

# Understanding the current status, emerging issues (challenges & opportunities) for advancing Private Sector Investment in sustainable Biomass Energy Production within Central Forest Reserves and Forest Landscapes in Uganda.

*Environmental Alert Study Report, November 2019.*



*Photo credit: Environmental Alert.*

For more information, contact the Executive Director, Environmental Alert.

Tel: +256-414-510547/510215

Email: [ed@envalert.org](mailto:ed@envalert.org)

Website: [www.envalert.org](http://www.envalert.org)

Plot 457/523 Sonko Lane, Kabalagala, Off Ggaba Road.  
P.O. Box 11259 Kampala, Uganda.



This report is an output from a study commissioned by Environmental Alert with financial support from Norad within the framework of the project titled, 'Increasing access to sustainable and renewable energy alternatives in the Albertine Graben' that is implemented by WWF-Uganda Country Office."



## ACKNOWLEDGMENT

Environmental Alert<sup>1</sup> highly appreciate the effort and support of all those who made this study and the preparation of this report a success. Special thanks go to the staff of Ministries of Energy and Mineral Development, Water and Environment, the National Forestry Authority and District Local Governments who provided the core information on the biomass energy sub-sector. The information from Development partners, CSOs and private sector players was indispensable for understanding the general status of biomass energy in the country as key informants. They are specially appreciated for their valuable time, willingness and openness to discuss without reservations.

The Team of Consultants including: *Mr. Levi A. Etwodu, Mr. Robert Esimu and Mr. Charles Oleja* are very much appreciated for their time, efforts and technical inputs in the study and related compilation of the study report.

The Management of Environment Alert is greatly thanked for mobilizing and coordinating the Renewable Energy CSO network for discussion on the biomass energy concerns which provided valuable information. Special thanks go to Dr. Joshua Zake (Ph.D.), the Executive Director, Environment Alert who guided the study and provided relevant documents and information; and Ms Rachael Nalule the Programme officer for ensuring the logistics for the assignment were effectively arranged.

WWF-Uganda Country Office and Norad are highly appreciated for the financial and technical support that enabled successful implementation of this study.

---

<sup>1</sup> Further information about Environmental Alert is available in **Box 1**.

## TABLE OF CONTENTS

<b>ACKNOWLEDGMENT</b> .....	<b>II</b>
<b>LIST OF FIGURES AND TABLES</b> .....	<b>V</b>
<b>LIST OF ACRONYMS AND ABBREVIATIONS</b> .....	<b>VI</b>
<b>EXECUTIVE SUMMARY</b> .....	<b>VIII</b>
<b>1 BACKGROUND</b> .....	<b>1</b>
<b>1.1 Introduction</b> .....	<b>1</b>
<b>1.2 Overview of the study</b> .....	<b>1</b>
1.2.1 Status of Forests and Biomass Energy Production and Use .....	1
1.2.2 Estimated Biomass Energy Trend .....	6
1.2.3 Opportunities in the Biomass Energy Production Value Chain .....	7
1.2.4 Regional Perspective of Biomass Energy Consumption.....	8
1.2.5 Best Practices in Wood Biomass Production and Use.....	9
<b>1.3 Objectives of the Assignment</b> .....	<b>9</b>
<b>1.4 Scope/Deliverables</b> .....	<b>9</b>
<b>2 APPROACH AND METHODOLOGY</b> .....	<b>10</b>
<b>3 POLICY AND LEGAL PROVISIONS SUPPORTING SUSTAINABLE BIOMASS PRODUCTION AND PRIVATE SECTOR INVESTMENT</b> .....	<b>12</b>
<b>4 STUDY RESULTS</b> .....	<b>15</b>
<b>4.1 NFA’s Contribution to Sustainable Biomass Energy Production through Implementation of the Guidelines on Land Allocation for Restoration in the Central Forest Reserves</b> .....	<b>15</b>
4.1.1 Land Allocated for Tree Planting in the CFRs.....	15
4.1.2 Tree Species Planted and Recommended for Biomass Energy Production .....	19
4.1.3 Incentives by NFA to Promote Sustainable Biomass Energy Production in the Country .....	19
<b>4.2 Baseline Information of the Status of Investments in Sustainable Biomass Production within Central Forest Reserves and Forest Landscapes across the Country</b> .....	<b>20</b>
4.2.1 Investment in Government Protected Areas .....	20
4.2.2 Investments in Forest Landscapes .....	29
4.2.3 Changes Needed to Improve the Biomass Production in the Country .....	34
4.2.4 Strategic Direction of Ministry of Water and Environment for Sustainable Wood Biomass Production .....	35
4.2.5 Coordination Mechanisms for the Institutions Responsible for the Sustainable Biomass Energy .....	35
4.2.6 Estimated Investment and Returns from the Biomass Energy Production.....	35

<b>4.3</b>	<b>Assessment of the NFA Guidelines on Land Allocation to Identify Gaps and Opportunities for Investment in Biomass Production.....</b>	<b>36</b>
4.3.1	Positive Changes the Guidelines Have Brought .....	36
4.3.2	Negative Changes the Guidelines Have Brought .....	37
4.3.3	Legal Safeguards to Avoid Abuse of the Guidelines in Regard to Land and Tree Ownership .....	37
4.3.4	Specific Gaps in the Land Allocation Guidelines in CFRs.....	37
4.3.5	Specific Opportunities for Investment in Biomass Energy Production in the Guidelines for Land Allocation in CFRs .....	37
4.3.6	Recommendations for Improving the Existing Guidelines for Land Allocation in CFRs .....	38
4.3.7	Actions for Implementing Recommendations on Land Allocation Guidelines .....	38
<b>4.4</b>	<b>Constraints/Challenges/Limitations Faced in Advancing Private Sector Investment in Sustainable Biomass Energy Production on CFRs, LFRs and Forest Landscapes .....</b>	<b>39</b>
<b>5</b>	<b>CONCLUSION AND RECOMMENDATIONS.....</b>	<b>41</b>
<b>5.1</b>	<b>Conclusions .....</b>	<b>41</b>
<b>5.2</b>	<b>Recommendations .....</b>	<b>41</b>
<b>5.3</b>	<b>Practical actions for implementation of the recommendations.....</b>	<b>43</b>
	<b>REFERENCES .....</b>	<b>45</b>
	<b>APPENDICES .....</b>	<b>46</b>
	<b>Appendix 2- List of Respondents.....</b>	<b>47</b>
	<b>Appendix 3 - List of members in attendance for validation meeting.....</b>	<b>48</b>

## LIST OF FIGURES AND TABLES

Figure 1: Maps showing comparison of Uganda land cover 1990 and 2015 (source: NFA 2015)	4
Figure 2: Status of deforestation in Uganda 2015 (Source NFA)	5
Figure 3: Forest cover change by management regime (Source: Uganda’s Forest Reference Emissions Level for REDD+, 2018)	6
Figure 4: Estimated biomass energy consumption, sustainable supply, deficit and annual deficit increment	7
Figure 5: Forest land restoration zonation for Uganda	24
Figure 6: Map of Uganda Showing Land Cover, 2019	26
Figure 7: Map Showing Western Mid Altitude Landscape, 2019	27
Figure 8: Map showing Changes in Forest cover around Bugoma CFR 1990-2015	28
Table 1-1: Estimated biomass consumption, sustainable supply and deficit	7
Table 1-2: Computation of cost of seedlings required for planting to cover the year 2019 deficit	8
Table 1-3: Estimated Biomass Energy Consumption in the Africa Region	8
Table 2-1: Land scape selection criteria	10
Table 4-1: Land allocation classified by size	16
Table 4-2: Land allocated classified by land use	17
Table 4-3: Land allocated classified by region	18
Table 4-4: Projected contribution of plantations in CFRs to Biomass energy	19
Table 4-5: NFA land allocation for biomass energy showing allocation and planting	20
Table 4-6: Estimated status of Biomass energy land area and planting for selected districts	21
Table 4-7: District ranking of biomass sources	22
Table 4-8: Estimated status of private investment in selected districts	29
Table 4-9: Western Mid- Altitude Landscape -Biomass Investments by Tea Companies	30
Table 4-10: SPGS Biomass Initiatives	32
Table 4-11: Bamboo production initiatives	33
Table 4-12: Agroforestry species for the selected forest landscapes	34
Table 4-13: Estimated Investment and Returns from the Biomass Energy Production	36

## LIST OF ACRONYMS AND ABBREVIATIONS

CA	Corporate Affairs
CFR	Central Forest Reserve
CO <sub>2</sub>	Carbon Dioxide
CSO	Civil Society Organisations
DFO	District Forest Officer
DLG	District Local Government
EA	Environment Alert
EU	European Union
FAO STAT	Food and Agricultural Organisation, Statistics
FLR	Forest and Land Restoration
FMNR	Farmer Managed Natural Regeneration
FREL	Forest Reference level, REDD+
FSSD	Forestry Services Support Department
GDP	Gross Domestic Product
GEF	Global Environment Facility
ICRAF	International Centre for Research In Agroforestry
IUCN	International Union for Conservation of Nature
LFR	Local Forest Reserve
MAAIF	Ministry of Agriculture, Animal Industry and Fisheries
MDA	Ministries, Departments, and Agencies
MDP (OP)	Ministry for Disaster Preparedness Office of Prime Minister
MEMD	Ministry of Energy and Mineral Development
MFPED	Ministry of Finance Planning and Economic Development
MLGSD	Ministry of Labour Gender and Social Development
MLHUD	Ministry of Lands, Housing and Urban Development
MOWT	Ministry Works and Transport
MST	Ministry of Science and Technology
MWE	Ministry of Water and Environment
NaFORRI	National Forestry Resources Research Institute
NARO	National Agricultural Research Organisation
NCTPP	National Community Tree Planting Programme
NDP	National Development Plan
NFA	National Forestry Authority
NFP	National Forest Plan
NFs	Natural Forests
NFTPA	National Forestry and Tree Planting Act
NGO	Non-Government Organisation
NORAD	Norwegian Agency for Development Cooperation
NRO	Natural Resources Officer
PA	Protected Area
R&D	Research and Development

REDD+	Reduced Emissions from Deforestation and Forest Degradation
SME	Small and Medium Enterprises
SPGS	Sawlog Production Grant Scheme
THF	Tropical High Forests
TORs	Terms of Reference
UBOS	Uganda Bureau of Statistics
UGX	Uganda Shilling
UN	United Nations
UNCST	Uganda National Council of Science and Technology
UNDP	United Nations Development Programme
UNHCR	United Nations High Commission For Refugee
USD	United States Dollar
UTGA	Uganda Timber Growers Association
WB	World Bank
WWF	World Wildlife Fund

## EXECUTIVE SUMMARY

This study is an output of Environmental Alert under the project titled, '*Increasing access to sustainable and Renewable energy alternatives in the Albertine Graben.*' The project was implemented in partnership with WWF-UCO with financial support from NORAD. Environment Alert (EA) is working in addressing community needs and contributing to an enabling natural resources policy and practice environment, with increased and active participation and self-representation of poor and vulnerable men, women and youth.

The national total primary energy is comprised of 88% biomass energy, 10% fossil fuels and 2% electricity. The biomass energy use is 74% for domestic, 18% industry and 8% institutions and SMEs. Whereas the Uganda population is currently 40.3 million and projected to be 55.4 million by 2030 with an annual growth rate of 3.2%, biomass will still be a major source of energy. Over 95% of the population, especially in the rural areas, depends on firewood for domestic energy. The influx of refugees into the country further exacerbates the demand for biomass energy.

The forest cover in Uganda currently stands at 12.4% of the land area, representing about 2,500,000 hectares of which 64% woodland, 20% tropical high forest and 16% of plantations and scattered trees in farmland. The standing wood biomass is estimated at 284.1million tons (355.125 million m<sup>3</sup>).

The current consumption of wood biomass for energy stands at about at 57,272,101 m<sup>3</sup> of raw wood p.a. and grows at 3.2 % in line with population growth rate. The capacity of the forest to sustainably supply wood is estimated at 26 million tons equivalent (32.5 million m<sup>3</sup>) of raw wood per annum representing 57% of the wood biomass annual demand. This is in addition to estimated 1.6 million cubic meters of fuel wood consumed by refugees per annum. While the contribution of woody biomass may slowly decline as a percentage of total energy consumption, demand for woody biomass for fuel can be expected to rise three- to five-fold by 2040. In order to meet the current annual fuel wood biomass demand it will require an area of about 2 million hectares of woodland (30m<sup>3</sup>/ha/yr.) or about 300,000 ha (200m<sup>3</sup>/ha/yr.) of well managed plantation.

Uganda has a total of 8,079,622 ha of land available for forest landscape restoration of which government through the Bonn Challenge is committed to restore 2.5 million hectares by 2030 through massive tree planting involving all stakeholders, private sector inclusive. Dedicated biomass energy plantations could be part of this important intervention to establish at least 133,000 ha per annum with potential of producing 20-30 million m<sup>3</sup> of wood biomass to supplement the natural wood stock from the forested areas with supply gap of about 26 million m<sup>3</sup> in 2019. The cost of establishing 133,000 ha is estimated at UGX 532 Billion (USD 144 Million) in a period of 5 years.



The current rate of tree plantation establishment of about 10,000 ha per annum, is 20% of the average annual rate of forest loss of 50,147 ha, which mainly targets industrial wood. Small woodlots and agroforestry are the appropriate options for forest landscape restoration and enhancing biomass energy production due to the existing small landholdings. The study determined issues in biomass energy production and informed actions for private sector investment.

The overall study approach was participatory, involving ministries, departments and agencies as well as district local governments, private sector, research institutions and CSOs dealing in biomass energy production and promotion of efficient use. The respondents were engaged through discussions, interviews, and self-administered questionnaires to enlist their input. The two forest landscapes of focus were southwest rangeland and western mid altitude farm lands although data was also gathered from other districts outside the said landscapes and in total 36 key informants were engaged.

The findings indicated that land allocation in CFRs by NFA to date was totalling to 196,882 ha and of this 82,709 ha were planted with assorted species of trees, with 3200 ha of land dedicated to biomass energy production in a number of forest reserves. The SPGS programme has supported the establishment of biomass energy plantations in CFRs and within institutions; UNHCR is implementing a biomass energy response refugee forestry project in partnership with NFA. Furthermore, the farmer managed natural regeneration (FMNR) has been piloted by World Agroforestry Centre in collaboration with World Vision Uganda in the districts of Nakasongola, Kibaale, Kotido and Abim with positive results of regenerating the woodlands and improving ecological conditions in the pilot areas. There are also efforts by other actors including private sector such as tea companies and local communities that are all geared to grow trees for biomass energy.

Several constraints were identified as limiting the advancement of private sector investment in sustainable biomass energy production. These include information gap, low priority, inadequate capacity of responsible institutions and players, limited investment and market based- incentives; lack of biomass energy standards, low adoption of efficient biomass energy technologies, land tenure system, weak governance arrangements and lack of clear financing mechanisms. Fuel wood use is said to be the cause of deforestation and health related pollution. This is not entirely correct because much of the fuel wood is obtained as a result of clearing land for agriculture expansion, settlements, urban or infrastructure development and harvesting of timber and poles. Pollution in households and charcoal production can be averted by application of efficient biomass energy technologies. Biomass is a renewable resource which can be utilized in perpetuity unlike fossil fuels.

Changes to improve biomass energy production and some policy recommendations and practical actions to achieve sustainable biomass energy production have been suggested. These include increased funding, access to information, communication and skills development, decentralized planning, integrated and coordinated implementation, improved regulation and law enforcement, institutional capacity, investment incentives to private sector, research and development and gender equity. These policy changes will provide a conducive environment for private sector investment in biomass energy production and related efficient use technologies. They will also improve the institutional capacities for planning, implementation and monitoring.

Conclusively, the use of biomass energy by the population and industry will remain significant in the mid to long term requiring that the country adequately plans for the sustainable production of this important resource. This calls for changes in the policy, legal, financing and institutional arrangements to address the barriers that limit sustainable biomass production. Therefore, government should give priority to biomass energy and private sector involvement, coordination of MDAs responsible for energy, legal regulatory matters and biomass energy information, institutional, financial and gender aspects.

# 1 BACKGROUND

## 1.1 Introduction

This study report details the approach to determine issues in biomass energy production, with the aim of generating recommendations and actions for private sector investment in the biomass energy production. The study is an output of Environmental Alert outputs under the project titled, '*Increasing access to sustainable and Renewable energy alternatives in the Albertine Graben.*' The project is implemented in partnership with WWF-UCO with financial support from NORAD. Environment Alert (EA) is working in addressing community needs and contributing to an enabling natural resources policy and practice environment, with increased and active participation and self-representation of poor and vulnerable men, women and youth. Within the context of its vision, '*Communities free of hunger and managing their natural resources sustainably,*' work is driven by conviction on the intrinsic link between poverty and environment. The report presents a summary of the biomass status in Uganda, objectives of the assignment, approach and methodology, results, conclusions, recommendations, and suggested actions for improving sustainable biomass production and efficient use.

## 1.2 Overview of the study

The national total primary energy is comprised of 88% biomass energy, 10% fossil fuels and 2% electricity (Draft Energy Policy, 2019). The biomass energy use is for domestic 74%, industry 18% and institutions and SMEs 8% (Biomass Strategy 2013). The Uganda population is estimated at about 40.3 million and projected to reach 55.4 million by 2030 (UBOS Statistical Abstract, 2019) at an annual growth rate of about 3.2%. Biomass energy will still be a major source of energy in the medium to long term given the increasing demands for energy by the growing population. Over 95% of the population especially in the rural areas depends on firewood for domestic energy. The influx of about 1.4 million refugees to Uganda further increases the demand on biomass energy estimated to be 1.6 million M3 of fuel wood per annum (WB/FAO, 2018). This is against inadequate supply of biomass coupled with unsustainable production. Dedicated biomass energy production is the solution which will have socio-economic benefits beyond the energy supply including direct and indirect employment especially to women and youth, mitigating climate change through enhancing carbon stocks and contributing to GDP through supporting industry. Biomass waste from thinning and pruning of plantations; harvesting waste which is about 70% has the potential for bio-electricity production that has not been fully exploited.

### 1.2.1 Status of Forests and Biomass Energy Production and Use

The forest cover in Uganda was 24% in 1990 but is currently standing at 12.4% of the land area. This represents about 2,500,000 hectares comprising 64% woodland, 20% tropical high forest and 16% of plantations and scattered trees in farmlands (FREL, MWE 2018). Figures 1 and 2 below depict the forest cover change that has occurred over the years from 1990 to 2015 and the status of deforestation in the country as by 2015 respectively while figure 3 shows the forest cover change by management regime in the same period. The decline in forest cover against increasing demand for forest products provides the opportunity for investment in commercial tree planting on private land and protected areas for production of sustainable forest products including biomass energy.

The standing wood biomass is estimated at 284.1million tons about 355.125 million m<sup>3</sup> equivalent (Clean technologies, 2018) The current consumption of wood biomass for energy stands at about at 43,292,521m<sup>3</sup> of firewood and 1, 118,336 metric tons of charcoal (FAOSTAT 2018) equivalent to13, 979,580 m<sup>3</sup> of raw wood (10% efficiency) giving total estimated consumption of 57,272,101 m<sup>3</sup> of raw wood p.a. This consumption is growing at 3.2 % in line with population growth rate. The capacity of the forest to sustainably supply wood is estimated at 26 million tons equivalent (32.5 million m<sup>3</sup>) of raw wood per annum. This is about 57% of the wood biomass annual demand creating a negative balance on the biomass energy equation. The refugee influx into the country contributes to consumption of fuel wood estimated at 1.6 million per annum. In 2017 alone, the refugee settlements in Northern Uganda with a population of 798,499 consumed 527,819 tons equivalent to 659,773 m<sup>3</sup> of raw wood (UNHCR, 2018). While the contribution of woody biomass may slowly decline as a percentage of total energy consumption, demand for woody biomass for fuel can be expected to rise three- to five-fold by 2040 (MWE 2016).

Firewood will remain the dominant biomass energy source in the rural areas depending on supplies from the natural wood in patches of forests remaining, woodlots and trees on farmlands. The current annual fuel wood biomass demand of about 60 million m<sup>3</sup> requires area of 2 million hectares of woodland (30m<sup>3</sup>/ha.) or about 300,000 ha (200m<sup>3</sup>/ha) of well managed plantation. The areas of existing natural forests and plantations harvested far exceed the natural capacity of the forests to regenerate and area of new biomass plantations so far established. This has led to the unsustainable harvesting of biomass resources resulting in the overall deforestation and forest degradation experienced throughout the country.

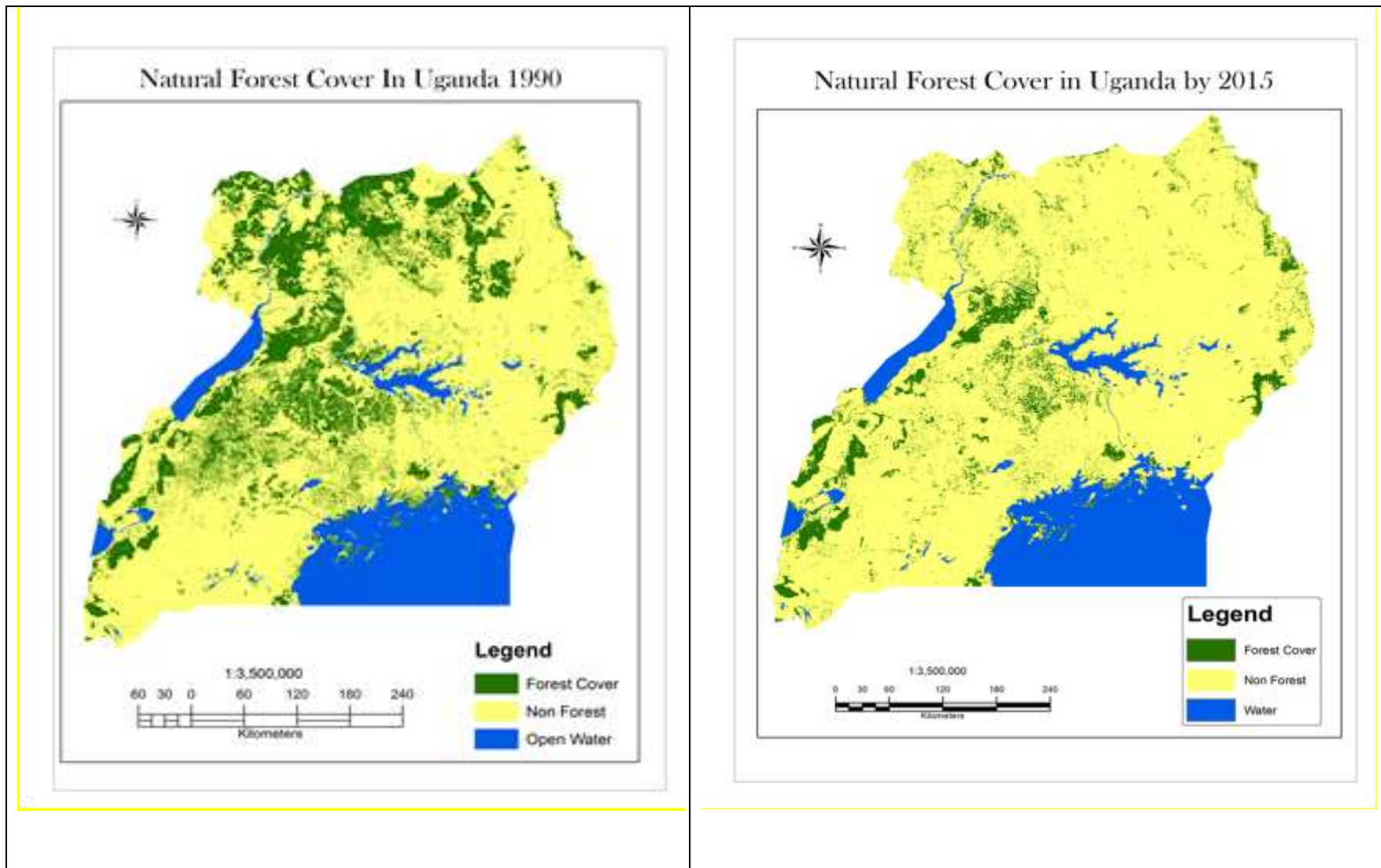
The use of efficient cook stoves can contribute to reducing the amount of fuel wood required for energy per household. The adoption of improved Rocket Lorena Stoves promoted by MEMD and GIZ from 2005 by households in Uganda is only about 10% (Clean Technologies, 2018) which means the use of the 3 stone cook stoves is still widespread in rural areas resulting in high per capita consumption of fuel wood of about 1.42 m<sup>3</sup> as compared to Rwanda with per capita consumption of 0.44 m<sup>3</sup> (Table 3). There is still a lot of effort required to promote use of efficient cook stoves.

Charcoal on the other hand will remain the dominant energy source for the urban areas with the rapidly growing population. The production of charcoal is the worrying situation due to the low efficiency of 8-15% using the traditional earth kiln. The traditional earth kiln is versatile and can be used for any quantity of wood available and therefore in spite of the low returns it is still favored by the majority poor charcoal producers. The very low output of this kiln results in the rapid and wasteful depletion of the natural feedstock and cannot be profitable for feedstock from the plantations raised at high cost.

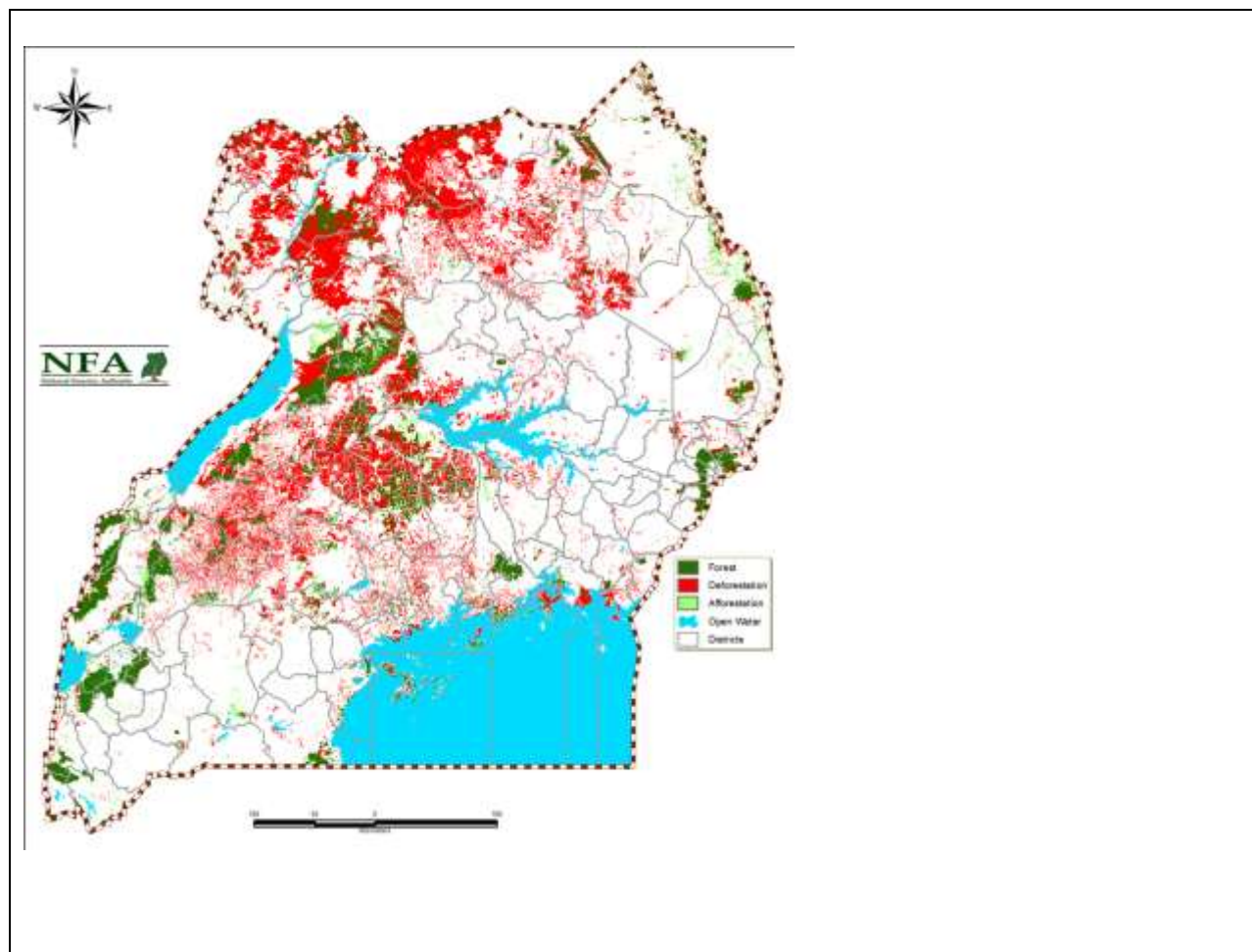
To address the issue of low charcoal production efficiency, efforts have been made to introduce better charcoal production technologies. The improved charcoal kilns introduced include the, Casamance (modified earth kiln) with efficiency of 20-30% and the Adam Retort kiln and Half Orange 30-40% for small scale production and the Missouri and CK Euro kilns with 35-42% efficiency for large scale production. The Missouri Kiln in New Forest Company, for example, produces about 3850 tons of charcoal from 11,000 tons of wood while the KC Euro in Green Resources has an annual capacity of 3,400 tons of charcoal which requires about 8,500 tons of wood (SPGS, 2014). However, the adoption of these improved kilns has been low due to high initial investment costs, and costs of transporting the kiln from one area to another for the Casamance kiln, or transporting the feed stock for the Half Orange retort kilns which are fixed in one area.

Establishment of dedicated biomass energy plantations will provide the opportunity for use of improved kilns since there will be no much expense in transporting the kilns or feedstock within the plantation area. The plantations will also generate adequate and uniform feedstock to supply the kilns. Eucalyptus plantation for example can provide 200-300 m<sup>3</sup>/ha of wood in 5 years as compared to natural production 100-150 m<sup>3</sup>/ha in the same period with additional advantage of planned and controlled production conditions for the former.

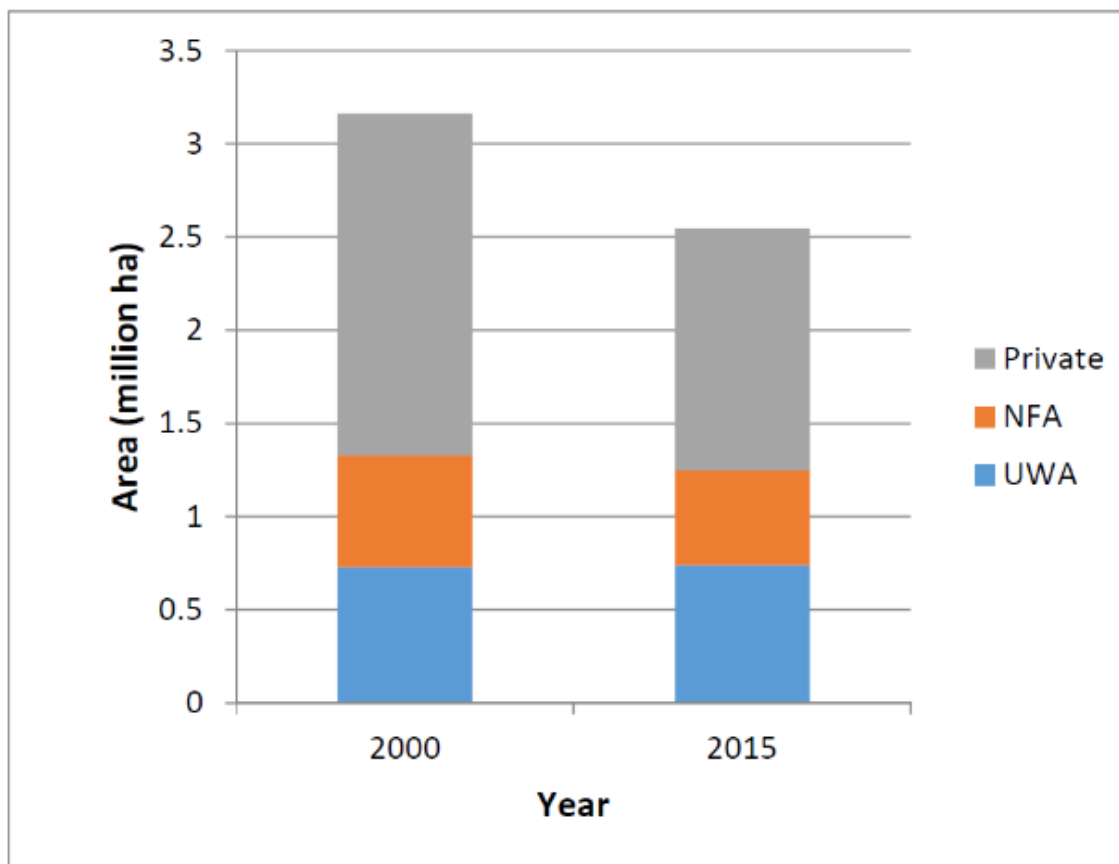
Uganda has a total of 8,079,622.1 ha of land available for forest landscape restoration (FLR- IUCN/MWE 2016). Government through the forest landscape restoration program (The Bonn Challenge) made commitment to restore 2.5 million hectares of degraded forest areas through massive tree planting involving all stakeholders. Dedicated biomass energy plantations could be part of this important intervention to establish at least 133,000 ha per annum with potential of producing 20- 30 million m<sup>3</sup> of wood biomass to supplement the natural wood stock from the forested areas with supply gap of about 26 million m<sup>3</sup> in 2019. The current rate of tree plantation establishment is about 10,000 ha per annum, i.e. about 20% of the average annual rate of forest loss (2000-2015) of 50,147ha (MWE-FREL 2018) targeting mainly industrial wood plantations.



**Figure 1:** Maps showing comparison of Uganda land cover 1990 and 2015. **Source:** NFA 2015.



**Figure 2:** Status of deforestation in Uganda 2015. **Source:** NFA.



**Figure 3:** Forest cover change by management regime. **Source:** Uganda's Forest Reference Emissions Level for REDD+, 2018.

### 1.2.2 Estimated Biomass Energy Trend

The biomass energy consumption in 2018 was estimated at 57.2 million metric tons while the sustainable supply for the same year was 32.5 million tons culminating to a deficit of 24.7 million tons as shown in table 1. The consumption is estimated to continue growing at the rate of the population growth of 3.2 % per annum. Unfortunately, the sustainable supply is likely to decrease or remain stagnant or grow at a lesser rate if no adequate deliberate investment is made to plant trees for biomass energy production. With biomass energy need estimated to grow at average of 2 million m<sup>3</sup> per annum, by year 2027 the deficit will be 43.5 million m<sup>3</sup> if no investment is made in tandem with the biomass energy consumption. Figure 4 shows the ensuing widening trend between biomass energy consumption and the sustainable supply.



Table 1-1: Estimated biomass consumption, sustainable supply and deficit

Year	Estimated Consumption (m <sup>3</sup> )	Estimated sustainable supply (m <sup>3</sup> )	Deficit (m <sup>3</sup> )	Annual increase of deficit (m <sup>3</sup> )
2018	57,272,101	32,500,000	24,772,101	
2019	59,104,808	32,500,000	26,604,808	1,832,707
2020	60,996,162	32,500,000	28,496,162	1,891,354
2021	62,948,039	32,500,000	30,448,039	1,951,877
2022	64,962,377	32,500,000	32,462,377	2,014,337
2023	67,041,173	32,500,000	34,541,173	2,078,796
2024	69,186,490	32,500,000	36,686,490	2,145,318
2025	71,400,458	32,500,000	38,900,458	2,213,968
2026	73,685,272	32,500,000	41,185,272	2,284,815
2027	76,043,201	32,500,000	43,543,201	2,357,929
<b>Estimated average annual deficit increase</b>				<b>2,085,678</b>

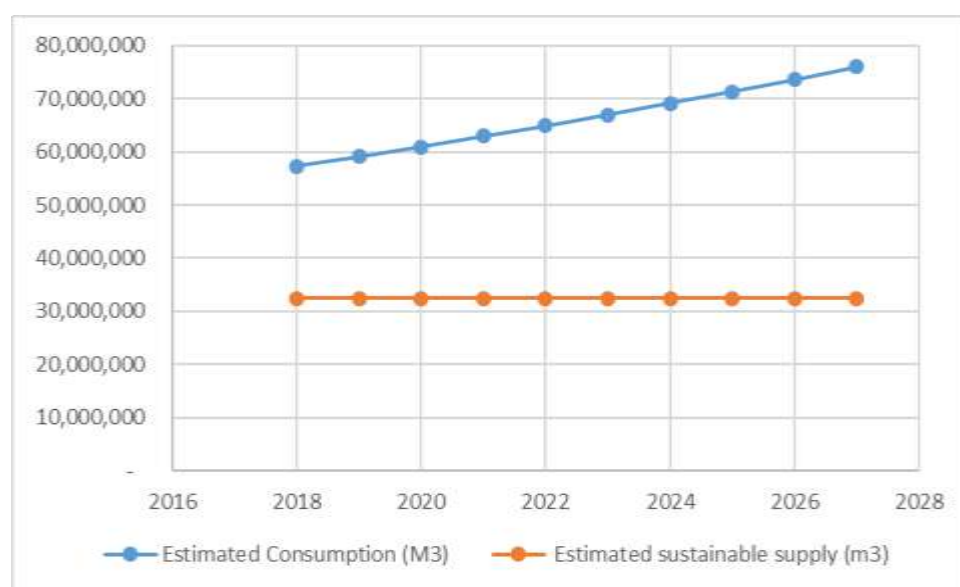


Figure 4: Estimated biomass energy consumption, sustainable supply, deficit and annual deficit increment

### 1.2.3 Opportunities in the Biomass Energy Production Value Chain

The disparity between biomass energy consumption and the sustainable supply presents opportunities for investment in the biomass energy production value chain. Plantation forestry and on-farm tree planting are appropriate options to bridge the biomass energy gap. This will call for production of seedlings and management of the trees, creating demand for labour and materials required for the same. In table 2, year 2019 estimated deficit is 26.6 million m<sup>3</sup> which translates to 133,024 ha each yielding 200 m<sup>3</sup> of biomass in five years. Table 2 shows that planting trees to cover the deficit creates opportunity to supply seedlings

worth approximately USD 17.3 million for year 2019 deficit and USD 1.3 million to take care of annual incremental deficit.

**Table 1-2: Computation of cost of seedlings required for planting to cover the year 2019 deficit**

Year	Deficit (m <sup>3</sup> )	Production per ha (m <sup>3</sup> )	Number of ha required	Number of seedlings planted per ha	Total number of seedlings	Cost per seedling (UGX)	Total cost in UGX	Total cost in USD
2019 deficit	26,604,808	200	133,024	1,600	212,838,400	300	63,851,520,000	17,257,168
Subsequent years average deficit	2,000,000	200	10,000	1,600	16,000,000	300	4,800,000,000	1,297,297
Exchange rate USD 1=3700 UGX								

## 1.2.4 Regional Perspective of Biomass Energy Consumption

The average per capita per annum of wood consumption for the region represented by the countries in table 3 is 1.01 m<sup>3</sup>. Rwanda ranks number 1 in wood consumption efficiency (0.44 m<sup>3</sup>) followed by Sudan (0.53 m<sup>3</sup>) which consumption is below the regional average. The lowest efficient user is Ghana ranking in 9<sup>th</sup> with 2.34 m<sup>3</sup> per person followed by Uganda ranking 8<sup>th</sup> with consumption of 1.42 m<sup>3</sup> per person per annum.

**Table 1-3: Estimated Biomass Energy Consumption in the Africa Region**

Country	Population (million)	Firewood (million m <sup>3</sup> )	Charcoal (million Tons)	Charcoal wood equiv. million m <sup>3</sup> (10% efficiency)	Total wood consumption (m <sup>3</sup> )	Per capita (m <sup>3</sup> )	Rank
Chad	16	7.8	0.479	5.98	<u>13,780,000</u>	<u>0.86</u>	6
Nigeria	200.9	65.89	4.51	56.37	<u>122,260,000</u>	<u>0.61</u>	3
Ethiopia	112	102.8	4.41	55.12	<u>157,920,000</u>	<u>1.41</u>	7
Sudan	42.8	15.41	0.588	7.35	<u>22,760,000</u>	<u>0.53</u>	2
Ghana	30.4	46.4	2	25	<u>71,400,000</u>	<u>2.34</u>	9
Kenya	52.5	23.76	1.19	14.87	<u>38,630,000</u>	<u>0.74</u>	5
Malawi	18.6	5.84	0.577	7.21	<u>13,050,000</u>	<u>0.7</u>	4
Rwanda	12.6	5	0.048	0.6	<u>5,600,000</u>	<u>0.44</u>	1
<b>Uganda</b>	<b>40.3</b>	<b>43.3</b>	<b>1.118</b>	<b>13.9795</b>	<b><u>57,275,000</u></b>	<b><u>1.42</u></b>	8
<b>Regional average</b>						<b><u>1.01</u></b>	

Source: FAOSTAT 2018 (Modified)

### **1.2.5 Best Practices in Wood Biomass Production and Use**

The region has countries that have managed wood biomass energy production and utilization to meet the needs of the ever increasing population and development pressure. Ethiopia, is addressing the biomass energy needs through increased supply of biomass from on-farm tree planting, use of new biomass products; increased efficiency in charcoal production; use of fuel wood efficient stoves and as remedy for biomass energy shortage substitution of woody biomass by other renewable energy types such as biogas, solar, hydroelectricity (Ethiopia Biomass Strategy 2013). These are supported by availability of sufficient and qualified human resources at all levels.

In Rwanda, all biomass energy needs are met from trees planted on farm and cutting of indigenous trees for fuel wood is prohibited. Households are required to set aside a portion of their land for biomass production). Equally all households are required to use energy saving cook stoves (Rwanda Biomass Strategy 2009)

### **1.3 Objectives of the Assignment**

The overall objective of the study was to, *'identify the underlying issues (challenges & opportunities), recommendations and actions for advancing structured investments (by government & private sector) in sustainable biomass production within central forest reserves and forest landscapes across the country so as to contribute towards the huge national demands for biomass energy.'*

### **1.4 Scope/Deliverables**

From the TORs, the assignment scope included:

- i. To provide an overview on the status on NFA's contribution to sustainable biomass energy production through implementation of the guidelines on land allocation for restoration in the central forest reserves;
- ii. To generate some baseline information of the status of investments in sustainable biomass production within central forest reserves and forest landscapes across the country.
- iii. To assess the NFA guidelines on land allocation to identify gaps and opportunities for investment in biomass production;
- iv. To review the current constraints (challenges & limitations) for advancing private sector investment in sustainable biomass energy production in central forest reserves and forest landscapes;
- v. To make recommendations (policy & practices) for addressing the constraints /limitations for private sector investment in sustainable biomass energy production in central forest reserves and the catchment/landscapes;
- vi. To identify practical actions for implementation of the identified recommendations;

## 2 APPROACH AND METHODOLOGY

The overall study approach was participatory where relevant stakeholders in the wider energy sector were consulted to tap their experiences, skills and knowledge about the various areas of the study focus. Ministries, departments and agencies as well as district local governments, private sector (tea companies, large scale tree growers), research institutions and CSOs dealing in biomass energy production and promotion of efficient use were engaged through discussions, interviews and questionnaires to enlist their input. The step by step procedures included: *discussion with EA staff, document review, development of data collection tools, conducting interviews, self-administered questionnaires, and stakeholder mapping.* The review of secondary data as well as collection of primary data from stakeholders in the biomass energy production was also undertaken.

The study focused on two forest landscapes namely southwest rangeland and western mid altitude farm lands. However, respondents from other landscapes were included to give the study a national perspective. Appendix 2 details the participants in the study and in total 36 key informants were engaged. These informants were selected considering relevance to the biomass energy production and use and representation of the landscapes. The landscapes were selected based on the following criteria in Table 4.

**Table 2-1: Land scape selection criteria**

SITE	RATIONALE
Western Mid Altitude Landscape (Albertine Rift)	<ul style="list-style-type: none"> <li>• Many natural forests with high biodiversity</li> </ul>
	<ul style="list-style-type: none"> <li>• High rate of loss of natural forests and tree cover.</li> </ul>
	<ul style="list-style-type: none"> <li>• Supports high population density with high demand for wood biomass energy.</li> </ul>
	<ul style="list-style-type: none"> <li>• More private investments in wood biomass production</li> </ul>
	<ul style="list-style-type: none"> <li>• Expected migration of workers to the oil region will create excessive demand on fuel energy</li> </ul>
South West Range Lands	<ul style="list-style-type: none"> <li>• Has many degraded wood land forests with large degraded area suitable for large scale plantation investments.</li> </ul>
	<ul style="list-style-type: none"> <li>• Has substantial private and government forest plantation investments</li> </ul>
	<ul style="list-style-type: none"> <li>• Supports relatively low population density with competitive advantage for tree growing.</li> </ul>
	<ul style="list-style-type: none"> <li>• Major source of high quality (high calorific value) fuel wood (charcoal) for Kampala and other urban areas which has resulted in high forest degradation.</li> </ul>

To keep the study on course and enlist wider input, review meetings were held with staff of Environment Alert and this review culminated with a validation workshop with selected stakeholders.

## **Data analysis**

The data collected through questionnaires, interview guide and document reviews were analysed and synthesised for report preparation through discussion and reviews by the consultants and EA staff. Through content analysis, raw data was organised and summarised to allow extraction of themes from the information given by the respondents. Data was processed by use of excel spreadsheets which allowed for easy processing of information where data was tabulated and graphs generated to provide valuable information and trends.

## **Limitations of the Study**

Some limitations were identified as below:

- a. *Limited number of respondents due to resource constraints.*
- b. *Limitation of some information from self-administered questionnaires because probing of issues was not done.*
- c. *Limitations of secondary data which may not be accurate.*

To address the limitations, triangulation of data and sources was done. The participants with key information for the study were sampled and this helped address the issue of the number of respondents. Respondent's inputs were also corroborated with earlier studies.

### **3 POLICY AND LEGAL PROVISIONS SUPPORTING SUSTAINABLE BIOMASS PRODUCTION AND PRIVATE SECTOR INVESTMENT**

The biomass energy production and use is supported by both the national policies and laws and the international policies and best practices on development and environment management. The following are pertinent policies, laws and plans for sustainable biomass energy production and use in Uganda.

#### **a. Vision 2040**

Vision 2040 states that efforts will be made to restore and add value to the ecosystems (wetlands, forests, range lands and catchments) by undertaking re-forestation and afforestation on public land, promoting participation of the population in tree planting on both private and public land and enhancing private investment in forestry through promotion of commercial tree planting on private land and adoption of green agriculture practices. This will lead to restoration of forest cover from the current 15 per cent of the total land area to 24 per cent.

#### **b. Sustainable Development Goals (SDGs, 2030)**

SDGs provide for elimination of poverty and hunger; renewable, affordable and accessible clean energy; gender equality, conservation of biodiversity, clean environment, mitigation of climate change and above all good health and wellbeing to which sustainable biomass energy production can contribute.

#### **c. National Development Plan 2015-16-2019-20 (NDP II)**

NDP II under the Environment and Natural Resources subsector has set forestry targets to increase the percentage of forest cover from 14% (2012/13) to 18% by 2020.

The forestry objective is to increase afforestation, reforestation, and adaptation and mitigated reforestation for sustainable forestry with the following interventions:

- i. Develop countrywide community based and institutional tree planting initiatives.*
- ii. Promote sustainable development of commercial forest plantations and industry including value addition.*
- iii. Promote implementation of sustainable management of forests through restoration of natural forests on protected and private land*
- iv. Promote forestry research and development.*
- v. Develop markets for forest products and services.*
- vi. Develop a robust and functional national forest monitoring system.*
- vii. Promote forestry in urban development planning.*
- viii. Scale up agroforestry-based alternative livelihood systems.*

Private sector financing remains a key challenge especially for start-up companies that are shunned by traditional commercial banks. NDPII recommends that Uganda considers establishing a fund of funds but adapt it to the local context with improved governance and management principles and practices. NDP II also recommends use of public private partnership (PPP) arrangements including concessions.

**d. Uganda Forestry Policy (2001)**

The Uganda Forestry Policy provides for the private sector to play a major role in developing and managing commercial plantations on government or private land and further developing and managing the forest products processing industries. It provides for forestry on government, private and farm lands as well urban areas.

**e. Renewable Energy Policy (2007)**

The Renewable Energy Policy provides for the establishment of an appropriate financing and fiscal policy framework that will attract more investments in Renewable Energy Technologies and to manage the biomass resource base in a sustainable manner.

Women will need to play a special role in the provision and management of energy sources, since they are the most affected by inadequate energy supplies. The difference in interests, needs and priorities that women have compared to those of men will be recognized in planning, implementation and monitoring of renewable energy projects.

**f. National Biomass Energy Strategy (BEST, 2013)**

The National Biomass Energy Strategy provides for increasing biomass supply, by involving private sector participation in a nationwide plan; of multipurpose trees, shrubs and energy crops; for both thermal and electricity generation and ensure that biomass deficit areas are among the first beneficiaries.

The private sector is expected to be a major player in biomass energy investment opportunities. The government makes a deliberate effort to break barriers that curtail adoption of the technologies by developing a number of innovative funding mechanisms such as grants, challenge fund and use of carbon credits as collateral

**g. REDD+ Strategy (2017)**

Under strategic option 2: *sustainable fuel wood and (commercial) charcoal production*, the REDD+ Strategy aims to address the energy poverty in the context of climate change by promoting sustainable fuelwood and charcoal production. The option provides one of the greatest opportunities to reduce CO<sub>2</sub> emissions while fostering significant sustainable development benefits including poverty alleviation, employment, and energy for industry and supporting nutritional health. Unlike fossil fuels, biomass energy production is able to offset its own carbon foot print by enhancing the carbon stocks.

**h. National Forestry and Tree Planting Act (2003)**

The NFTP (2003) provides for the responsible body subject to the management plan to grant licenses to interested persons for the sustainable utilization and management of a forest reserve or community forest. The license is issued subject to terms, conditions, rights and fees. However, the license does not give the licensee any privilege, right or title over the forest reserve other than that stated in the terms of the license.

### **i. National Forest Plan (NFP 2011)**

The NFP provides for firewood, charcoal and bamboo as forest products to be targeted for house hold, commercial and industrial purposes. It provides for NFA and the private sector to establish energy plantations in a responsible manner.

In view of the need to implement the above favourable policy and legal frameworks, the country is zoned into 7 forest restoration landscapes: Western Mid-Altitude Farmlands, Lake Victoria Crescent, Karamoja, South East Kyoga Floodplains, Afro-Montane High Altitude, North Moist Farmlands, and South West Rangelands (FLR Assessment, IUCN-MWE 2016) based on homogeneous landscape types in terms of restoration-relevant characteristics to enable restoration interventions. The priority areas for investment in sustainable biomass production cut across these landscapes.



## **4 STUDY RESULTS**

The study findings are presented according to the study objectives as below.

### **4.1 NFA's Contribution to Sustainable Biomass Energy Production through Implementation of the Guidelines on Land Allocation for Restoration in the Central Forest Reserves**

The NFA is mandated to manage government central forest reserves as the lead agency. It manages 506 CFRs with a total area of 1.2 million hectares constituting 15% of the forest estate in Uganda. In 2004 NFA developed and launched guidelines on land allocation to enable the public gain access to land in forest reserves for tree planting. These guidelines were revised in 2017 in line with the lessons learnt and emerging issues.

#### **4.1.1 Land Allocated for Tree Planting in the CFRs**

Land allocation in CFRs has taken place in two phases, the old allocation was done from 2002 to 2012, and the new allocation done in 2018. Land allocated in this report is classified according to land size, purpose for production, and the region and FLR landscape where the land/reserve is located. To date, a total of 196,882 ha have been allocated and 82,709 ha of this land have been planted. Table 5 shows the land allocation according to land sizes: large for investors allocated over 100 ha, medium with 21-100 ha and the small investors with allocation of 20 ha and below. The objective of the NFA as expressed in the guidelines is to revamp the forest resources in the Country and encourage private investors. However, the guidelines incorporated the principles of sustainable forest management, best practice, accountability, transparency, and inclusiveness to bring all stakeholders to participate in the forest resource development and management. The small land size (<20ha) in particular targets the forest adjacent communities who by default have depended on forest resources for household needs such as fuelwood, building poles and even sale of timber from forest reserves for income and livelihoods.

Of the 196,882 ha allocated, 42% (82,709 ha) have been planted. The allocation by land size stands at: large 62%, medium 29% and small holders 9%. The percentage of area planted by holders is: large holders 58%, medium 26% and small holders 16%. The small holders have been more efficient in planting the area allocated; planting 72% of the area they were allocated as compared to 39% by large holders and 38% by medium holders. In addition, NFA has since 2004 established 11,000 ha of own industrial wood plantations in several central forest reserves.

**Table 4-1: Land allocation classified by size**

Land size	Old Allocation (2002-2012)				New Allocation (2018)				Total			
	No. of farmers	Allocated Area (ha)	Planted Area (ha)	%	No.	Allocated Area (ha)	Planted Area (ha)	%	No.	Allocated Area (ha)	Planted Area (ha)	%
Large (>100 ha)	99	71,279	47,774	67	64	50,780	-	-	163	122,059	47,774	39
Medium (21-100 ha)	500	25,814	21,818	85	702	30,900	-	-	1,202	56,714	21,818	38
Small (<20 ha)	2,277	13,594	13,117	96	517	4,515	-	-	2,794	18,109	13,117	72
<b>Total</b>	<b>2,876</b>	<b>110,687</b>	<b>82,709</b>	<b>75</b>	<b>1,283</b>	<b>86,195</b>	<b>-</b>	<b>-</b>	<b>4,159</b>	<b>196,882</b>	<b>82,709</b>	<b>42</b>

**Allocation by percentage**

Land size	Old Allocation (2002-2012)			New Allocation (2018)			Total		
	No. of farmers	Allocated Area (ha)	Planted Area (ha)	No.	Allocated Area (ha)	Planted Area (ha)	No.	Allocated Area (ha)	Planted Area (ha)
	%	%	%	%	%	%	%	%	%
Large (>100 ha)	3	64	58	5	59	58	4	62	58
Medium (21-100 ha)	17	23	26	55	36	26	29	29	26
Small (<20 ha)	79	12	16	40	5	16	67	9	16
Total	100	100	100	100	100	100	100	100	100

**Source:** NFA Records, 2018.

Land is allocated for specific purposes which include: industrial wood production, production of pole and fuelwood, restoration of forest cover, and biomass production. The biggest part of the allocation goes for industrial wood production (172,281 ha) and poles and fuel wood (12,051 ha) as shown in table 6. Restoration (9,350 ha) and biomass production (3,200 ha) take the least allocation. Although allocation for biomass production is small, the initiative from NFA shows how there is a deliberate effort to address the biomass need in the country. It's worth noting that NFA has given land in CFRs for production of timber and poles and part of this timber and poles end up as biomass energy as by-products of the timber processing or after its primary use.

Unlike the previous allocation (2002-2012) that did not provide for biomass production directly, the 2018 land allocation provided for biomass energy production (3,200 ha). Five investors were allocated land of 500 ha and above. Of these the data is not yet available about the proportion of area planted as the mapping exercise had not been conducted by the time of writing this report.

**Table 4-2: Land allocated classified by land use**

Land Purpose	Old Allocation (2002-2012)				New Allocation (2018)				Total			
	No. of farmers	Allocated Area (ha)	Planted Area (ha)	%	No.	Allocated Area (ha)	Planted Area (ha)	%	No.	Allocated Area (ha)	Planted Area (ha)	%
Area for industrial wood production (ha)	1,190	99,311	70,999	71	1,130	72,970	-	-	2,320	172,281	70,999	41
Area for pole and fuel wood (ha)	1,686	11,376	11,711	103	135	675	-	-	1,821	12,051	11,711	97
Area for restoration (ha)	-	-	-	-	13	9,350	-	-	13	9,350	-	-
Biomass Production (ha)	-	-	-	-	5	3,200	-	-	5	3,200	-	-
<b>Total</b>	<b>2,876</b>	<b>110,687</b>	<b>82,710</b>		<b>1,283</b>	<b>86,195</b>			<b>4,159</b>	<b>196,882</b>	<b>82,710</b>	
<b>Allocation by percentage</b>												
Purpose	Old Allocation (2002-2012)			New Allocation (2018)			Total					
	No. of farmers	Allocated Area (ha)	Planted Area (ha)	No.	Allocated Area (ha)	Planted Area (ha)	No.	Allocated Area (ha)	Planted Area (ha)			
	%	%	%	%	%	%	%	%	%			
Area for industrial wood production (ha)	41	90	86	88	85		56	88	86			
Area for pole and fuel wood (ha)	59	10	14	11	1		44	6	14			
Area for restoration (ha)	-	-	-	1	11		0	5	-			
Biomass Production (ha)	-	-	-	0	4		0	2	-			
<b>Total</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>		<b>100</b>	<b>100</b>	<b>100</b>			

**Source:** NFA Records, 2018.

The greatest land allocation and planting has taken place in the central region. Table 7 shows allocation in central region is 102,358 ha with 51% (51,861 ha) planted, followed by northern region 41,646 ha with 11% planted, western region 30,735 ha with 55% (17,912 ha) planted. Eastern region ranks last with allocation of 22,143 ha but ranks second in percentage planted with 42% (9,403 ha). The area of CFRs varies by region which has an effect on the area allocated for example eastern Uganda has the smallest area under CFRs (statutory instrument no. 63, 1998). On the other hand, eastern region has the largest area of land under local forest reserves, estimated at about 2500 ha. Northern region was affected by insecurity during the first of land allocation.

**Table 4-3: Land allocated classified by region**

Region	Land scape	Old Allocation (2002-2012)				New Allocation (2018)				Total			
		No. of farmers	Allocated Area (ha)	Planted Area (ha)	%	No.	Allocated Area (ha)	Planted Area (ha)	%	No.	Allocated Area (ha)	Planted Area (ha)	%
Central	LVC,SWR	1,220	67,988	51,861	76	481	34,370	-	-	1,701	102,358	51,861	51
Eastern	SEK,LVC,AML	599	18,268	9,403	51	159	3,875	-	-	758	22,143	9,403	42
Northern	NML, KAR	190	5,781	4,434	77	407	35,865	-	-	597	41,646	4,434	11
Western	WML,AML	867	18,650	17,012	91	236	12,085	-	-	1,103	30,735	17,012	55
<b>Total</b>		<b>2,876</b>	<b>110,687</b>	<b>82,710</b>		<b>1,283</b>	<b>86,195</b>	<b>-</b>	<b>-</b>	<b>4,159</b>	<b>196,882</b>	<b>82,710</b>	

**Allocation by percentage**

Region	Land scape	Old Allocation (2002-2012)			New Allocation (2018)			Total		
		No. of farmers	Allocated Area (ha)	Planted Area (ha)	No.	Allocated Area (ha)	Planted Area (ha)	No.	Allocated Area (ha)	Planted Area (ha)
		%	%	%	%	%	%	%	%	%
Central	LVC,SWR	42	61	63	37	40		41	52	63
Eastern	SEK,LVC,AML	21	17	11	12	4		18	11	11
Northern	NML, KAR, AML	7	5	5	32	42		14	21	5
Western	WML,AML	30	17	21	18	14		27	16	21
<b>Total</b>		<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>		<b>100</b>	<b>100</b>	<b>100</b>

Key: Lake Victoria Crescent (LVC). South Western Range Land (SWR), South East Lake Kyoga (SEK), Afro Montane Landscape (AML), Northern Moist Landscape (NML), Karamoja (KAR), Western Mid Altitude Landscape (WML)

Source: NFA Records, 2018.

**Contribution of NFA to biomass energy**

NFA through allocation of land in CFRs for plantation forestry is expected to contribute to biomass energy from the resulting thinnings and final harvest of the tree crop. The plantations established by the private sector and NFA in CFR so far covering about 93, 710 ha will over the period of about 20 years provide fuel wood mainly as secondary product from harvesting of timber and poles but also directly from the biomass energy dedicated plantations as detailed in table 8. The total estimated yield for biomass from thinning and final harvest is 30,086,760 m<sup>3</sup> segregated as industrial plantations by private sector 23,811,900 m<sup>3</sup>, industrial plantations by NFA 3,190,000 m<sup>3</sup>, pole and fuel wood plantations 3,044,860 million m<sup>3</sup> and biomass 40,000 m<sup>3</sup>. This is a substantive contribution to the biomass energy need in the country, however, more investment is needed to bridge the increasing biomass energy deficit. The allocation of land in CFRs to the private sector for tree growing is the main contribution of NFA to biomass energy production in the country.

**Table 4-4:** Projected contribution of plantations in CFRs to Biomass energy

Investment Type	Area planted (Ha)	Estimated wood biomass m <sup>3</sup> /Ha	Est. total Wood biomass m <sup>3</sup>	Remarks
Industrial plantations (PS)	82,710	290	23,811,900	Thinnings and final harvest.
Industrial plantations (NFA)	11,000	290	3,190,000	Thinnings and final harvest.
Pole and fuel wood	11,711	260	3,044,860	5-10 years harvest
Biomass	200	200	40,000	5 years harvest
<b>Total</b>	<b>105,621</b>		<b>30,086,760</b>	

Source: NFA records 2018

#### 4.1.2 Tree Species Planted and Recommended for Biomass Energy Production

The common species planted for biomass energy production include: *Eucalyptus grandis* and *E. camaldulensis*, and *Grevillea*. According to the respondents, most of the species planted are exotic with few indigenous species. This could be attributed to the undeveloped skills in planting and management of indigenous species. The public prefers planting species with high success rate and fast maturing thereby being harvested for use and sale in short time. The cross cutting factors influencing preference of particular species include: attractive economic returns, fast growth rate, multiple uses of the species, and adaptability of the species to the local soils and local climate.

The species recommended for biomass energy production include: *Eucalyptus grandis*, *Eucalyptus paniculata*, *Eucalyptus closiana*, *Eucalyptus camaldulensis*; *Grevillea robusta*, *Bathdavia*, *Senna spectabilis*, *Senna siamea*, *Melia spp* and bamboo (NFA, 2019). Indigenous species recommended include *Albizia*, *Combretum*, *Terminalia*, and *Markhamia*. The indigenous species are recommended due to termite resistance, adaptation to the cattle corridor, high caloric value, and drought resistance, while for exotic species the main reason is the fast growth rate. The selection of the species for planting should be based on the planting site for good yield i.e. site – species matching; consideration of the nature of the predominant economic activity and local climatic conditions.

NFA has planted 200 ha in Kaweri CFR with *Eucalyptus*, *Markhamia* and *Senna* species under the GEF UNDP sustainable charcoal project, 2017-2018.

#### 4.1.3 Incentives by NFA to Promote Sustainable Biomass Energy Production in the Country

NFA has put in place incentives to promote tree planting in the country and support sustainable biomass energy production including:

- i. Distribution of 51 million seedlings to the public under the national community tree planting programme (NCTPP) from 2009 to-date
- ii. Allocation of 3,200 ha of land for dedicated biomass production; part of it is established as a demonstration centre in Kasagala CFR

- iii. Importation of seeds of tree species for biomass production such as *Eucalyptus paniculata*, *E. closiana* and bamboo.

## 4.2 Baseline Information of the Status of Investments in Sustainable Biomass Production within Central Forest Reserves and Forest Landscapes across the Country

### 4.2.1 Investment in Government Protected Areas

Investments in government protected areas are considered under central forest reserves and local forest reserves. Available literature was reviewed to identify initiatives by government agencies and development partners. In addition, the respondents provided information on the status of investments in sustainable biomass production.

#### i. Area of Land Under Biomass Energy Production in CFRs

NFA has put 3200 ha of land under dedicated biomass energy production spread in a number of forest reserves. Table 9 shows area allocated, planted and plantation type.

**Table 4-5: NFA land allocation for biomass energy showing allocation and planting**

Investment type	Allocated Area (ha)	Area planted	Investor	Remarks
Tree plantation	3200	Data not available	Private sector	Commercial biomass energy plantations
Bamboo	300	Data not available	UNHCR /NFA	Areas impacted by refugee biomass energy use in CFRs.
Tree plantation	1100	Data not available	UNHCR /NFA	Areas impacted by refugee biomass energy use in CFRs.
Tree plantation	200	200	NFA in Kaweri	Dedicated charcoal biomass

**Source:** NFA Records, 2019.

#### ii. Area of Land Under Biomass Energy Production in LFRs

Some districts were sampled to inquire on the district biomass energy production. The respondents provided information on area of LFR and area planted as shown in table 10. Tororo district has all of its LFR area planted (100%). However, the rest of the districts still have most of the area unplanted, presenting opportunity for biomass energy production.

**Table 4-6:** Estimated status of Biomass energy land area and planting for selected districts

District	FLR Land scape	Area of LFR Ha	Area Planted (Ha)	Percentage planted
Kabarole	WML	36	8	22
Rukungiri	WML	48	2	4
Bushenyi	WML	26		-
Rakai	SWR	75	11	15
Nakasongola	SWR	-	-	
Mukono	LVC	554	-	-
Mbale	AML	188	23	12
Tororo	LVC	66	66	100
Arua	NML	684	324	47
<b>Total</b>		<b>1,677</b>	<b>434</b>	<b>26</b>

Key: Lake Victoria Crescent (LVC). South Western Range Land (SWR), South East Lake Kyoga (SEK), Afro Montane Landscape (AML), Northern Moist Landscape (NML), Karamoja (KAR), Western Mid Altitude Landscape (WML)

**Source:** Districts' Records 2019.

### iii. Main Sources of Biomass Energy Wood.

Identifying the main sources of biomass energy wood used in the community and for industrial purposes is important in planning interventions to improve the biomass energy production in the country. Some districts were surveyed through a self-administered questionnaire and were asked to rank the sources of biomass energy wood. The identified sources were natural forest, wood land, plantation, and farm trees. They were asked to rank the sources of biomass by ranking the main source as number 1 and the least as number 4. Table 11 gives the results of the survey. The results show that the main source of biomass energy is plantation and farm trees. Of the 7 districts that ranked their source of biomass energy, four (Kyenjojo, Mbale, Bushenyi, Tororo) ranked plantations as the main source of the biomass energy wood and farm trees were second. Natural forest ranked least except in Mukono and Arua districts.

**Table 4-7: District ranking of biomass sources**

District	Landscape	Natural forest	Wood land	Plantation	Farm trees
		Rank	Rank	Rank	Rank
Kyenjojo	WML	4	3	1	2
Mukono	LVC	1		2	3
Mbale	AML	4	3	1	2
Bushenyi	WML	3	4	1	2
Nakasongola	SWR	4	1	2	2
Tororo	LVC	4	3	1	1
Arua	NML	1	2	3	4
1=most used source, and 4= least used source					

**Key:** Lake Victoria Crescent (LVC). South Western Range Land (SWR), South East Lake Kyoga (SEK), Afro Montane Landscape (AML), Northern Moist Landscape (NML), Karamoja (KAR), Western Mid Altitude Landscape (WML)

**Source:** Districts' Records 2019

#### iv. Main Sources of Funding for the Biomass Energy Investment

The country does not have a clear policy on funding biomass energy production. The main source of dedicated investment for biomass energy is by donor funding i.e. GEF-UNDP, FAO/UN, EU, NORDIC countries, UNHCR and WB. In addition, the private sector including households uses personal savings. There are potential funding opportunities for biomass energy production with International carbon funds and carbon trade credits as specified in the REDD+ strategy.

#### v. Priority Areas of the Country for Investment in Sustainable Biomass Production and Reasons

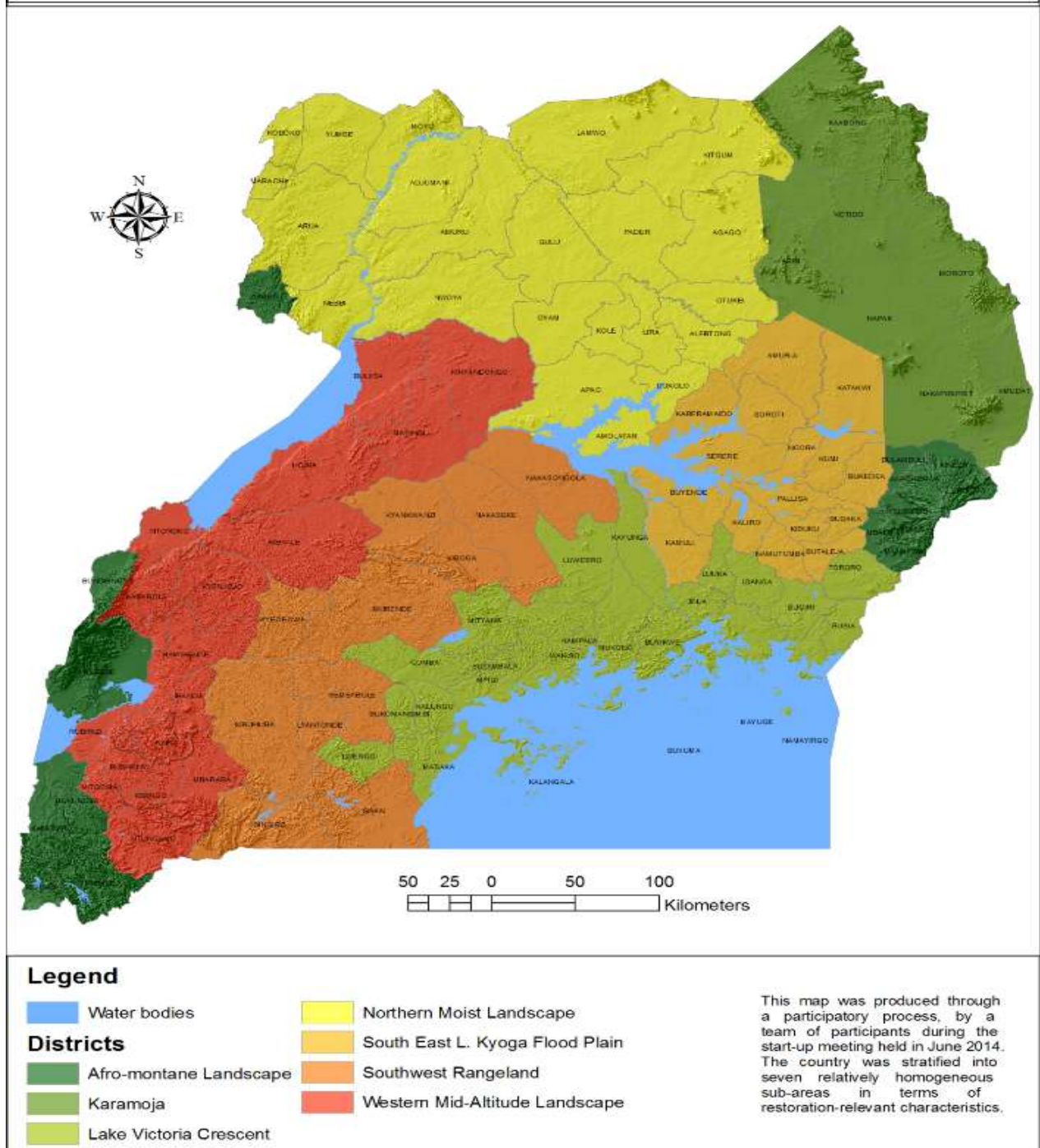
The country is zoned into 7 forest landscapes (Figure 5): Afro-Montane landscapes, Karamoja, Lake Victoria Crescent, North Moist Landscape, South East L. Kyoga, Southwest Rangeland, Western and Mid-Altitude Farm land based on homogeneous landscape types in terms of restoration-relevant characteristics to enable restoration interventions. The priority areas for investment in sustainable biomass production cut across these landscapes. According to the respondents, the areas that rank high for biomass investment is the cattle corridor, which comprise the Southwest Rangelands, South East Lake Kyoga, Karamoja, and in addition the North Moist landscape and Lake Victoria Crescent. The cattle corridor has experienced a high rate of deforestation where now the natural resource is not coping with the demand for biomass energy from increasing population and development.

However, the Uganda FLR - Restoration Opportunity Assessment Report 2016 indicates that northern moist, southwest rangeland and western mid altitude farmland were the most deforested and degraded landscape zones between 2005 and 2015 both in terms of coverage and magnitude. These were followed



by South East Lake Kyoga flood plain, Afro-montane and Karamoja respectively. Northern Moist, Karamoja and southwest Rangeland landscape zones offer the highest acreage for restoration. Afforestation, reforestation, agroforestry and natural regeneration are the most preferred restoration options. The degraded areas will form the focus for dedicated biomass energy plantations within Northern moist, Southwest Rangeland landscape, Western mid altitude and South East Lake Kyoga flood plain taking the priority due to available degraded areas.

# Forest Landscape Restoration Zonation for Uganda



**Figure 5:** Forest land restoration zonation for Uganda. **Source:** MWE-IUCN, 2016.

The land cover maps for Uganda (Figure 6) and Western mid altitude landscape (Figure 7) below show the current land use which is dominated by the subsistence farmlands which are potential areas for agroforestry production system. The woodlands, bush lands and grasslands are equally potential areas for

forest landscape restoration activities including dedicated biomass energy production. The maps (figure 8) also indicate the potential threat to the PAs which stand as islands without significant buffer forests for forest products including fuel wood.

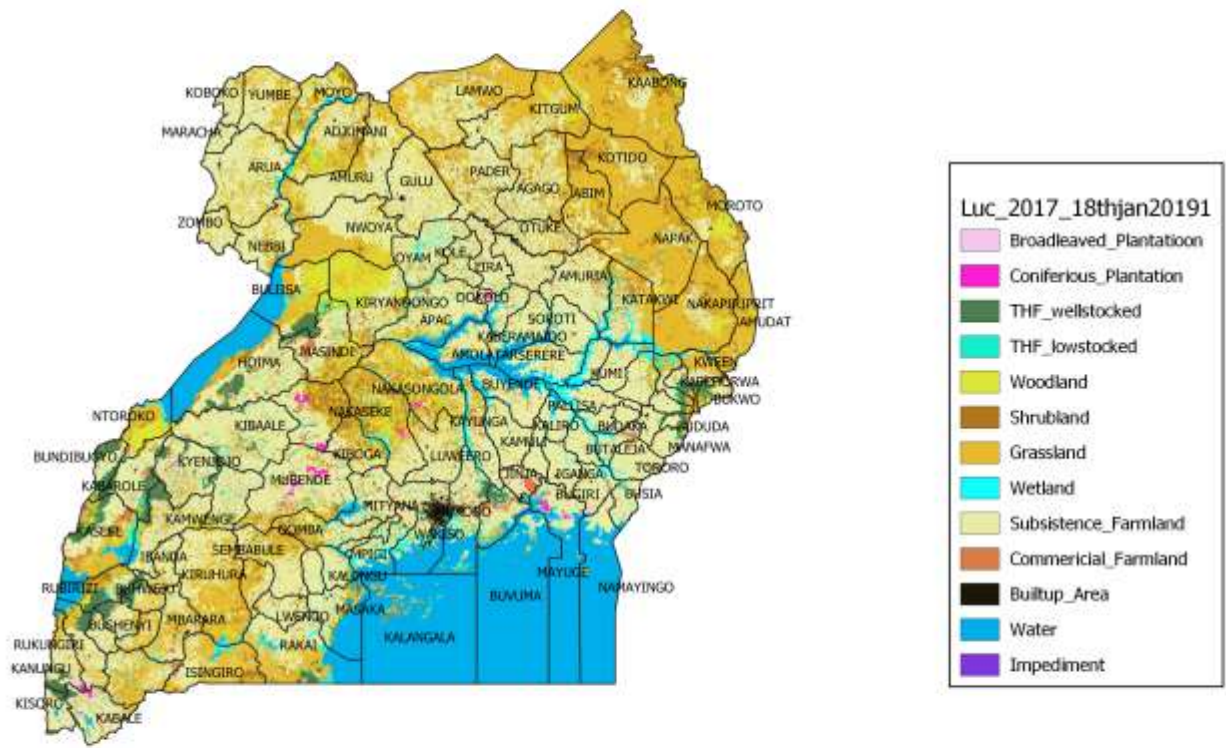


Figure 6: Map of Uganda Showing Land Cover, 2019.

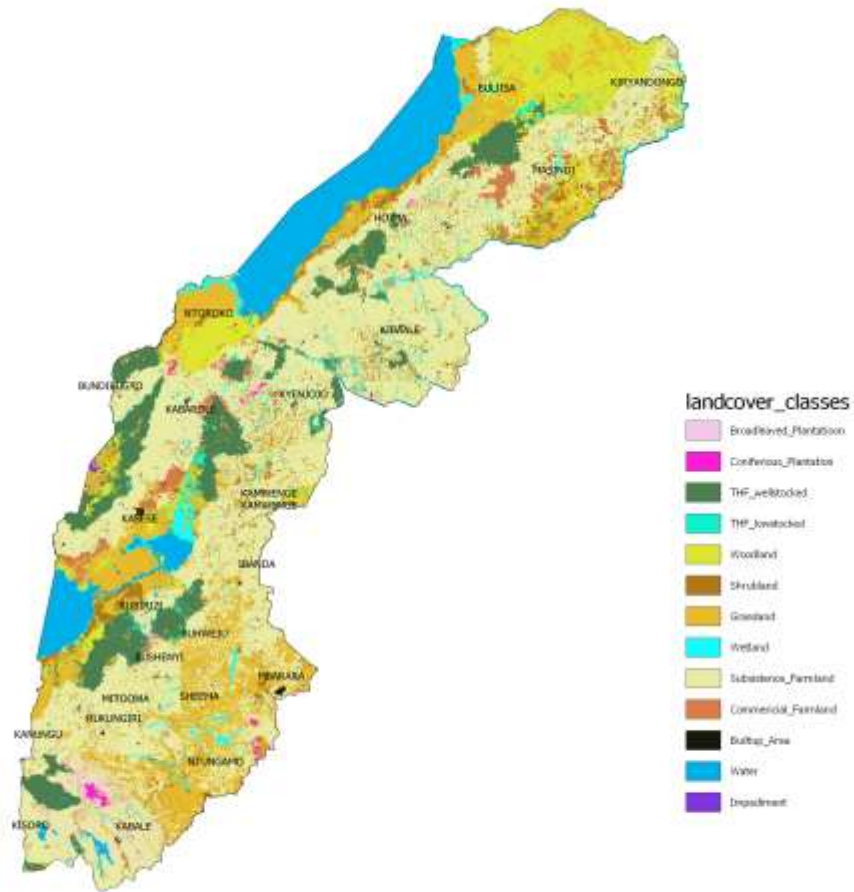


Figure 7: Map Showing Western Mid Altitude Landscape, 2019.



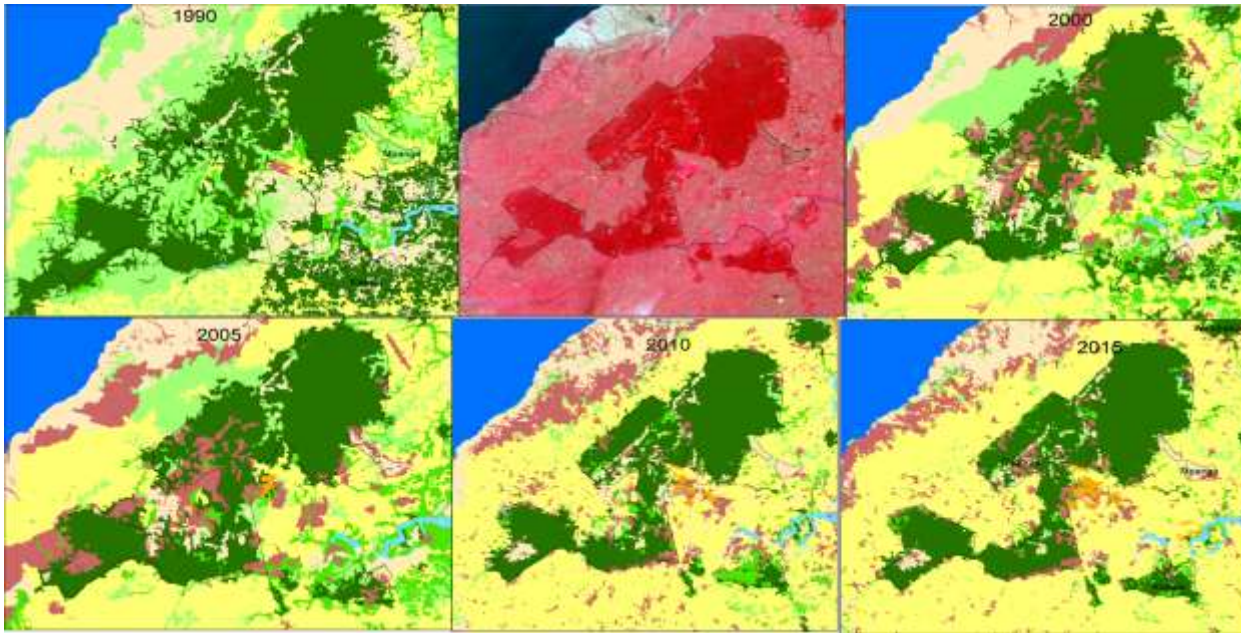


Figure 8: Map showing Changes in Forest cover around Bugoma CFR 1990-2015.

**vi. District Plans/Strategies for Biomass Energy Production in the Medium Term**

Some of the strategies the districts are involved in for biomass energy production in the medium term include:

- a) Distribution of seedlings to communities under the National Community Tree Planting Program;
- b) Mainstreaming environment and climate change activities in all sectors in a DLG
- c) Promotion and adoption of agroforestry systems due to land shortage and the growing population.
- d) Holding an Annual Tree Planting Day for sensitizing and encouraging communities to engage in tree planting on their private lands for example Nakasongola district annually holds a tree planting day
- e) Restoration of catchment areas and private/home plantation establishment
- f) Encouraging collaborative forest management in CFRs
- g) Working with the CSOs to promote tree planting programs

**4.2.2 Investments in Forest Landscapes**

Investment in forest landscapes covers private land and not government protected areas.

**i. Area of Land Put Under Biomass Energy Production on Private Land**

Production of biomass energy on private land is carried out by households and big investors mostly involved in tobacco and tea growing, processing and export (Table 12). Some of the big investors who as well have acquired land in CFRs through lease have invested in biomass energy production (Table 13).

**Table 4-8: Estimated status of private investment in selected districts**

District	Land scape	Area Private land (Ha)	Species planted	Remarks
Kabarole	WML			No information was given
Rukungiri	WML	20	Eucalyptus., Pinus, Grevillea, Prunus	Information not credible
Bushenyi	WML			No information was given
Rakai	SWR			No information was given
Nakasongola	SWR	2,000	Eucalyptus, Grevillea, Melia, Bathdavia. Maesopsis, Pine, Indigenous species	
Mukono	LVC	45,000	Eucalyptus, Albizzia, Maesopsis, Indigenous species	
Mbale	AML	1,750	Eucalyptus, Grevillea,	
Tororo	LVC			No information was given
Arua	NML			No information was given

**Key:** Lake Victoria Crescent (LVC). South Western Range Land (SWR), South East Lake Kyoga (SEK), Afro Montane Landscape (AML), Northern Moist Landscape (NML), Karamoja (KAR), Western Mid Altitude Landscape (WML)

**Source:** Districts’ Records 2019.

There has been no study carried out to establish actual areas of biomass production in the districts.

**Table 4-9: Western Mid- Altitude Landscape -Biomass Investments by Tea Companies**

Tea Company	Area (Ha)	Production (m <sup>3</sup> /ha)	Quantity	Location
Igara Tea	260	300	78,000	CFR
TAMTECO	92	300	27,600	CFR
MacLeod's Russell	1,300	300	390,000	Private /CFR

**Source:** Tea Companies, 2019.

Western mid altitude landscape has large tea estate companies (table 13) that grow biomass energy plantations for own use. These tea companies are good example of private sector investments in the biomass energy production but equally have stimulated out growers who sell their firewood to the tea companies creating opportunities for employment and incomes for the local people.

#### ii. Initiatives to Interest the Private Sector to Invest in Biomass Energy Production

There are initiatives to interest the private sector to invest in biomass energy production sponsored by various actors which include NFA, donor community, and government of Uganda. These include:

- a) The NFA provides licenses for land in CFRs for biomass production. It is worth noting that NFA has given land in CFRs mainly for production of timber and poles and that part of this timber and poles end up as biomass energy as bye products of the timber processing or after its primary use.
- b) The government and NFA provide tree seedlings to the community under the national community tree planting programme (NCTPP). The community plant own woodlots and some of the trees or branches supplement the biomass energy need
- c) Through the donor and government support, through SPGS, MWE provides funds to grow trees for biomass
- d) There are tax incentives/holidays for promotion of energy technologies, solar and associated machinery

#### iii. On-going Initiatives

##### a) On-going Policy Reviews

The policies relevant for biomass production and use are currently undergoing review and presents opportunity for addressing policy gaps. These policies include Uganda Forest Policy 2001, Energy Policy 2002 and their associated laws.



### **b) Uganda National Council for Science and Technology Initiative**

In 2019, the Uganda National Council for Science and Technology in collaboration with Ministry of Science and Technology embarked on interventions for coordination of the Technology Needs Assessment (TNA) for Uganda focusing on 4 priority sectors including: Energy, Agriculture, Forestry and Water. The initiative is funded by the Global Environment Facility and executed by UN Environment, in collaboration with the UN Environment DTU (Technical University of Denmark) Partnership Centre on Energy, Climate and Sustainable Development (UDP). TNAs present an opportunity to track evolving needs for equipment, techniques, practical knowledge and skills which are necessary to mitigate greenhouse gas emissions and/or reduce vulnerability of sectors and livelihoods to the adverse impacts of climate change. Therefore, the identified technology needs and priorities in the 4 priority sectors should be addressed through investments in the technology development and transfer for advancing adaptation to climate change at community, local and national levels.

### **c) Renewable Energy CSO Network**

The Renewable Energy CSO Network hosted at Environment Alert is a great opportunity for advancing structured advocacy engagements to influence investments in renewable energy, biomass energy inclusive.

### **d) UNHCR Refugee Forestry Project (2019-2020)**

UNHCR is implementing a forestry Project in partnership with NFA (NFA, 2019). The refugee population in Uganda is 1.36 million with population density 10 times that of Uganda. The impacts of refugee settlements include environment degradation due to biomass harvesting for energy and building materials, reduced groundwater recharge, sexual and gender violence to refugees; and conflict between refugees and host communities on scarce resources. Rapid assessment by UNCHR and FAO in 2018 in the refugee areas found out that per capita use of firewood was 2.5-4.5kg per day. 1.3 million tons of wood biomass (1.63 million m<sup>3</sup>) was needed to support 1.36 million refugees. This is also equivalent to 20 trees (5yr-old trees) per person per annum, including poles for construction of refugee shelters.

The overall project objective is environment and natural resources protected and restored and green livelihoods promoted using catchment based approach. The project districts hosting refugees are Arua, Moyo Yumbe, Koboko, Adjumani, Lamwo, Kiryadongo, Kyegegwa, Kisoro, Kikuube, Kamwenge and Hoima. The project targets include:

- *8.4 million Seedlings to be produced for planting.*
- *Restore tree cover in 24,302 ha in 12 districts.*
- *Restore 1,100 ha in CFRs impacted by the refugees.*
- *Establish 300 ha of bamboo demonstration planting in 3 CFRs each 100 ha in Lamwo, Moyo and Hoima Districts.*

The project plans to implement 50% of planned targets in refugee areas and 50% in areas for host communities.

#### e) Biomass Investment Under SPGS

The SPGS programme has supported the establishment of biomass energy plantations in CFRs and within institutions as shown in the table 14. The SPGS II supported establishment of biomass energy plantations in CFRs while SPGS III in institutions like schools, churches, prisons, and hospitals all over Uganda.

**Table 4-10: SPGS Biomass Initiatives**

Category of planters	Area planned (ha)	Area achieved (ha)	Remarks
Dedicated biomass plantations (Farmers)	1000	1000	Planted under SPGS II
Institutional planting (schools, Churches, Prisons)	2500	800	Planting under SPGS III
Community tree planting	4,000	Data not available	Planting under SPGS III
<b>Total area planted</b>		<b>1,800</b>	
Refugee settlements	60	Not yet known	Rwamanja, Kyangwali and Bidibidi

**Source:** SPGS, 2019.

#### f) Planned Bamboo Investments

Uganda has a strategic target to restore 2.5 million ha by 2030 under the Bonn Challenge. The Bamboo Strategy, 2019, provides for medium term (2019-2024) and long term (2025-2040) plans for restoration of degraded forest areas with bamboo. In the medium term, new bamboo plantations will cover 70,000 ha with 40,000 ha in protected areas and 30,000 on private land. In addition, 15,000 ha of degraded bamboo areas will be restored. On the other hand, the long term plan targets to restore 375,000 ha of which 104,000 ha will be in protected areas and 271,000 ha on private land by 2040.

The landscapes targeted for bamboo restoration include 225,000 ha planted in the lowland areas of Northern Uganda, Karamoja, Teso, Nakaseke, Luwero and L. Victoria shores; and 75,000 ha to be established in the highland areas of Mt Elgon, Rwenzori and Kisoro. The species to be planted include *Oldeania alpine*, *Oxytenanthera abyssinica* which are indigenous to Uganda and *Dendocalmus gigantea* and *Bambusa vulgaris* which are exotic.

The bamboo yields are estimated to be about 2,000 poles per ha and in terms of biomass equivalent to 30 tons / ha. Table 15 presents the restoration initiatives and targets as spelt in the Bamboo Strategy 2019.

**Table 4-11: Bamboo production initiatives**

Organisation	Time frame	Target	Target achieved	Location	Remarks
1. NFA/UNHCR	2019-2020	300ha		CFRs in Lamwo, Moyo and Hoima	Bamboo plantation
2. MEMD	2017-19	2,200 Ha		N. Rwenzori	Bamboo plantation
3. FIEFOC II	2017-20	2,500 Km	150km	Mt Elgon.	Riverine boundary planting
4. WMDP-MWE	2015-20	1,500 Km		Nile Banks	Riverine boundary planting
5. WSSPII Project-MWE	2015-20	120 Km	120 km	Mt Elgon	Riverine boundary planting
6. SPGS- EU-FAO	2019-20	60 Ha		Refugee areas	Woodlots for biomass and poles
7. UBA	2019-2020	500 Ha	none	Kasagala CFR	Bamboo plantation

**Source:** MWE: Bamboo Strategy, 2019.

#### g) Agroforestry Technologies in Farming Systems

Farmer managed natural regeneration (FMNR) has been piloted by World Agroforestry Centre in collaboration with World Vision Uganda in the districts of Nakasongola, Kibaale, Kotido and Abim with positive results of regenerating the woodlands and improving ecological conditions in the pilot areas (ICRAF, 2017). FMNR is a rapid, low cost and easily replicated approach to restoring and improving agricultural, forested and pasture lands. It is based on encouraging the systematic re-growth of existing trees or self-sown seeds. It can be used wherever there are living tree stumps with the ability to coppice (re-sprout) or seeds in the soil that can germinate. However, this initiative has not been rolled out country wide with clear government policy. FMNR is the most suitable and cost effective approach to sustainable management of woodlands for biomass energy production as opposed to replanting of indigenous woodland species whose silvicultural management is not well known by the land owners. The Global Climate Change Alliance (GCCA) working with The Forest Sector Support Department piloted a project on biomass energy production and use in the districts of Luwero, Nakaseke, Nakasongola, Mubende, Kiboga and Sembabule mainly emphasizing planting of fast growing tree species like *Gmelina arborea*. 100ha of demo plantations established and another 600 Ha established by farmers supported by the project. Two efficient demo Charcoal kilns were also constructed in Kiboga district and the project is planned to expand to Kalungu, Gomba and Lyantonde Districts following success of the pilot phase (FSSD, MWE, 2019).

Households in Uganda practice agroforestry by retaining some indigenous species of trees in the farms or planting selected trees mainly for fruits, poles and fuel wood. This is done as boundary planting, woodlots, home gardens, scattered trees and alley or strip planting along the bunds for soil erosion control. However, this is usually done without proper farm planning and technical guidance due to limited access to agricultural and forestry extension services. MWE and MAAIF extension staff in the districts need to coordinate their programmes to support farmers on agroforestry in order to maximize benefits including biomass energy, food, forage and incomes as well as environmental benefits like soil conservation. This will require some joint training of the relevant staff of the two ministries to harmonize the extension approach.

The World Agroforestry Centre (also known as ICRAF) has implemented an agroforestry pilot project at Rhino Camp and Imvepi refugee settlements, showing that agroforestry systems can be rolled out in a refugee situation targeting both refugee and host communities (UNHCR, 2018)

The forest landscape restoration assessment for Uganda 2016, recommends trees species per forest landscape suitable for agroforestry, shown in table 16 below.

**Table 4-12: Agroforestry species for the selected forest landscapes**

Forest Land scape	Recommended Agroforestry Tree Species
South western rangelands	<ul style="list-style-type: none"> <li>• Promoting multi-purpose tree planting for soil fertility improvement and bee keeping such as <i>Leucaena leucocephala</i>, <i>Callindra calothyrsus</i>, <i>Croton megalocarpus</i>, <i>Sesbania sesban</i>, <i>Senna siamea</i></li> <li>• Planting shade trees such as <i>Ficus natalensis</i></li> <li>• Mixing crops with indigenous tree species such as <i>Erythrina abyssinica</i></li> </ul>
Mid altitude	<ul style="list-style-type: none"> <li>• Tree bands of <i>Grevillea robusta</i>, <i>Sesbania sesban</i>, <i>Calliandra calothyrsus</i></li> <li>• Scattered trees of <i>Milicia excelsa</i>, <i>Warbugia ugandensis</i> <i>Prunus africana</i></li> <li>• Crops for intercropping: Coffee, Cocoa</li> </ul>

**Source:** Forest Landscape Restoration Assessment for Uganda, 2016.

#### 4.2.3 Changes Needed to Improve the Biomass Production in the Country

There is a Renewable Energy Policy under MEMD but it is not specifically targeting biomass energy production. The mandate for biomass energy production falls within MWE and NFA. MEMD policies concentrate on the demand side of energy but not the supply side which is involved with production. They focus on efficiency in energy conservation technologies and utilization especially addressing alternative sources of energy like electricity and solar.

The following are the changes needed to improve biomass energy production.

- a. The current land tenure system limits investment in biomass energy production because it threatens tree tenure. This can be addressed by harmonizing land tenure and tree tenure.
- b. There is lack of a conducive market based environment for biomass production, which should be addressed. For example, companies that have invested in the improved/efficient charcoal production technologies should be availed export licenses for biomass products. A case in point is Green Resources that were cleared to export charcoal by MEMD but failed to get clearance from Ministry of Trade and Industry. This is a disincentive for investment in biomass energy production.

The company could not sell its charcoal locally due to the fact that they could not compete with charcoal in the market that is produced cheaply and therefore sold at low prices.

- c. Institutions such as, prisons, schools and hospitals have limited mandates for investment in biomass which should be expanded to allow them to plan and invest in biomass energy production
- d. Proportion of the tax revenues from oil companies and forestry exploitation should be allocated to biomass energy production to address the effects of oil exploration and exploitation on forestry resources;
- e. Improve technology of conversion of wood to charcoal;
- f. Encourage use of alternative renewable energy sources;
- g. There should be a coordination mechanism for stakeholders in biomass energy sector. The MEMD responsible for energy policy should work together with MWE mandated with biomass energy production. This is in addition to other stakeholders such as prisons, army, schools and hospitals that consume much fuelwood.
- h. MWE coordinates with MAAIF and MEMD to implement agroforestry technologies with households by integrating into farming systems suitable tree species especially those which can be used for multiple benefits, like biomass energy, food, fodder, soil erosion control and nitrogen fixing among others.

#### **4.2.4 Strategic Direction of Ministry of Water and Environment for Sustainable Wood Biomass Production**

The Ministry of Water and Environment has strategic interventions to address the biomass energy production and efficient utilisation as listed below.

- a) *To promote growing of own trees for example NFA plantations;*
- b) *To encourage household allocation of land to biomass production;*
- c) *To promote bamboo growing, the Bamboo Strategy 2019 focuses on solving energy issues*
- d) *MWE is in talks with MEMD to develop a combined biomass strategy;*
- e) *MWE is in the process of developing national guidelines for sustainable biomass production by harmonizing guidelines produced by the various MDAs (NFA, SPGS) and,*
- f) *To develop a plan for restoration of biomass in refugee settlement areas*

#### **4.2.5 Coordination Mechanisms for the Institutions Responsible for the Sustainable Biomass Energy**

There is no apparent coordination mechanism for institutions responsible for sustainable biomass energy production, although it is supposedly coordinated by the Office of the Prime Minister (OPM). However, there is an inter-ministerial committee on clean energy cooking, comprising of MEMD, Prisons, UPDF and MWE but none exists between the supply side (MWE) and the demand side (MEMD). The renewable energy CSO Network supports the coordination of the stakeholders in the biomass energy sub – sector.

#### **4.2.6 Estimated Investment and Returns from the Biomass Energy Production**

Table 17 shows the estimated total investment needed to cover the deficit which amounts to USD 143.8 million for the accumulated deficit as it stands in 2019 of 26.6 million m<sup>3</sup>, and USD 10.8 million for annual incremental deficit estimated at 2 million m<sup>3</sup>. The estimates are based on eucalyptus as the key species to

address the biomass energy supply need. The returns are estimated to be USD 215.7 million and USD 5.4 million respectively, which presents opportunity for economic growth adding to the national GDP

**Table 4-13: Estimated Investment and Returns from the Biomass Energy Production**

Year	Deficit (m <sup>3</sup> )	Production per ha (m <sup>3</sup> )	Number of ha required	Estimated cost of managing 1ha of eucalyptus to 5 years	Estimated total cost in UGX	Estimated total cost in USD	Estimated total Expected revenue in UGX	Estimated total Expected revenue in USD	Profit in USD
	<i>million</i>			<i>million</i>	<i>million</i>	<i>million</i>	<i>million</i>	<i>million</i>	<i>million</i>
2019 deficit	26.6	200	133,024	4	532,096	143.8	798,144	215.7	71.9
Subsequent years average deficit	2	200	10,000	4	40,000	10.8	60,000	16.2	5.4
<i>Exchange rate USD 1= UGX</i>			3,700						
<i>Expected Revenue per ha of eucalyptus</i>			6,000,000						

Other costs like harvesting, roads, transport are not included. Given the best practices, Eucalyptus can yield real rates of return of over 15% in Uganda. (Tree planting guidelines for Uganda, SPGS 2010).

### 4.3 Assessment of the NFA Guidelines on Land Allocation to Identify Gaps and Opportunities for Investment in Biomass Production

NFA land allocation guidelines are the basis for land allocation in CFRs. The guidelines introduce an open system of land allocation where the public apply for access to land for tree growing. The guidelines focus on timber and pole production but not specific on dedicated biomass energy production. As to whether the guidelines have had success in easing access to land in CFRs, the perception of the respondents is affirmative. Besides, addressing the needs of commercial biomass production, the guidelines also provide for access to land free of charge for communities adjacent to the forest reserves covering area of at least 5%. The guidelines are developed based on national policies, laws, and international best practices.

#### 4.3.1 Positive Changes the Guidelines Have Brought

The guidelines have had a significant positive change in the biomass energy production. This is evidenced by the rate of tree planting already by the private sector in CFRs and the requests for more land allocation. The implementation of the guidelines has created public awareness and generated more interest in tree planting especially by the private sector. This is a sign of positive attitude change toward tree planting. Other positive changes include:

- a) *Affirmative allocation of land for local /poor communities (at least 5% of area of CFR allocated for tree planting for mainly fuel wood and poles.*
- b) *The principles of the guidelines are sustainable forest management, transparency, accountability and best practices.*
- c) *The guidelines provide for small, medium and large investments allowing for diversified participation.*

#### **4.3.2 Negative Changes the Guidelines Have Brought**

The respondents observed some negative changes as a result of the guidelines, namely:

- a) The emphasis is on commercial investment (95%) as opposed to local community interest of 5% of the forest area
- b) The natural or indigenous tree species in the woodlands are destroyed when people open land to plant commercial species.
- c) The communities lose the opportunities for forest based livelihood activities such as collecting free firewood and crop growing in CFRs

#### **4.3.3 Legal Safeguards to Avoid Abuse of the Guidelines in Regard to Land and Tree Ownership**

The safeguards to abuse of guidelines with regard to land and tree ownership respectively include:

- a) The guidelines provide a probation period of 2 years within which the investor should plant  $\geq 50\%$  of the land allocated;
- b) The investor pays annual ground rent as a requirement for right of access to land in the CFR
- c) The license agreement gives the investor the rights over trees planted but no right on land ownership which is reserved for NFA on behalf of government.
- d) The investor is given a tenure of 25 years for biomass production and 50 years for timber

#### **4.3.4 Specific Gaps in the Land Allocation Guidelines in CFRs**

The main gaps in the land allocation guidelines relate to the needs of the local communities and emerging issues. The guidelines do not adequately address the needs of the local communities. Respondents also noted the need to consider emerging issues in the forestry management. These emerging issues include for example incorporating agroforestry trees/crops in the natural forests and plantations management. Details are given below.

- a) The guidelines are specific to allocation of land in the CFRs
- b) The guidelines are limited to only allocation of land but do not provide for overall process of biomass energy production.
- c) The procedures in the guidelines provide for centralized allocation of land which disadvantages potential investors in remote areas who cannot access NFA headquarter.
- d) Priorities for investment given to the industrial wood, therefore no specific provision for dedicated biomass production.
- e) Guidelines are designed to work with other supporting documents like the license conditions, forest management plans, and technical guidelines for tree planting among others. They are not comprehensive for the whole biomass production process
- f) The guidelines lack affirmative action for gender equity.

#### **4.3.5 Specific Opportunities for Investment in Biomass Energy Production in the Guidelines for Land Allocation in CFRs**

The guidelines provide opportunities for investment in biomass energy production through extending a long period of investment, 25 years for biomass and 50 years for timber production. Other opportunities include:

- a) Access to CFR land based on legally binding license agreement.
- b) Long concession periods for investment up to 25 years for biomass and 50 years for timber.
- c) Ground rent in the CFR is lower than the open market rates
- d) Guidelines guarantee ownership of the crop on CFR land.
- e) Affirmative allocation of land for local /poor communities (at least 5% of area of CFR allocated for tree planting.
- f) Wide variety of tree species recommended for planting in the CFR.
- g) Clear terms of payment of license fees indicated in the guidelines.
- h) The principles of the guidelines, which are sustainable forest management, transparency, accountability and best practices, are internationally acceptable.
- i) The guidelines provide for small, medium, large investments allowing diversified participation.

#### **4.3.6 Recommendations for Improving the Existing Guidelines for Land Allocation in CFRs**

The guidelines should be reviewed based on enterprise development and the capacity of the local communities to participate in biomass energy and timber production. However, specific changes are outlined below.

- a) The procedures for land allocation in CFRs should be decentralized to regional level to make it more accessible and transparent to the local communities.
- b) The allocation of land should be balanced on all needs of plantation investments – timber, biodiversity and biomass energy.
- c) The area for community local needs be increased to at least 10% of the CFR area where biomass energy production remains a priority.
- d) The license fees for biomass energy plantations be made lower than for industrial wood to encourage investment in biomass energy production because its returns are lower.
- e) Commitment agreements be made with licensees for biomass energy production to avoid change of investment objectives prior to provision of incentives (lower fees for biomass).
- f) Develop national guidelines for investment in the biomass energy sector.
- g) Affirmative action be made in the guidelines to ring fence area in CFRs for women and youth groups for biomass energy production.
- h) Provide for biomass energy production demonstration plots near the industrial parks (Urban forests) to educate corporate companies on best practices for biomass energy use.

#### **4.3.7 Actions for Implementing Recommendations on Land Allocation Guidelines**

The following actions are suggested to implement the review of land allocation guidelines.

- a) Applications for land in CFRs should be handled in the NFA Range offices to give opportunity to a wide range of stakeholders to participate in the bidding process. The actual processing of applications can be done at the centre.
- b) Demarcate an area of 10% for biomass production along the boundary of the CFRs for free access by the organized community groups.
- c) NFA should take an affirmative action for biomass energy production in terms of land allocation and fees charged.



- d) MWE and MEMD carry out studies to collect information on biomass energy production and use to prepare national guidelines.
- e) Districts should mobilize women and youth to form groups for biomass energy production in CFRs and LFRs.

#### **4.4 Constraints/Challenges/Limitations Faced in Advancing Private Sector Investment in Sustainable Biomass Energy Production on CFRs, LFRs and Forest Landscapes**

The following constraints were identified as limiting the advancement of private sector investment in sustainable biomass energy production.

- a) Low priority given to biomass energy within the energy sector in spite of supporting energy needs of 90% of the population, resulting in low funding for forestry and biomass energy.
- b) Dispersed responsibility for biomass energy among different institutions and stakeholders with weak coordination mechanisms affects planning, implementation and monitoring of biomass energy situation.
- c) Lack of reliable information on the status of biomass energy resources and utilization creates a gap for both policy and investment decisions.
- d) Land tenure system in Uganda limits squatters, women, and youth from land rights which affects tree growing including for biomass energy production.
- e) Lack of consolidated land use plans at the district level dis-advantages non- traditional activities like tree planting in the face of reducing land.
- f) High cost of biomass investments, long payback period and fear of risks on investment like fires, pests and diseases as well as theft of trees.
- g) Competition for land from high return alternatives like commercial agriculture, industries, and urbanization.
- h) Limited fiscal and administrative incentives to motivate private sector to invest in biomass energy plantations as profitable enterprises.
- i) Poor attitude towards biomass energy as primitive, causing deforestation and pollution of the environment with associated health risks.
- j) Weak regulation and enforcement of laws, ordinances and byelaws, guidelines creates imbalance in the biomass energy market which discourages investment in biomass energy plantations and technologies.
- k) Weak institutional capacity especially at district level to provide the necessary technical support for biomass investments.
- l) Reluctance of financial institutions to provide credit for investments of long term and risky nature like commercial tree plantations including for biomass energy.
- m) Limited research and development (R&D) especially on the silviculture and ecology of the indigenous biomass energy species limits the capacity for sustainable management of the forests and investment in indigenous biomass energy species preferred especially for charcoal production.
- n) The informal nature of the biomass energy resources trade does not generate much revenue for re-investment into biomass energy production. Existing procedures for trade in biomass products vary from district to district and the control is weak.

- o) Restricted export or high taxes of value added products like charcoal produced at high cost discourages investment in biomass energy production. For example, Green Resources were cleared to export certified charcoal by MEMD but were not granted export licence by the Ministry of Trade and Industry.

## **5 CONCLUSION AND RECOMMENDATIONS**

### **5.1 Conclusions**

The use of biomass energy by the population and industry will remain significant in the medium and long term (2020-2040) requiring that the country adequately plans for the sustainable production of this resource. This calls for changes in the policy, legal, financing and institutional arrangements to address the barriers that limit sustainable biomass production. Specific changes suggested include:

- A. Review of the Energy Policy, 2002, Renewable Energy Policy, 2007, Uganda Forestry Policy 2001 and the Biomass Strategy 2013 with the participation of all stakeholders both on the biomass supply and demand sides. The review will provide the opportunity to address the gaps in the biomass energy production which are currently not well represented and therefore not implemented.
- B. Address the low funding of the biomass energy subsector which has undermined the capacity of responsible MDAs for biomass energy to carry out their mandate.
- C. Improve the investment environment for the private sector in biomass energy production and use through market based incentives, improved governance and information.
- D. Strengthen the implementation capacity of MDAs responsible for sustainable biomass energy production especially at the district level.

### **5.2 Recommendations**

The recommendations address the priority of government on biomass energy and private sector involvement, coordination of MDAs responsible for energy, legal regulatory matters, and biomass energy information, institutional, financial and gender aspects.

- a) MEMD should address the biomass energy production as priority within the energy sector as a leading source of thermal energy for the population. Currently biomass energy does not receive the funding it deserves. Therefore, MoFPED needs to increase the allocation of funds for biomass energy production to MEMD and MWE.
- b) MWE should promote the establishment of dedicated large scale biomass energy plantations in all the seven FLR landscapes. The biomass plantations will be established with fast growing tree species and bamboo in order to quickly remedy the situation of biomass energy supply gap and reduce the pressure on natural forests.
- c) MoFPED needs to provide the private sector with incentives to support investment in dedicated biomass energy plantations and efficient biomass energy production and use technologies. These incentives include performance grants, soft loans, tax waivers and subsidies. Some percentage of

taxes on oil products could be used to support investment in biomass energy production as a renewable resource. Economic incentives will stimulate private sector investment in biomass energy by increasing competitiveness and profitability of the investments.

- d) MEMD and MWE follow up the integration of issues of biomass production and use into the policies, plans and budgets of all MDAs that consume or impact negatively on biomass energy resources. The MDAs include the Ministries of Agriculture, Education, Health, Internal affairs, Local Government; Works and Transport, Community Development, Gender and Trade and Industry. Equally private sector organizations including cement, tea, sugar, tobacco, and construction companies among others that have high demand for biomass energy need to be brought on board in the implementation phase. However, this will require establishment of strong coordination mechanisms for the implementation at national and district levels.
- e) MWE, MEMD and Local Governments to strengthen regulation and enforcement of laws, ordinances and byelaws throughout the value chain of biomass energy resources especially charcoal to reduce the loss of forests, raise revenues for re- investment in biomass energy production and create a conducive environment for the private sector to invest in biomass energy production. Harmonized permit system be developed, implemented and coordinated by Ministry of Water and Environment based on wood resource data base in each unit responsible for biomass energy as opposed to the current disorganized system implemented by each unit. The technical forestry staff should be responsible for the control of harvesting to ensure only sustained yields are removed otherwise the tendering of harvesting of forest produce by districts is totally irregular.
- f) MWE and MEMD working with other relevant players assess biomass energy resources and develop a biomass database as the basis for decision making and planning of interventions on biomass energy to cover key areas of production, utilization (technologies), financing, population dynamics, and trade and market projections among others. The biomass energy resource baseline will be developed in a participatory approach by all the key institutions involved in the biomass energy supply and demand. The database under the stewardship of MEMD will support the continuous monitoring of biomass production, utilization and trade with the advantage of making it a formal business enterprise recognized by UBOS in the national accounts.
- g) MEMD and MWE working with the key stakeholders develop and implement biomass energy management plans based on the national biomass energy strategy at national, district and sub - county levels. The plans will include standards for improved management of existing forest resources, dedicated biomass energy plantations, agroforestry innovations and farm managed trees, appropriate and efficient biomass production and use technologies. The plans will also include implementation structures, financial resources, monitoring and evaluation. This will be a highly participatory process with all stakeholders and will require technical support from the MDAs, Research, Academia and development partners.
- h) MEMD in coordination with MWE and MAAIF should establish regional biomass energy technology dissemination centres. The centres will be for public awareness education, applied research, standards development and certification, skills transfer and active stakeholder participation in biomass energy production and efficient utilization. These should include planting of demonstration

biomass woodlots, agroforestry plots, farmer managed natural regeneration areas and efficient charcoal harvesting technologies; certified biomass products and technologies appropriate to the needs of the beneficiaries. Possible location of these centres will include CFRs, LFRs, agricultural research centres, and other available government and institutional land in all the 7 landscapes for security of investments.

- i) All MDAs responsible for biomass planning, production and use should address the challenges that women and children meet in biomass production and utilization with emphasis on affirmative action to support women managed biomass energy plantations, energy saving stoves, affordable alternative bio-energy sources like biogas. There is need to change the society attitude towards the role that women play in the biomass energy subsector through targeted skills training programs and biomass related projects such as tree nurseries, agroforestry gardens, seed supply.
- j) MEMD should carry out institutional capacity needs assessment for biomass energy in the areas of staffing, training, equipment and funding in order to strengthen the capacity of the institutions responsible for biomass energy production and use especially at the implementation level in the districts. MDAs responsible for biomass energy and development partners support research in sustainable biomass energy production covering all key aspects of the biomass energy value chain. This should be applied research with participation of the key stakeholders including producers, consumers, traders, transporters, scientists and policy makers which will also contribute to policy review and adaptive management in the biomass energy value chain.
- k) The lead agency, MEMD, should establish a coordination mechanism for the energy sector to include MWE, MAAIF, MGLSD, MLHUD, MST UNCST, MDP (OP) and MoWT for planning, implementation, monitoring and conduct reviews of biomass energy production and use.
- l) MEMD, MWE, and MAAIF in coordination with UNCST should promote research and development in biomass energy production and use to address the knowledge, skills and technology gaps in enhancing sustainable biomass production and utilisation.

### **5.3 Practical actions for implementation of the recommendations**

The following are suggested practical actions to implement the recommendations for addressing the constraints to private sector investments in sustainable biomass energy production.

- a) Civil society organizations (CSOs) lobby government and Parliament to allocate more financial resources towards dedicated biomass energy production and efficient use through the MEMD and MWE.
- b) CSOs working with private sector organizations should lobby government (MoFPED) and Parliament to review the fiscal barriers to investment in biomass energy production.
- c) MEMD and MWE working with CSOs carry out sensitization of the public about urgent action for sustainable biomass energy production and use.

- d) MWE, NFA and DLGs prioritize the planting of bamboo and fast growing tree species appropriate to different landscapes and by small, medium and large scale enterprises to maximize production and distribute benefits.
- e) MWE, MEMD and NFA carryout country wide inventory of biomass resources to generate information for policy review, planning and implementation.
- f) MEMD, MWE and working with development partners and DLGs support biomass energy planning at district level to ensure biomass energy is integrated in the DDPs and UBOS database.
- g) MEMD and MWE using a participatory approach develop national biomass energy guideline as a standard for biomass production, technology and value addition, transportation and trade and certification.
- h) MEMD and MWE in partnership with development Partners, districts and CSOs establish regional biomass energy demonstration centres for practical learning of the private sector, communities, and institutions.
- i) MDAs and Districts should develop, review and implement relevant policies, laws, ordinances and bye-laws, as applicable, to ensure that issues of biomass energy are addressed.
- j) MWE, MEMD, NFA and DLGs should strengthen law enforcement along the value chain of biomass products especially charcoal.
- k) MEMD establishes the structures for renewable energy at the District level under the Natural Resources Department or in the short term this responsibility be allocated to the related existing unit like Forestry or Environment.
- l) Government land in protected areas (CFRs and LFRs) remains accessible for private sector for biomass energy production on fair, secure and equitable terms.
- m) MEMD should strengthen the capacity of the institutions responsible for biomass energy production and use to manage biomass related development activities especially at the implementation level in the district. This should include staffing, training, equipment and funding.
- n) CSOs with private sector organizations lobby Government to ease conditions for export market for investments which on sustainable basis are producing certified biomass energy products like charcoal. This market can be source of funding for re- investment in sustainable biomass energy production.
- o) MEMD, MWE and NFA sign agreements with NaFORRI (NARO) on the biomass energy themes for research so as to focus the research on the needs of the biomass energy sub- sector.
- p) MWE working with MEMD and DLGs should review the permit system for biomass energy products to improve the control and ensure regulated harvesting and revenue collection.

## 6.0 REFERENCES

- Adebayo Fashion, Mustafa Mundu, Oluwole Akiyode, Lookman Abdullah Dahiru Sanni and Living Ounyesiga (2018). *Clean Technologies: Review of The Drivers and Barriers of Renewable Energy-Applications and Development in Uganda*.
- Ethiopia (2014) *Biomass Energy strategy and action Plan*.
- FAO (2018). FAOSTAT –FAO Forest Department.
- IUCN (2016). *Forest Landscape Restoration Opportunity Assessment for Uganda*
- NFA (2015). *Biomass study reports*
- Rwanda (2009) Biomass Energy Strategy (BEST)
- SPGS (2014). Assess the feasibility of commercial charcoal production systems in Uganda
- SPGS (2014). *Assess the local fuel wood demand and the feasibility of supplying fuel wood from dedicated Bio-energy plantations*.
- SPGS (2014). *Review of existing improved kiln technologies and other efficient charcoal production systems*.
- UNDP –GEF (2014). *Addressing Barriers to Adoption of Improved Charcoal Production Technologies and Sustainable Land Management Practices through an Integrated Approach*
- UNHCR/NFA (2019). *Refugee Forestry Project*
- WB/ FAO (2018). *Rapid Assessment of Natural Resources Degradation in Areas Impacted by the South Sudan Refugee Influx in Northern Uganda*

## APPENDICES

### Appendix 1 Documents reviewed

- i. Bamboo strategy 2019
- ii. Draft Energy policy 2019
- iii. Energy Policy 2002
- iv. Forest Investment Plan 2017
- v. GOU National development plan II 2015
- vi. GOU Vision 2040
- vii. National Biomass Energy Strategy 2013
- viii. National forestry plan 2011
- ix. NFA Land allocation guidelines 2017
- x. NFA Yield tables for Eucalyptus, Pine and Maesopsis 2005
- xi. Renewable Energy Policy 2007
- xii. Sustainable Development Goals 2030
- xiii. UBOS Statistical Abstract 2019
- xiv. Uganda Forestry Policy 2001
- xv. Uganda Forestry reference level, REDD+ MWE 2018
- xvi. Uganda National REDD+ strategy MWE 2016



## Appendix 2- List of Respondents

No.	NAME	TITLE	INSTITUTION
1.	Stuart Maniraguha	Director Plantations	National Forestry Authority
2.	Stephen Galima	Coordinator Natural Forests	National Forestry Authority
3.	Kabi Maxwell	Coordinator Utilization	National Forestry Authority
4.	Rashid Ssekitto	Land Management Officer	National Forestry Authority
5.	Charles Ariani	Inventory Officer	National Forestry Authority
6.	Margaret Athieno	Assistant Commissioner Forestry	MWE/FSSD/REDD+
7.	Charles Byaruhanga	PFO	MWE/FSSD
8.	Charles Odeke	Forestry Officer	MWE/FSSD
9.	John Tumuhimbise	Assistant Commissioner- Energy	MEMD
10.	Dennis Muttaryebwa	Assistant Project Manager	FAO/SPGS
11.	Gaster Kiyangi	Team Leader	Tree Talk Plus
12.	Annet Kandole	Project Manager	CARE
13.	James Omoding	Senior Program Officer	IUCN
14.	AsikuRobert	District Forestry Officer	Arua DLG
15.	Christopher Olike	District Forestry Officer	Kyenjojo
16.	Silus Anguti	District Forestry Officer	Tororo
17.	Michael Nakimesi	District Forestry Officer	Mbale
18.	William Mujuni	District Forestry Officer	Mukono
19.	Arthur Twinomujuni	District Forestry Officer	Rukungiri
20.	Charles Andama	District Forestry Officer	Nakasongola
21.	Sylvia Mirembe	District Forestry Officer	Rakai
22.	Michael Malinga	Program Officer	INBAR
23.	Enock Nimpamyia	Program Officer	ACCU- RE Hub
24.	Rolex Aleku	Program Officer	RICE- W/nile RE- Hub
25.	Elias Asimwe	Program Officer	Kima Foods- RE Hub , Kasese
26.	Rachael Nalule	Programme Officer	Environment Alert
27.	Dr. Joshua Zake (Ph.D.)	Executive Director	Environment Alert
28.	Alex Kyabawampi	Managing Director	New Forest Company
29.	John Ferguson	Managing Director	Green Resources
30.	Onesmus Musinguzi	Plantation Manager	Igara Tea Company
31.	Mark Muhereza	Plantation Manager	Macleods Russell Tea
32.	Denis Mujuni	Senior Research Officer	National Forestry Research Institute (NAFORRI)

**Appendix 3 - List of members in attendance for validation meeting**

No.	NAME	TITLE	INSTITUTION
1.	Charles Byaruhanga	PFO	MWE/FSSD
2.	Rachael Nalule	Program Officer	Environment Alert
3.	Stephen Galima	Coordinator Natural Forests	National Forestry Authority
4.	Denis Mujuni	Senior Research Officer	NaFORRI
5.	Sandra	Program Officer	Tree Talk Plus
6.	Charles Oleja	Consultant	Consultant
7.	Robert Esimu	Consultant	Consultant
8.	Levi Etwodu	Consultant	Consultant
9.	Rashid Ssekitto	Land Management Officer	National Forestry Authority
10.	Dennis Kavuma	Managing Director	Uganda Timber Grower's Association

### **Box 1. About Environmental Alert**

Environmental Alert (EA) was founded in **1988** and has developed and transitioned into a National Non-Governmental organization contributing to an enabling policy environment for sustainable agriculture and sound environment and natural resources management at community, local, national and international levels. EA is officially registered with the NGO Board as a Ugandan non-governmental organization (NGO), incorporated as a company limited by guarantee. EA is governed by an Independent Board that is responsible for providing strategic oversight of the organization including ensuring its integrity as a voluntary service organization.

EA is a **1<sup>st</sup> prize winner of the Energy globe award for environmental sustainability-2005 under the category, earth.**

EA is a member of the International Union for Conservation of Nature (IUCN) and a Member of The IUCN National Committee for Uganda.

EA envisions, *'Resilient and dignified communities, managing their environment and natural resources sustainably.'*

**EA's mission is to,** *'Contribute to improved livelihoods of vulnerable communities by enhancing agricultural productivity and sustainable natural resources management'*

#### **Program and institutional Components:**

- a. Environment and Natural resources management;
- b. Food security and Nutrition;
- c. Water, Sanitation and Hygiene;
- d. Finance and Administration;
- e. Resource mobilization and Investment.

#### **Scale of Implementation:**

EA operates in selected districts for generation of evidence to inform policy engagements on agriculture, environment and natural resources at National and International levels. Currently EA's operations are in 40 districts across the country. EA undertakes area wide targeted awareness on selected issues in agriculture, environment and natural resources engagements

#### **EA is a Secretariat for following networks:**

- a. The Network for Civil Society Organizations in Environment & Natural Resources Sector (ENR-CSO Network) - <http://enr-cso.org/>;
- b. Uganda Forestry Working Group - <http://ufwg.entalert.org/>;
- c. The Standards Development Group (for promotion of Sustainable Forest Management in Uganda); and
- d. Promoting Local Innovation in ecologically oriented agriculture and natural resources management (PROLINNOVA-Uganda Network) - <http://www.prolinnova.net/uganda>;
- e. The Renewable Energy CSO Network.

Further information about Environmental Alert is available at: <http://entalert.org/>