,122

ANNEX 4: ISSMI Estimates for sustainable annual allowable cut in Uganda

The table below summarises the result of Integrated Stock Survey and Management Inventories for the five CFRs that provide the largest wood supply for the NFA. The estimates were part of the 2005 National Biomass Survey activities. The summary shows the stocked area, the volume of wood, the available harvest, the annual allowable cut and the volume of wood retained after harvest.

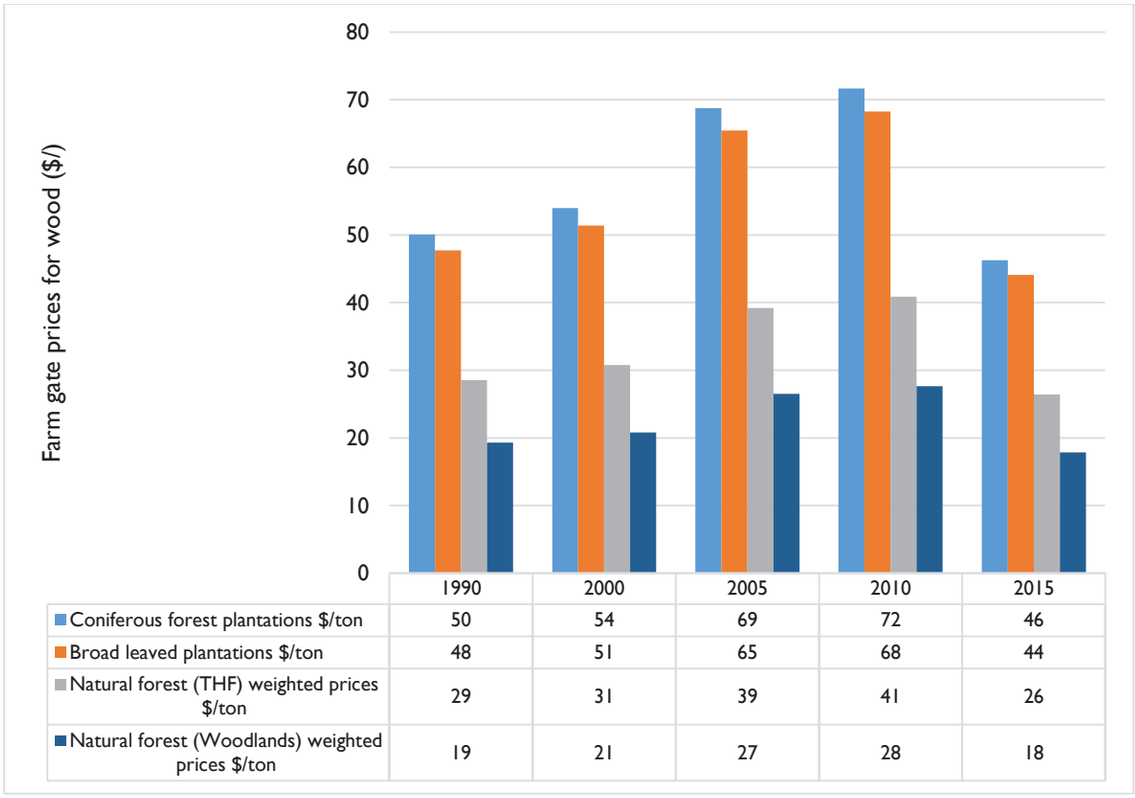
Harvestable volume based on 30-year cycle and removal of 20m^3/ha/year							
Forest	Stocked area (ha)	Net vol/ha (m^3)	Net volume (m^3)	Available harvest volume (m^3)	Annual allowable cut (m^3)	Area for annual removal (ha)/ISSMI area	Net volume retained for forest integrity (m^3)
Budongo	29,445	62.5	1,839,826	588,900	19,630	982	1,250,926
Bugoma	24,550	76.8	1,699,447	491,000	16,367	818	1,208,447
Mabira	13,640	75.0	1,028,045	272,800	9,093	455	755,245
Kalinzu	7,035	70.0	490,262	140,700	4,690	235	349,562
Itwara	4,496	60.0	266,056	89,920	2,997	150	176,136
	79,166	***68.9***	***5,323,636***	***1,583,320***	***52,777***	***2,639***	***3,740,316***

Note: *1: Volumes computed after removal of relict volume*
2: Low intensity harvest regime of 20m^3/ha used to determine harvest volume
3: AAC determined by dividing harvest volume by 30 years.
4: All volume removals are above 50cm except for Funtumia and Strombosia (40cm)

Source: NFA (2009)

ANNEX 5: Trends of farm gate wood prices

The trends of wood prices show generally declining monetary wood values, even though prices of wood generally increased between 1990 and 2010. Whereas the increasing prices of wood cancelled out some of the reduction in wood stock, the price increase was not able to fully counter the 43percent dip in wood stock between 2000 and 2005.



	1990	2000	2005	2010	2015
Coniferous forest plantations $/ton	50	54	69	72	46
Broad leaved plantations $/ton	48	51	65	68	44
Natural forest (THF) weighted prices $/ton	29	31	39	41	26
Natural forest (Woodlands) weighted prices $/ton	19	21	27	28	18

Farm gate wood prices, 1990 to 2015

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