



PROJECT DOCUMENT

Republic of Uganda

United Nations Development Programme

Global Environment Facility

Title:

Addressing Barriers to Adoption of Improved Charcoal Production Technologies and Sustainable Land Management Practices through an Integrated Approach

GEFSEC PROJECT ID: 4644; GEF AGENCY ID: PIMS 4493; AWARD ID: TBC

Brief Project Description

Charcoal is the preferred cooking energy in Uganda (particularly by urban consumers) because of a variety of reasons including: it is affordable by all cadres of society and the only option available for the many low waged urban employees; it is substantially more efficient than wood and burns with very limited smoke, it has high-energy content per unit weight; it has a higher energy density than wood; it is easier to transport than wood and can be easily transported to markets far away from the forest. As a result, many people consider charcoal a relatively modern fuel rather than a traditional one. Government statistics attests to this. According to Uganda Bureau of Statistics, the total nominal value of household consumption of firewood and charcoal increased by 81.6% from US\$ 18.0 billion in 1996/97 to US\$ 32.7 billion in 2005/06. The value of charcoal consumption more than doubled, while the value of firewood consumption increased by 67.7% for the same period. Notwithstanding its popularity, the charcoal sub-sector remains plagued by inefficient production practices, lack of sustainable supplies of woody biomass and inadequate, often conflicting, policy statements. At this rate, the pressure on natural resources will be exacerbated even further as communities produce more charcoal to meet their livelihood demands and urban charcoal consumer demand.

Objectives of the Project: The overall goal of this project is “*Improved charcoal production technologies and sustainable land management practices through an integrated approach in Uganda.*” The objective of the project is to secure multiple environmental benefits by addressing the twin challenges of unsustainable utilization of fuel wood (including charcoal) and poor land management practices common in Uganda’s woodland through *technology transfer, enhancement of the national policy framework and the promotion of Sustainable Land Management (SLM) and Sustainable Forest Management (SFM) practices*. The project consistent with the National Development Plan (NDP) to promote a low carbon emission development path, the National Forestry Policy (2001) that seeks to promote the rehabilitation and conservation of forests, soil and water resources, the National Action Plan (NAP) to combat desertification under the United Nations Convention to Combat Desertification (UNCCD) and other relevant national policy and legal frameworks. The project involves piloting low carbon emission sustainable charcoal technologies and broader sustainable land and forest management practices in four districts: Mubende, Kiboga, Nakaseke and Kiryandongo.

Overcoming Barriers: This project has three main components to overcome the main barriers to transforming the current charcoal production practices into sustainable:

1. Data collection and improved coordination and enforcement of regulations governing the biomass energy sector, in particular those related to sustainable charcoal.
2. Dissemination of appropriate technologies for sustainable charcoal production in selected (4) charcoal-producing districts (Mubende, Kiboga, Nakaseke and Kiryandongo).
3. Strengthening the capacity of key stakeholders in SFM and SLM best practices and establishment of sustainable woodlots.

Management of Project: Ministry of Energy and Mineral Development (MEMD) / Partners: Implemented under the Global Environmental Facility Phase 5, System of Transparent Allocation of Resources (GEF-5 STAR)

SIGNATURE PAGE

Country: Uganda

Project Title: Addressing Barriers to Adoption of Improved Charcoal Production Technologies and Sustainable Land Management Practices through an Integrated Approach in Uganda: Biomass Energy Technology Transfer

UNDAF Outcome(s): Vulnerable segments of the population increasingly benefiting from sustainable livelihoods and, in particular, improved agricultural systems and employment opportunities to cope with population dynamics, increasing economic disparities, economic impact of HIV/AIDS, environment shocks and recovery challenges by 2014.

UNDP Strategic Plan: Environment and Sustainable Development

Environment and Sustainable Development Primary outcome: Markets transformed to support sustainable use of natural capital in national development.

UNDP Strategic Plan Secondary Outcome:

Expected CP Outcome(s): Selected institutions have capacity for sustainable environment and natural resources management as well as climate change adaptation and mitigation.

Expected CPAP Output(s):(1) Selected national and local government institutions have the capacity to develop key policies and systems for sustainable environment and natural resources management and climate change adaptation and mitigation and (2) Selected local government and communities have the capacity to mainstream and pilot sustainable environment and natural resources management, climate change adaptation and mitigation interventions.

Executing Entity/Implementing Partner: Ministry of Energy and Mineral Development (MEMD)

Implementing Entity/Responsible Partners: MWE, NFA, District Local Governments of Mubende, Kiboga, Nakaseke and Kiryandongo. Implemented under the Global Environmental Facility Phase 5, System of Transparent Allocation of Resources (GEF-5 STAR)

Programme Period:
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• UNDP	US\$ 1,860,000.00
Government	US\$ 6,928,246.00
FAO	US\$ 1,600,000.00
UNCDF	US\$ 1,300,000.00
GIZ	US\$ 2,607,562.00
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Agreed by the Executing Agency (Ministry of Finance, Planning and Economic Development):

NAME
Date/Month/Year

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Agreed by the Implementing Partner: Ministry of Energy and Mineral Development

NAME
Date/Month/Year

SIGNATURE

Agreed by United Nations Development Programme:

NAME
Date/Month/Year

SIGNATURE

Problem Statement

Uganda's National State of Environment (NSE) Report (2010) identifies biomass sources of energy as the most widely used despite government efforts to promote hydro-electricity. In rural areas, access to energy services remains very poor, with only five percent of the rural population connected to an electricity supply; 93% still rely on biomass for cooking. The energy sector is characterized by over dependence on biomass energy which contributes massively to the country's total energy consumption. The report further estimates that wood supplies will still contribute over 75% of total energy consumption in year 2015 even if the entire 2,000MW hydro-electric potential of the country is fully utilized (Republic of Uganda, 2010a). The Renewable Energy & Energy Efficiency Partnership (REEEP) reports that low-grade forms of energy, especially traditional biomass fuels, account for more than 90% of total energy consumption (REEEP, 2012). Charcoal is preferred to firewood (particularly by urban consumers) because it has a higher energy density than wood. Due to this high-energy content per unit weight, it is easier to transport than wood and can be transported to markets far away from the forest. When used for cooking, it is substantially more efficient than wood and does not burn with much smoke. As a result, many people consider charcoal a relatively modern fuel rather than a traditional one. However, notwithstanding its popularity, the charcoal sub-sector remains plagued by inefficient production practices and the lack of sustainable supplies of woody biomass and inadequate, often conflicting, policy statements.

Underlying Causes of the Problem

Most of the charcoal produced in Uganda is from natural forests and 70% of such trees are found on private land where the government has limited control on land use and tree harvesting (IRDI, Undated). According to a 2007 national survey, about 33 million cubic meters of firewood is consumed nationally each year (NFA, 2009). The country's average population growth rate is 3.2%, one of the highest in the world (UBOS, 2009). At this growth rate, the population increased to 31.8 million in 2010 and is projected to increase to 37.9 million in 2015 and 61 million by 2040 (NDP, 2010). The population growth is highest in arid areas, where most charcoal farming is rampant.

Uganda is extraordinary in that it contains three of the ecosystems identified by the Intergovernmental Panel on Climate Change (IPCC) as the most vulnerable in Africa: dry lands, water-basins, and mountain ranges (IPCC, 2007b). To meet the needs of a growing population within such vulnerable ecosystems, natural resources are harvested unsustainably and this poses significant challenges to sustainable agricultural production, energy access, job creation and livelihoods assets. Deforestation is the main environmental issue confronting Uganda's forest and savannah woodlands. While in 1890 around 45% of Uganda was covered by forests and woodlands, total forest coverage has now reduced to only 20% of the total land area. FAO estimates that forest cover in Uganda has halved during the past century, and continues to shrink at a rate of 55,000 ha per year. Others estimate the rate of land clearance to be between 70,000 and 200,000 ha per year. The leading causes of deforestation are over-harvesting (timber, firewood-domestic, firewood-industrial and charcoal) and encroachment, with the root causes being policy deficiencies, lack of sustainable land management (SLM) and sustainable forest management (SFM) practices, lack of appropriate technologies, market failures, weak regulations and a rapidly increasing population driving up demand for forest and woodland products. A lack of viable alternatives perpetuates extractive activities from the natural resource base with low returns and high costs on the environment. In Uganda's dry lands, which occupy an area stretching from the north-east through central regions to the south-west (commonly referred to as the cattle corridor), the greatest environmental challenge is desertification. Drivers of desertification in this region are droughts, unsustainable utilization of biomass for fuel wood (mainly charcoal), poor farming practices and overgrazing. As a result, the region experiences soil erosion, declining fertility and nutrient loading of water bodies. Additionally, soil erosion has been on the increase in the whole corridor area despite the huge efforts to contain it.

Objectives of the Project

The overall goal of this project is to develop *“improved charcoal production technologies and sustainable land management practices through an integrated approach in Uganda.”* The objective

of the project is to secure multiple environmental benefits by addressing the twin challenges of unsustainable utilization of biomass for charcoal and poor land management practices common in Uganda's Woodlands. The project is being developed within the context of the National Development Plan (NDP) to promote a low carbon emission development path; the National Forestry Policy (2001) that seeks to promote the rehabilitation and conservation of forests, soil and water resources; the National Action Plan (NAP) to combat desertification under the United Nations Convention to Combat Desertification (UNCCD) and other relevant national policy and legal frameworks. The project involves piloting low carbon emission sustainable charcoal technologies and broader sustainable land and forest management practices in four districts: Mubende, Kiboga, Nakaseke and Kiryandongo.

Barriers

There are many barriers to overcome in order to improve charcoal production technologies and establish sustainable land management practices. The overriding ones are the socio-economic-cultural issues that drive the community to use inefficient earth kilns which degrade the environment and cause deforestation. To encourage sustainable change in the charcoal production system, it is imperative to introduce a production system that is environmentally friendly and compatible with values and expectations of the target communities. The choice of an appropriate charcoal conversion technology must contend with the challenges for providing a consistent and reliable technology that will generate more income and benefits in comparison with the traditional sources of income and means of survival. Given that for sustainability, the wood should be grown or coppices from properly managed forests be selectively cut, the conversion technology should be able to efficiently convert wood of relatively small and uniform diameter in order to be acceptable.

Overcoming Barriers

This project has **three main components** to overcome the main barriers to transforming the current charcoal production practices into a sustainable model:

- I. Data collection and improved coordination and enforcement of regulations governing the biomass energy sector, in particular those related to sustainable charcoal. This component has five outcomes:
 - a. Outcome 1: Existing & ongoing policy, regulatory and institutional work on sustainable charcoal and land tenure security integrated with recommendation from the new biomass energy strategy (BEST)
 - b. Outcome 2: Improved coordination of institutions managing sustainable charcoal production at district level
 - c. Outcome 3: Improved data collection and monitoring of biomass energy and charcoal production and use (integrated into national database)
 - d. Outcome 4: Improved charcoal and biomass guidelines and ordinances at district level
 - e. Outcome 5: Heightened awareness of new institutional frameworks and ordinances, guidelines and certification schemes at district level
- II. Dissemination of appropriate technologies for sustainable charcoal production in selected (4) charcoal-producing districts (Mubende, Kiboga, Nakaseke and Kiryandongo). This component has five outcomes:
 - a. Outcome 1: Low-carbon charcoal production technologies have successfully replaced inefficient systems in targeted pilot districts leading to:
 - 143,314 metric tons (MT) of wood saved over project lifetime from improved kilns compared to BAU scenario (14,431 hectares of avoided deforestation)

Lifetime energy savings (compared to BAU scenario) of :

 - 1,843,200,000 MJ for Casamance kilns (avoided emissions of 210,816 tCO₂eq) ; and
 - 9,737,142,857 MJ for retort kilns (avoided emissions of 1,113,686 tCO₂eq)
 - additional lifetime avoided methane emissions for all retort kilns introduced of 252,000 tCO₂ eq

- b. Outcome 2: Sustainable charcoal recognized as a viable SME in pilot districts by end of project and for post-project sustainability
 - c. Outcome 3: Carbon finance is integrated into sustainable charcoal practice in targeted areas
 - d. Outcome 4: Increased incomes for all charcoal cooperatives involved in project
 - e. Outcome 5: Technical support for charcoal briquetting producers enhanced
- III. Strengthening the capacity of key stakeholders in SFM and SLM best practices and establishment of sustainable woodlots. This component has two main outcomes:
- a. Outcome 1: Improved capacities of stakeholders in targeted districts to establish and manage dedicated sustainable woodlots leading to:
 - Accumulated yields of **368,770¹ MT** of renewable biomass produced over 5,900 hectares under woodlot management by end of project (year 5) and 1,475,083 MT of biomass accumulation over the lifetime.
 - Net avoided lifetime emission reductions of **2,699,402 tCO₂eq** of avoided deforestation compared to the BAU scenario from use of this renewable biomass in kilns compared to a BAU scenario²
 - b. Outcome 2: Best practice SLM/SFM knowledge effectively transferred from successful SLM projects in neighboring districts to four pilot districts for this project leading to:
 - 50,000 ha of forestlands across four pilot districts brought under improved multifunctional forest management leading to enhanced carbon sequestration of **2,100,000 tCO₂eq over lifetime**
 - A least half of land under improved SFM registers reduction in land degradation by at least 20% as measured by reduction in soil erosion and improvement in soil organic matter
 - Conservation farming practices piloted leading to verified improved soil organic matter and yield increased across 400 hectares

Project Management, Monitoring and Evaluation

The project will be managed by MEMD which will build institutional capacities within it to manage biomass energy and make vertical linkages with DFS, District Local Governments and Forestry Sector Support Department (FSSD) in the MWE. FSSD offers supportive back-up to the NFA and District Forest Services, as well as Charcoal Producers Association. Project monitoring and evaluation will be conducted by the project team and the UNDP country office in accordance with established UNDP and GEF procedures for GEF-5 STAR. UNDP Country Office with support from UNDP/GEF Regional Coordination Unit will provide quality assurance for project implementation.

¹ See Section A.5 for detailed assumptions behind figure

² This figure nets out estimated BAU CO₂ eq emissions from deforestation activities for charcoal production in the four targeted districts – see Annex F

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ACRONYMS

AEM	African Eco-Labeling Mechanism
APFS	Agro-Pastoral Field Schools
APR	Annual Progress Report
BEST	Biomass Energy Strategy
CAI	Current Annual Increment
CARE International	Cooperative for Assistance and Relief Everywhere International
CBD	Convention on Biological Diversity
CBO	Community Based Organization
CCM	Climate Change Mitigation
CCO	Certificate of Customary Ownership
CDM	Clean Development Mechanism
CDM - PoA	CDM - Programme of Activities
CER	Certified Emission Reduction
CFR	Central Forest Reserve
CH₄	Methane
CIFOR	Center for International Forestry Research
CO	Carbon monoxide
CO₂	Carbon dioxide
CPAP	Country Program Action Plan
CSO	Civil Society Organization
DFS	District Forestry Service
DNA	Designated National Authority
EB	Executive Board
ENR	Environment and Natural Resources
ERPA	Emission Reduction Purchase Agreement
EUEI	European Union Energy Initiative
EUEI-PDF	European Union Energy Initiative's Partnership Dialogue Facility
FAO	Food and Agriculture Organization
FD	Forest Department
FFS	Farmer Field Schools
FGDs	Focus Group Discussions
FOWODE	Forum for Women in Democracy
FSC	Forest Stewardship Council
FSP	Full-Size Project
FSSD	Forest Sector Support Department
GEF	Global Environmental Facility
GEF - CCM	Global Environmental Facility – Climate Change Mitigation
GEF - CCM FA Area	Global Environmental Facility – Climate Change Mitigation Focal Area
GEF - LD	Global Environmental Facility – Land Degradation
Grid EF	Grid Emission Factor
GHG	Green House Gas
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GOU	Government of Uganda

GTZ	German Technical Cooperation
GWC	Global Warming Commitment
GWP	Global Warming Potential
HERA	Sector Project Poverty Oriented Basic Energy Services
HQ	Head Quarter
ICS	Improved Charcoal Stoves
ICPS	Improved Charcoal Production System
IDA	International Development Association
IPCC	Intergovernmental Panel on Climate Change
IRDI	Integrated Rural Development Initiatives
ITCZ	Inter-tropical Convergence Zone
ITTO	Revised International Tropical Timber Organization
JESE	Joint Effort to Save the Environment
KfW	Kreditanstalt für Wiederaufbau
KPI	Key performance indicators
LC	Local Councils
LFR	Local Forest Reserve
CH₄	Methane
MAI	Mean Annual Increment
MEMD	Ministry of Energy and Mineral Development
MCPFE	Ministerial Conference on the Protection of Forests in Europe
MFI	Micro Finance Institutions
MOLG	Ministry of Local Government
MOU	Memorandum of Understanding
MRV	Monitoring Reporting and Verifications
MTE	Mid-Term Evaluation
MW	Megawatt
MWE	Ministry of Water and Environment
MWLE	Ministry of Water, Lands and Environment
NAADS	National Agricultural Advisory Services Act
NAP	National Action Plan
NBS	National Biomass Study
NDP	National Development Plan
NEA	National Environment Act
NEAP	National Environment Action Plan
NEMA	National Environment Management Authority
NEMP	Environment Management Policy
NFA/NAFA	National Forestry Authority
NFP	National Forest Plan
NFTPA	National Forestry and Tree Planting Act
NGO	Non-Governmental Organization
NORAD	Norwegian Agency for Development Cooperation
NRB	Non-renewable biomass
NSE	National State of Environment
PCF	Prototype Carbon Fund

PDD	Project Design Document
PERACOD of	Programme to Promote Rural Electrification and a Sustainable Supply Domestic Fuel
PFE	Permanent Forest Estate
PIC	Products of Incomplete Combustion
PIR	Project Implementation Review
PMA	Plan for the Modernization of Agriculture
PMU	Project Management Unit
PPP	Public-private partnerships
PREEP	Promotion of Renewable Energy and Energy Efficiency Programme
PRODOC	Project Document
PSC	Project Steering Committee
RB	Renewable Biomass
RE	Renewable Energy
REDD+	Reducing Emissions from Deforestation and forest Degradation
REEEP	Renewable Energy & Energy Efficiency Partnership
REPA	Rights Equity and Protected Areas
RET	Renewable Energy Technologies
ROAR	Results Oriented Annual Report
ROI	Return on Investments
SACCO	Savings and Credit Co-operative
SBL	Standardized Baseline
SC	Steering Committee
SFM	Sustainable Forest Management
SIP	Sector Investment Plan
SLM	Sustainable Land Management
SME	Small and Medium Enterprises
THF	Tropical high forests
TNMOC	Total Non-Methane Organic Compounds
TOR	Terms of Reference
TPR	Tripartite Project Review
UBOS	Ugandan Bureau of Statistics
UETCL	Uganda Electricity Transmission Company Limited
UFP	Uganda Forestry Policy
UNCCD	United Nations Convention to Combat Desertification
UNCDF	UN Capital Development Fund
UNDP	United Nations Development Programme
UNFF	United Nations Forum on Forests
UNFCCC	United Nations Framework Convention on Climate Change
VCS	Verified Carbon Standard
UNEP	United Nations Environmental Programme
UWA	Uganda Wildlife Authority
UWS	Uganda Wildlife Service

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1.1 Geographical and Environmental Context

1. Uganda is a landlocked country which borders Rwanda to the southwest, the Democratic Republic of Congo to the west, Kenya to the east, Sudan to the north, and Tanzania to the south. The country lies within the latitude of 4°12N and 1°29S, and longitude of 29°34E and 35°0W. Its land surface area is 241,038 km² of which approximately 82% is land and 18% water and swamps (UBOS 2001). It is heavily endowed with natural resources which are the main source of livelihood for the majority of its people.
2. The country has an attractive climate and experiences moderate temperatures throughout the year because of its location astride the equator and on a raised African plateau. The highest temperatures are over 30°C in the north and northeast of the country, while temperatures in the highlands of the southwest including areas around Mt. Ruwenzori and Mt. Elgon can fall as low as 0 - 4°C.
3. Uganda has two rainy seasons, namely, March-June and October/ November-December/January. The average rainfall is about 1180 mm/year and exhibits considerable spatial and temporal variability (500 to 2600mm/yr.) partly due to a number of factors including complex topography, the existence of large inland lakes such as Lake Victoria and Kyoga, and the seasonal migration of the Intertropical Convergence Zone (ITCZ). Bukasa Islands in Lake Victoria receive in excess of 2200 mm per annum³.
4. The country's vast natural resources include: Atmospheric resources, good soils, abundant water and wetlands, biodiversity, fisheries, forestry, ample vegetation cover, land resources, wildlife, and minerals among others. The forestry industry makes a significant contribution to Uganda's economic development. For instance, commercial wood fuel (charcoal) is very important for the national economy and the industrial sector. Uganda's rich biodiversity offers the country a comparative advantage in bio-trade. Despite its importance to the economy, the natural resources sector is highly vulnerable to a number of factors including high population, poor land practices, poverty and climate change.
5. Uganda's natural forests and woody biomass cover 4.9 million ha of the total land area of which 30% are in protected areas and 70% are found in private forests. Tropical high forests, forest plantations and woodlands cover 924,208 ha, 35,066 ha, 3,974,102 ha respectively. The country's Permanent Forest Estate (PFE) is found in protected areas (NFA 2005). PFEs encompass Central Forest Reserves (CFRs), local forest reserves, and forested areas in national parks (UNEP/UNDP 2009) managed by the National Forestry Authority (NFA), district governments and the Uganda Wildlife (UWA) respectively. The PFE occupies 1.9 million ha representing about 9% of the total land area of Uganda (UWS 2005) of which CFRs cover 1,270,797 ha, forested regions in protected areas cover 731,000 ha and local forest reserves cover 4,997ha (Kayanja and Byaruhanga 2001)
6. According to Uganda's State of Environment Report there is low level of electrification with only 9% of the population having access to power including less than 1% of the rural population. Most of the electricity is generated from the River Nile which makes the sub-sector highly vulnerable to severe climate change-related risks. Even then, less than 10% of the potential hydropower is currently exploited. Bio-energy is second only to hydropower as the second significant pillar to secure energy supply, particularly in rural areas. Consequently, the Government of Uganda considers transition from traditional biomass to modern biomass and biofuel production and consumption a national development priority hence this project is crucial to the Uganda economy.

³See National Environment Management Authority (NEMA); State of Environment Report for Uganda 2008 published at http://www.nemaug.org/reports/n_s_o_e_r_2008.pdf (accessed on 8 April 2011) p.107

7. The project is also strongly supported by the Renewable Energy Policy⁴ which envisages an increase in share of renewables from 4% to 62% by 2017 and states that biomass contributes over 90% of the total energy consumed in the country and provides almost all the energy used to meet basic energy needs for cooking and water heating in rural areas, most urban households, institutions, commercial buildings and rural industries. The policy further contends that limited availability of electricity and high prices of petroleum products, constitute barriers to reduction in the demand of biomass as a result trading in biomass especially charcoal contributes to the rural economy, in terms of rural incomes, tax revenue and employment. Charcoal consumption have increased at a rate close to the urban growth rate of 6% per annum accelerating the degradation of forests as wood reserves are depleted at even higher rate as fuel wood requirement have also increased according to the policy. To overcome this problem the policy calls for, among other measures, use of improved biomass energy technologies along the charcoal value chain in addition to incentives for growing energy and planting sustainable woody biomass to contribute to reforestation and sustainable use of biomass including charcoal.
8. This project will be implemented in the Mubende, Nakaseke, Kiboga and Kiryandongo districts which cover some of the most naturally wooded outside protected areas in the country according to the Forestry Department (FD 2002). Charcoal production is a popular economic activity in these districts. The pilot districts were selected based on the following criteria: (i) Current charcoal production rates and deforestation rates; (ii) available wood fuel resources; (iii) secure land tenure; (iv) access to markets; (v) degree of stakeholder engagement and interest and (vi) potential co-financing resources from stakeholders for operations and maintenance. In addition, other considerations include overlaps with FAO Farmer Field Schools (FFS); capacity of district stakeholders and local communities to manage the chosen technologies; technical/agronomic considerations; and linkages with Reducing Emissions from Deforestation and forest Degradation (REDD)-Readiness Proposal Plan.

Table 1: Biomass by District

DISTRICT	OPEN WATER	LAND AREA	DISTRICT AREA	Tons_Ha_1990	Tons_Ha_2004	Area_ha	Bio_Diff
KIBOGA	5	404,547	404,552	10,605,033	4,876,714	404,552	-5,728,319
NAKASEKE	165	347,060	347,225	9,830,898	5,013,632	347,225	4,817,266
MUBENDE	2,937	459,706	462,643	11,539,635	5,529,190	462,643	-6,010,444
MASINDI (Kiryandongo)	4,092	751,737	755,829	24,048,438	24,824,503	755,829	776,065

Source: National Biomass Study, 2005

⁴ Uganda Renewable energy Policy 2007

inflow to Kampala from Mubende was 315.32 tons per week and 16,396.58 tons per year (Knöpfle, 2004).

11. Kiboga District is located in Central Uganda, and covers 404,552 square kilometers. It is bordered to the east by Mityana District, northeast by Nakaseke District, and south by Mubende District and Kyankwanzi District to the northwest. Kiboga District headquarters are located approximately 135 kilometers (84 mi), by road, northwest of Kampala, Uganda's capital and largest city. The coordinates of the district are: 01°00N, 31°46E (Latitude: 1.0000; Longitude: 31.7667). This is a low population density (less than 50 persons per square km covering approximately 76,708 km²). The population of Kiboga District as approximated by the 1991 and 2002 national census was 98,153 and 108,897 respectively. Agriculture (crop and animal rearing) is the main economic activity in this district and approximately 80% of the population provides a labor force to agricultural activities. Crops grown include: Bananas, potatoes (Irish and sweet potatoes), cassava, maize, upland rice, cabbages, tomatoes, mangoes, pineapples, passion fruit and coffee.
12. Kiryandongo District is located in Western Uganda on the main Gulu-Masindi Highway, approximately 50 kilometers by road, northeast of Masindi, the largest town in the sub-region. It is approximately 225 kilometers (140 mi) by road, northwest of Kampala, Uganda's capital and largest city. It covers an area of 3,624.1 km² and has population density of 372/km². It is bordered to the north by Nwoya District, to the northeast by Oyam District, to the east by Apac District, to the south and west by Masindi District. The coordinates of the district are: 02°00N, 32°18E (Latitude: 2.0000; Longitude: 32.3000). Kiryandongo District was partitioned from Masindi District in July, 2010. According to the 1991 and 2002 National census, Kiryandongo's population was about 83,405 and 187,700 respectively. The Ugandan Bureau of Statistics projected the population in 2012 to be approximately 317,500.
13. Nakaseke is located in Central Uganda and covers 34,722 square kilometers. It is bordered to the north by Nakasongola District, to the northeast by Luweero District, to the northwest by Masindi District, to the south by Mityana District, to the southeast by Wakiso District, to the west by Kyankwanzi District, southwest by Kiboga District. Nakaseke is located approximately 66 kilometers by road, northwest of Kampala, the capital of Uganda. The coordinates of the town are: 00°43'48N, 32°24'54N (Latitude: 0.7300; Longitude: 32.4150). Its population is 138,990 people representing 0.6% of Uganda's total population and its density is 40 people per square km. In addition, this district's population growth rate from 1991 to 2002 was 3.3% (UBOS, 2007). The Uganda Bureau of Statistics reveals that 88% of the population reside in rural areas whereas on 12% live in urban areas.

1.2 Social Economic Context

14. Uganda's National State of Environment (NSE) Report (2010) identifies biomass sources of energy as the most widely used energy sources despite the prestige associated with hydro-electricity. The NSE Report estimates that wood supplies will still contribute more than 75% of the total energy consumption in year 2015 even if the entire 2,000MW hydro-electric potential of the country is fully utilized (Republic of Uganda, 2010a). The Renewable Energy & Energy Efficiency Partnership (REEEP) reports that low-grade forms of energy, especially traditional biomass fuels, account for more than 90% of total energy consumption (REEEP, 2012). It is estimated that over 95% of Ugandans depend almost entirely on charcoal and wood fuel for cooking. Most of the charcoal which is produced in Uganda is from natural forests and 70% of such trees are found on private land where the government has limited control on land use and tree harvesting (IRDI, Undated). According to a 2007 national survey, about 33 million cubic meters of firewood is consumed nationally each year (NFA, 2009). *Figure 1 (Total primary energy supply) and 2 (total installed electricity supply) below summarize the most important current energy statistics for Uganda.*

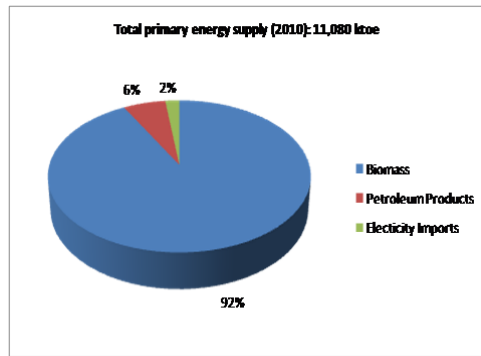


Figure 2: Total primary energy supply for Uganda (2010) (Adapted from REEEP 2012)

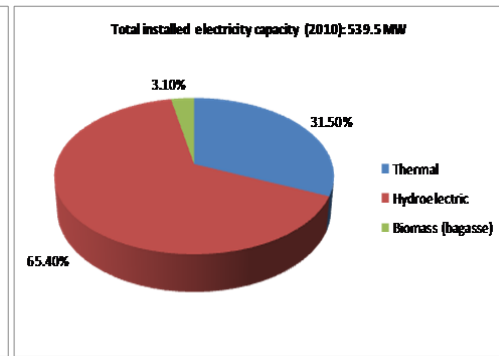


Figure 3: Total Installed electricity capacity for Uganda (2010) (Adapted from UETCL via REEEP 2012)¹

15. There is a low level of electrification with only 7% of the population having access to power including less than 1% of the rural population. Most of the electricity is generated from the River Nile which makes the sub-sector highly vulnerable to severe climate change-related risks. Even then, less than 10% of the potential hydropower is currently exploited. Bio-energy is second only to hydropower as the second significant pillar to secure energy supply, particularly in rural areas. Consequently, the Government of Uganda considers the transition from traditional biomass to modern biomass and biofuel production and consumption a main focal area. Please note that this has changed significantly (+20-25%) since the commissioning of the Bujagali Hydropower Project.
16. Charcoal production and trading provides an immediate employment opportunity to people who have no access to land, are unskilled and unemployed. Current consensus among experts therefore, is that biomass including charcoal will continue to play a vital role in the country's energy mix and that the crucial question is how to make charcoal production a viable and sustainable income generating activity. Not only is biomass an important energy source for domestic use, biomass resources are also a main energy source for small and medium scale industries and commercial activities including bakeries, tea processors, tobacco curing, lime and brick making, fish smoking, jageries and distilleries (MEMD, 2008). In economic terms, the biomass energy sector admittedly saves the country tens of millions of US\$ in foreign exchange annually. Charcoal production translates into a US \$319 increase in household income per adult per year and reduces the likelihood of households falling below the poverty line by approximately 14% (NSE, 2010).
17. Uganda's National Biomass Energy Demand Strategy 2001-2010 estimated that firewood, charcoal and residues met more than 97% of the total energy requirements in Uganda, representing a rise in demand of 7% since 2008 (Republic of Uganda, 2001). Further, the demand for biomass energy rose proportionally with the country's population estimated to increase at a rate of 3.6% per year in 2008. The NSE statistics add further to this scenario by concluding that the dominant use of biomass for household energy supply is the single most important cause of deforestation in Uganda and a major factor in terms of household productivity as deforestation leads to increases in the distance and time required to gather wood fuel. The biomass sector is therefore considered to be under threat because forests as the primary source of biomass are being decimated without corresponding investments in biomass production for energy supply. There is very little effort to process and add value to the large amounts of agricultural residues left to rot in the fields.
18. The significance of the charcoal sub-sector in Uganda's economy and energy mix has led to current expert opinion that rather than emphasize the potential environmental dangers of charcoal production, the focus should shift to the income-generating role of charcoal in rural areas, with the goal of tracking the correlation between charcoal production and poverty (Khundiet al., 2010). Indeed, Khundiet al. (2010) argues that there is no single solution to the charcoal problem. According to the authors, the solution to the charcoal dilemma in Uganda should focus on a constellation of measures: enforcement targeted in environmentally sensitive areas, fee collection

along the value chain, investments in tree planting and efforts to develop viable and affordable alternatives to wood-based fuels for consumers. The Integrated Rural Development Initiatives (IRDI) (Undated) supports this view. According to the IRDI, government limitations in controlling land use on private land has led to the recognition that the best way to influence maintenance of tree cover on private land is through incentives and institutional frameworks as captured by policy statement number two of the Uganda Forestry Policy (2002). This policy states that the development and sustainable management of natural forests on private and customary land will be promoted. Sustainable biomass and charcoal production calls for improved technologies as well as the development of standards for charcoal and fuel wood. Ultimately, improved technologies give much higher yields of high quality charcoal as well as by-products of commercial value. This makes the practice very profitable and the actors will have a high motivation for sustainable production.

19. The major economic activity in **Mubende** is agriculture with emphasis on food crops such as: Sweet potatoes, beans, cassava, maize, bananas, groundnuts, onions, cabbage, tomatoes and cash crops (coffee and tea). Charcoal transporters are licensed by the district forest service office. The revenue derived from all forest resources is shared between the district (70%) and the Department of Natural Resources (30%) and is meant to promote and maintain good environmental management in the district (Kasekye, 2006). Charcoal in Mubende is produced mainly by traditional earth kilns as established by FAO reports. This kiln is preferred because it is applicable in small and large scale charcoal production. There are two types of earth kilns that are popular in this district: Kinyankore also called the “bus” and the Kasisira also known as “the banda” (FAO, 1987). Deforestation, mainly driven by land clearance for agricultural purposes, has led to a decrease in vegetation cover in this district as revealed by several reports. In addition, the methods used for land clearing were unsustainable (e.g. slash and burn) and did not promote charcoal production as trees were burnt in the process.
20. **Kiboga** District is one of the main suppliers of charcoal to Kampala. Studies conducted indicate that there is an increasing amount of charcoal supply to Kampala from the district despite the fact that there is severe degradation of forests in both public (CFR and LFR) and private land, mainly attributed to a high population growth rate and extreme poverty (Knöpfle, 2004). Due to high poverty in the district, farmers grow crops for subsistence. Charcoal production and cattle farming are the only ways of making cash money needed to fulfill basic needs. Charcoal production in this district takes place in the sub-counties of Dwaniro, Muwanga and Rwamba. The transporters in Kiboga district are licensed from the counties in which they derive the charcoal. The fee derived by licensing transporters is the only revenue accrued from charcoal. It is important to note that like most other districts in Uganda, Kiboga District Forest Service is functional but understaffed (Kisakye, 2006).
21. The major economic activities in **Kiryandongo** District include: Pit sawing, cultivation of maize, cassava, sugarcane, tobacco, cotton, and bananas and fishing. The natural vegetation in the district comprises of forest, dry and humid savannah with Elephant grass. Rapid population growth coupled with a lack of soil conservation practices has led to soil erosion and land degradation. Overgrazing, charcoal production, clearance of trees for agricultural production and bush fires have aggravated the issue. Charcoal in Masindi (Kiryandongo) District is produced mainly by use of traditional earth kilns as established by FAO. There are two types of earth kilns: Kinyankore also called the “bus” and the Kasisira also known as “the banda” (FAO, 1987). In the recent past, an approximate 509 bags of charcoal were produced daily in Masindi District as indicated by surveys (Kisakye, 2004). This translates to an annual production of 9.29 thousand tons of charcoal and from this 91% (8.47 thousand tons) was transported to Kampala. At that time Masindi contributed 4% of the estimated charcoal consumed in Kampala and was deemed to be the biggest charcoal supplier to Uganda’s big towns (Knöpfle, 2004, 2004).
22. In **Nakaseke District**, agriculture is the main economic activity with farming practices ranging from fishing, cattle, goat and chicken rearing, cultivation of coffee, maize, beans, bananas, cassava, potatoes, mangoes, cabbage and tomatoes, etc. Traditional farming methods are most dominant among farmers. The local community is dependent on timber, charcoal and firewood for

livelihood sustenance. This has resulted in the district's biomass depletion thus biomass density decrease. Timber, charcoal and firewood contribute immensely to the district's revenue. Unfortunately, unsustainable use of timber, charcoal and firewood has led to a decline of the resources. Guiding sustainable utilization of the forest resources is therefore an important stimulus for development in the area. Nakaseke District was partitioned from Luweero District. Districts surrounding Uganda's major charcoal consuming towns (Kampala, Entebbe and Jinja) are noted to be rapidly losing vegetative cover. Some of the notable districts include Masindi, Nakasongola, Luweero (Kisakye, 2004). According to the National Biomass Study and the National Academy of Science, the estimated biomass consumption in Luweero District is 305,230.39. In addition, the annual increment in protected areas in Luweero District is as follows: Hard wood plantations (342), soft wood plantations (320), tropical high forest (0), depleted tropical high forest (0), woodland (92,675), bush lands and grasslands (8,388), subsistence farmland (313). The sum total is 102,038.00. Charcoal in Nakaseke is produced mainly by use of traditional earth kilns as established by a report by FAO. This kiln is preferred because it's applicable in small scale and large scale charcoal production. There are two types of earth kilns; Kinyankore also called the "bus" and the Kasisira also known as "the banda" (FAO, 1987). Previously, the license fee derived from transporters was being collected from the Department of Finance and Administration. Reports from the District Forest Officer indicate that approximately 7,300 Lorries per year are cleared transporting charcoal to Kampala (Kisakye, 2006).

1.2.1 Threats, Root Causes and Barrier Analysis

23. From the above it is clear that Uganda in general and indeed the pilot districts are experiencing an extensive process of deforestation and land degradation which are driven by a set of complex, competing and interrelated factors such as increasing population coupled with high demand for forest products, degazettement, unsustainable land use practices, climate change, ineffective governance systems and slow adoption of improved technology (UWS 2005). For example, the government forest reserves which occupy over 1.1 million ha currently have less than 740,000 ha forest cover.
24. **Population:** High population growth rates, density and numbers, together with poor farming methods, have greatly reduced the productivity of the land in pilot districts. Rapid population growth has contributed to an increase in wood fuel demand that currently exceeds biomass supply. In addition, it has also led to the rampant clearance of forests for agricultural purposes as well as settlement and development of urban centers. Degraded land is of no use and therefore pushes people into fragile forest ecosystems leading to deforestation and further land degradation. For instance, in Mubende District population increased from 436,493 to 603,900 people between 1991 and 2012, an increase of about fifty percent. The Population and Housing Census Analytical Report established that 89.7% of the population used firewood as source of cooking materials, 8.6% used charcoal, and 78.2% of the households depended mainly on subsistence farming and traditional charcoal-making for survival, thus leading to degradation.
25. **Subsistence Agriculture:** Agriculture is a dominant activity in Uganda with subsistence farming accounting for about 41% of the entire land area whereas forests and bush land cover 24% and 7% respectively. Grasslands, water bodies and built regions among others, cover the remaining 28% (Ministry of Water, Lands and Environment 2002). Subsistence farming that involves the use of unsustainable methods of forest clearance has led to a decrease in vegetation cover as revealed by several reports in the past including the National Biomass Study (2005). Continued clearance and invasion of forest land has resulted in severe deforestation and the shortage of forest products. Biomass surveys indicate that Mubende experienced a loss of 70.0% of forest cover from 1990 to 2005 (NBS, 2005).
26. **Markets:** Urban markets for beef and other farm produce greatly encourage increased investment in farming without regard to conservation. There is very poor care for the land as most farming practices do not invest in soil conservation. As a result, there is overgrazing, soil erosion and the loss of soil fertility. Charcoal burning is also a market-related problem since there is ever-rising

demand for charcoal in Kampala and other urban centers thus supporting increased charcoal burning, resulting in deforestation and soil erosion.

27. Slow adoption of **energy efficient improved technologies** at the supply and demand side (e.g. improved kiln, energy efficient cook stoves etc.) contributes to forest decline and an unsustainable charcoal sector. For example, traditional kilns utilize plenty of wood during production and thus contribute to deforestation, which in turn limits charcoal production. In addition, metallic cooking stoves waste energy because they lack a heat insulator. Due to this increased use of charcoal, there is a high demand for charcoal.
28. **Weak institutional capacities** of bodies mandated to manage the forest and energy sector have resulted in the decline of forest cover, illegal charcoal production and an unsustainable charcoal sector. The rapid decline of forest cover in both public and private land reduces the raw material required for charcoal-making. In addition, over dependence on biomass for sustenance is the force behind increased bioenergy demands, despite limited biomass supplies. If this crisis is not addressed, Uganda will face a biomass scarcity in the near future.
29. The Uganda Forest Policy notes that the major factors contributing to increased decline of forest cover on private land include: **High value of alternative land uses** (e.g. agriculture as compared to retaining the forest cover) and a **lack of awareness** about the value of forest products (e.g. costs of wood and inadequate skills for managing forests).

A disorganized charcoal value chain affects the nature and quality of research data. It limits data collected during research aimed to improve the charcoal value chain and the charcoal sector in general. In addition, disproportional benefits are accrued from the charcoal sector (e.g. producers benefit the least in spite of the fact that they are the backbone of the charcoal sector). This escalates to producers seeking alternative methods to increase their income. Some may resort to illegal charcoal trade.
30. Climate change due to global warming makes forests vulnerable to fires.

1.2.2 Analysis of Barriers to Sustainable Charcoal and Technology Transfer

31. From the above, to cause sustainable change in the charcoal production system, it is imperative to introduce a production system that is environmentally friendly and compatible with the values and expectations of the target communities. The choice of an appropriate charcoal conversion technology must contend with the challenges for providing a consistent and reliable technology that will generate more income and benefits in comparison with the traditional sources of income and means of survival. Given that for sustainability, wood should be grown, or coppices from properly managed forests be selectively cut, the conversion technology should be able to efficiently convert wood of relatively small and uniform diameter
32. Various literature including Miranda et al. (2010), observe that economic benefits are the driving force for sustainability of commercial wood fuel production. This was also observed by Sanchez (1995), who noted that for agroforestry to be sustainable, it should be able to put money in farmers' pockets. Sanchez argued that availability of markets for fuel wood could be one of the crucial elements for determining diffusion and adoption of tree planting technologies. Miranda et al. (2010) further observed that the scarcity of wood products spurs reforestation. This implies that the scarcity of tree products increases the economic value of remaining forests. This increased value in turn directly translates into better forest management and the establishment of woodlots and tree plantations. However, there are several barriers to sustainable charcoal production. Despite government acknowledgment that biomass energy consumption accounts for more than 90% of the total energy consumption, charcoal and other biomass are regarded as traditional, backward, ecologically risky and even illegal energy sources. They are, therefore, generally shunned, and because of necessity and lack of appropriate alternatives, charcoal production and marketing is left to the informal sector. There is a general lack of a coherent and appropriate policy to ensure sustainable charcoal production. Relevant policies that would address sustainable charcoal production are fragmented; they overlap, and result in unnecessary additional transaction costs. Policy coherence, consensus, and commitment in the wood fuel sector suffer from

insufficient open discussions of policy options (Sepp, Undated). Additionally, the authority and jurisdiction of relevant ministries and agencies (Energy and Environment) lack clarity, with the result that some encroach on the others' 'terrains'. The result of this state of affairs has been the dominance of *small-scale self-help project type* approaches as opposed to national strategic and concerted efforts. The key barriers to a sustainable charcoal production sector therefore include the following;

33. **Absence of a Nationally Driven Biomass Energy Research Agenda:** In order to accurately capture and analyze information regarding biomass energy production issues, access to charcoal as a fuel and consumption including cost, gender related concerns and climate change impacts, a national research agenda is imperative. The fact that these factors are very dynamic makes consistent innovation and creativity unavoidable. This calls for well-established and adequately funded research institutions that will both monitor and generate timely knowledge for appropriate interventions and responses.
34. **Lack of Relevant Charcoal Data along the Charcoal Value Chain:** Both the directed structured interviews and focused group interviews indicate that there is no reliable mechanism for capturing charcoal data along the value chain. This makes planning for the charcoal sector impossible. Shaping policy presupposes reliable baseline information as a precondition for rational decisions. Past assumptions and predictions by national and international organizations regarding wood-based fuels were disproven in many cases (Sepp, Undated). This could explain the lack of capacity and interest by the government in formulating effective policies for the sector. The sector is thus perceived negatively with some authorities including the police generally treating it as an illegal activity. Some of the consequences have been:
35. **Negative Perceptions:** Although charcoal is one of the key sources of revenue to the local governments and a source of employment and income to many households, it is generally perceived as an illegal activity by the authorities. During the focus group interviews in Nakaseke, it was reported that the charcoal sector contributes more than 70% of the district revenue collections. However, because the sector is largely informal with many unchecked taxes, both official and unofficial, the taxes to be collected were not clear to the actors along the chain. This was expressed clearly during the focus group discussions in Mubende. In addition to the confusion about taxation, out of the 124 charcoal producers interviewed 41 (33.1%) reported that money is extracted from them in bribes and that this leads to low profitability for the actors along the chain as well as reduced revenue collections. This effectively makes charcoal production unattractive to many potential investors.

Table 2: Respondents Who Confessed to Have Paid a Bribe

Bribe	Frequency	Percent
Yes	41	33.1
No	83	66.9
Total	124	100.0

36. Due to a lack of data and information, the development of the relevant support structures, institutions and correct infrastructure for charcoal production becomes difficult.
37. **Lack of Standards for the Biomass Sector:** The lack of standards in the sector has hindered market development and a formal market infrastructure is grossly lacking. It is therefore very difficult to plan, regulate and effectively monitor the charcoal sector. This makes charcoal production and marketing difficult to finance and to collect revenue. Formal banking institutions are reluctant to provide financing for actors in the sector.

Table 3: Reasons for Failure to Get Loans

Reason for failing to get loans	Frequency	Percent
Did not apply for loan	114	91.9
No security	4	3.2
Charcoal Business not first priority for loan	3	2.4
Charcoal business not dependable	2	1.6
Total	124	100.0

38. **Lack of Relevant Business and Technical Skills:** The actors in the sector lack business and technical skills. Technology issues are therefore not easily understood. This also hinders access to information and communication. Access to appropriate efficient conversion technologies is hampered and makes their diffusion very difficult. The actors in the value chain also do not know their rights and obligations, which makes them vulnerable to unscrupulous state actors.
39. An overriding reason for the low uptake of improved technology is that interventions in the charcoal sector have been projects either by the government or the NGO sector supported by development partners in most cases. When these actors come in, they fund trainings of a few selected people, provide **free** inputs including tools and kilns and sometimes offer subsidies. When the projects come to an end, the farmers realize that they cannot maintain the improved technologies and quickly revert back to the traditional technologies. If charcoal production is to be done sustainably, there should be a shift from the project-oriented approach of improving charcoal production to an overall national strategy that will address demand and supply holistically. A demand-oriented policy that indicates the role of the government in pricing and market development is required.
40. **Socio-Economic Factors:** In communities where social factors are dominant, it is very difficult to introduce a new technology of charcoal-making unless the social factors have been addressed. The practice where there are attempts to modify the technology of charcoal-making by providing inputs such as chain saws, new kilns and any other inputs has resulted in disappointments when these inputs stop flowing. In addition, burning of charcoal requires skill, patience, experience and readiness to observe correct working methods at all times. The economics of the operation is determined by the yield achieved in the burning stage. In a situation where the capacity to use the new and efficient technologies is not well developed and the necessary inputs lacking, economic necessity will force the producers to revert to the traditional but predictable and well understood methods with all their obvious technical faults. To overcome social factors, technologies selected should take into consideration the following factors:
41. **Appropriateness to the target users** which addresses issues of user friendliness and safety during operation. If the operation of the technology is not well understood, it will lead to high losses. As mentioned earlier, the economics of the charcoal enterprise depends to a great extent on the charcoal yields during the carbonization process. Safety will address issues of protection from injury and pollution. Carbonization is a process that takes place in circumstances of limited oxygen and inevitably results in substantial diversion of biomass carbon into products of incomplete combustion (PIC), which include carbon monoxide (CO) that is poisonous to human beings. Most important is the need to identify the crucial players for sustainable charcoal production.
42. **Affordability** in this case will include the cost of the conversion technology (the kiln/retort) and the cost of operations. Operations will include: The cost of felling trees, billet preparation, loading and stacking the kiln/retort, carbonization and unloading of kiln. The other important cost is the time taken for carbonization, although it can be argued that rural people have more time than money and could therefore afford to be patient for several weeks.

43. **Gender sensitivity**, women in most Sub-Saharan African countries participate in village woodlots or take care of home gardens that supply the much needed fuelwood. Women, therefore, play a significant role in the production of fuel wood. They have knowledge on the art of making charcoal and can identify the properties of materials suitable for fuel wood and gather woods both for commercial and domestic purposes (Texon, 1998). Cultural considerations in the choice of a charcoal production system and/or technology is important because fuel wood gathering for domestic and commercial purposes requires the utilization of human energy, to which women contribute the larger part. In Uganda, agriculture is the main occupation of women. Nationwide, agriculture employs 72% of all employed women while, 90% of all rural women work in agriculture. Only 53% of rural men do so (FOWODE, 2012). Hence, in the event of deforestation, it would become more difficult for rural women to gather firewood. According to Texon (1998), because of their role in wood energy systems, extra efforts should be undertaken to address issues confronting women.
44. **Compatibility with norms and beliefs:** The choice of an appropriate charcoal conversion technology must contend with the challenges for providing a consistent and reliable technology that will generate more income and benefits in comparison with the traditional sources of income and means of survival. To cause sustainable change in the charcoal production system, it is imperative to introduce a production system that is compatible with values and expectations of the target communities. Given that for sustainability, the wood should be grown, or selective cutting of coppices from properly managed forests, the conversion technology should be able to efficiently convert wood of relatively small and uniform diameter.
45. Insufficient technical expertise in the charcoal sector specifically in the governing institutions directly linked to forestry and the charcoal sector. In addition, the lack of a standardized criterion that ensures appropriate charcoal packaging promotes unsustainable charcoal production.
46. Limited advocacy on sustainable forest and charcoal production particularly to charcoal producers reflects the current relatively low awareness levels on existent charcoal subsidies and the importance of sustainable charcoal. In addition, limited efforts to mainstream gender in the charcoal sector encourages inequitable participation of men and women in the charcoal value chain which results in unequal sharing of benefits accrued from the charcoal production.
47. Inadequate linkages between charcoal producers and relevant governing institutions, donors in the forest and charcoal sector leads to lack of communication on key issues in charcoal production which in the long run makes charcoal business unsustainable. Limited research on the charcoal value chain and limited capacity building of the stakeholders in the charcoal sector create room for unsustainable practices in the charcoal sector.
48. According to a US-EPA report (1999), combustion of biomass harvested or naturally re-grown on a sustainable basis does not cause a net increase of CO₂ in the atmosphere. Unfortunately, through deforestation and other non-renewable practices, much of the burned biomass is not replaced. Even with complete recycling of the carbon, however, a biomass fuel cycle can produce a net increase in global warming commitment (GWC) because of the emitted PIC, which have, on average, a higher global warming potential (GWP) per kilogram carbon than CO₂. These are some of the compelling global reasons for why efficient conversion technologies which minimize PIC during charcoal conversion are essential. The retort kiln is an example. The other advantage of the retort technology is that it minimizes the crushing of the lump charcoal as a result of handling during the harvesting process compared to earth-covered kilns.

1.2.3 Enabling Technology Review & Transfer

49. The role of technology transfer is to effectively and efficiently disseminate products and technical information to forest owners for long-term improved sustainable forest management that leads to ecologically sustainable charcoal production. For this to happen, mechanisms and the infrastructure to facilitate technology transfer must be in place. The following are the prerequisites for a functional technology transfer mechanism:

50. **The Charcoal Production and Marketing Monitoring System:** The need for accurate, timely data is a prerequisite for planning and implementing technology transfer. For an innovation to be accepted, it must be compatible. Compatibility is the degree to which the innovation is perceived as being consistent with existing values, norms, past experiences and the needs of the potential adopter. Its relative advantage must be clear to the adopters. According to Rogers (1983), relative advantage is defined as the degree to which an innovation is perceived to be better than the innovation it tries to replace and is measured in either economic profitability or a contribution to subsistence needs like convenience. For the planners to ensure that the technology they are transferring is both compatible and has a clear advantage, they should have access to reliable and timely data. This is necessary in the formulation and implementation of measures for market transformation to ensure that the technologies being transferred motivate the farmers. The charcoal production and marketing monitoring system will be structured as follows:
51. *Standardization and Market Transformation:* Market transformation is the strategic process of market intervention which aims to alter market behavior by removing identified barriers and leveraging opportunities to further the internalization of cost-effective energy efficiency as a matter of standard practice (Wikipedia, 2012). Standardization is one of the effective tools for market transformation. For charcoal production to be environmentally clean and sustainable, standardization is a prerequisite and must take into account:
- The source of the charcoal (the name of the farmer or producer, the size of his forest or plantation and when it was established).
 - Specify the tree species and the age at which they were harvested before conversion into charcoal.
 - Specify the charcoal conversion technologies (including preparation of billets; size and moisture content and kiln/retort technology used).
- This information must be captured on a label that should be put on every charcoal package in any market as a requirement to facilitate traceability. The standardization plan must consider enrichment planting and/or woodlot establishment/tree planting for charcoal production and improved charcoal production processes. The standardization process will entail identifying farmers that have access to land which is currently either under crop, animal production or fallow, which could be used for tree production without affecting food security and income for the household. The farmers should also be willing to invest in improved charcoal production technologies.
52. *Develop Capacity for Biomass Estimation at the village Level:* During the field work exercises, two groups of selected farmers and leaders in a selected sub-county from the four selected districts were selected and trained. The first group was trained in biomass estimation for natural forests and plantations. The second group was trained in wood preparation for carbonization and kiln and retort operation during carbonization. The purpose was to test whether those skills could be retained and appropriately applied by the trained groups. So far the findings indicate that the skills can be applied at that level. For the communities to capture and record the necessary data and information, the capacity to estimate standing biomass at the level of the household has to be created. This will involve training local council members at the Local Councils I (LC I) especially the secretaries for the environment, youth and women. The local council officials should be trained in skills for biomass estimation (for natural forests and plantations) and improved charcoal production techniques. At this level there should be a register of farmers who produce fuel wood for charcoal production. Land tenure, size of landholding and size of land committed to tree production for charcoal, species planted and therefore expected yields should be specified at this level. It should be a requirement for every farmer participating in commercial fuel wood and charcoal production to register the details of their farms. This information should be periodically updated and submitted to the responsible officers at the Sub-County.
53. *Software Development:* User friendly software to capture the charcoal production data and information can be developed. The responsible officers at the sub-county and district could be facilitated with solar powered computers to capture the charcoal production information. With the country wide coverage mobile networks, computers could be provided with modems for

uploading information and data along the charcoal chain to the districts and at the Ministry of Energy and Mineral Development (MEMD). As the local council secretaries submit data and information from the farms, the expected charcoal production levels can be captured. The use of the software should be concerned primarily with capturing data on land acreage to be planted with tree species, the number of households participating, plantation sizes, charcoal production technologies, saving/absorption of carbon dioxide and the location of plantations.

54. *Establishing Charcoal Markets:* As is the case for livestock, special market areas within the sub-counties should be gazetted. The name of the charcoal producer and the standards of the charcoal sold in these markets should be specified (i.e. the tree species used, evidence of conversion technology employed and quantity of charcoal). This information should be provided by the responsible local council secretary in form of labels on the charcoal bags and corroborated with the information submitted at the sub-county. The traders in charcoal and fuel wood should only be allowed to buy charcoal from these established centers. Repackaging and branding of charcoal in more appropriate materials for transportation and standardizing (e.g. by mass) could take place at these centers. When charcoal is packed in polythene bags and transported on trucks, huge amounts of charcoal fines are generated. A charcoal vendor in Bukoto in Kampala indicated that depending on the quality of charcoal, one bag of 70 kg could generate up to 15kg of charcoal fines. When charcoal is packed in proper boxes, there will be no fines generated as a result of transportation and handling.
55. **Charcoal Fines at the Vendors Kiosk:** Farmers should register and be members of the charcoal centers. The registration of sustainable charcoal producers should therefore also indicate/allocate quarters depending on the size of land and expected biomass yields for charcoal production for every registered farmer. This will be verified by the district forest and environment departments before the issuance of production permits. No farmer should be allowed to sell beyond the allocated quarter on the exclusive market.



Figure 4: Example of Charcoal Packaging in Three-Ply Charcoal Boxes Packed in Store vs. Poor Packaging Methods Fines Generated

56. **Carbonization: the Kiln and Retort Technologies:** The process of transforming biomass to charcoal – carbonization – is fundamentally different from that of biomass combustion. Unlike complete combustion of biomass which produces little more than just CO₂ and water, charcoal-making involves combustion of the biomass in circumstances of very limited oxygen and the result is substantial diversion of biomass carbon into PIC. PIC, which include CO and CH₄, are dangerous greenhouse gases compared to CO₂ because, once emitted, there are no known

processes yet that can re-absorb them from the atmosphere. Indeed, current estimates are that biomass combustion accounts not only for 25-45% of the annual global emissions of CO₂, but also for 15-50% of CO, 3-10% of CH₄, and 24% of total non-methane organic compounds (TNMOC) (Levine, 1990, Crutzen and Andreae, 1990, Andreae, 1991). CO₂ and CH₄ are the two most important greenhouse gases (GHG) and CO and TNMOC indirectly affect global warming through atmospheric chemical reactions that in turn affect GHG levels.

57. Charcoal production is done through a variety of systems that rely on similar principles but, different in detail. The differences affect the operations and yields of the conversion technology, with some being grossly inefficient and others very expensive. Therefore, the choice of an optimum charcoal production method is imperative for an efficient and sustainable charcoal industry. From a review of relevant charcoal production literature, the existing retort/kiln designs and the charcoal production environment in the sampled districts, it is evident that charcoal production methods cannot be evaluated just on the basis of technical factors only; social factors and cultural factors are of equal importance. For successful diffusion and adoption of energy technologies, proper identification of the combination of technology and the target group is a major determining factor. In business terms, the analogy would be the product-market combination (Hulscher, 1991). Matching innovation attributes with the characteristics of the potential adopters of the charcoal production technologies is critical for diffusion and adoption of the innovations. These are being carefully considered and three designs have been selected for demonstration and consequently piloting.
58. **Kiln technology:** The most common method of carbonization is the kiln method which employs direct burning of part of the charge to provide the necessary heat required for carbonization to take place. The problem with this method of carbonization is that part of the wood that would have been converted to useful charcoal, is actually burnt. The other problem is that when the carbonization process starts, it is very difficult to control in terms of temperature regulation and carbonization speed. There have been several efforts to improve kiln technology and especially for the small scale charcoal producers. One of the improvements is the Tones Kiln.
59. The **Tones kiln** was developed in Senegal and is an earth mound kiln equipped with a chimney. This chimney, which can be made out of oil drums, allows a better control of air flow. In addition, the hot flues do not escape completely but are partly redirected into the chimney of the kiln, which enhances pyrolysis. This reverse draft allows faster and more uniform carbonization than the traditional earth mound kilns yielding a higher quality of charcoal and efficiency which ranges between 18 and 25% according to the level of expertise by the operators. Comparative tests of the Tones kiln and traditional mound kilns confirmed the advantages in terms of efficiency and the shorter carbonization times due to the enhanced hot flue circulation (Meulecasamancaise PERACOD Mundhenk, 2010). The other advantage is its ability to carbonize billets with large diameters. The major disadvantage of this kiln type is that the PIC which includes CO, CH₄, and HC cannot be condensed at those temperatures and inevitably escapes to the atmosphere. The other disadvantages are that it requires some capital investment for the chimney and it is more difficult to construct compared to the traditional earth mound kilns.



Figure 5: Cassamance Retort

60. **Retort technology** is the standard method of production for industrial charcoal in western countries, but due to high investment costs it is not viable for traditional subsistence charcoal makers. In the retort method, the wood charge is placed in a closed container known as the "retort". This has a tightly closed door, and some means to allow tar and other gases to escape. The retort is heated from the outside and air is not allowed to enter it. Because the heating is external, poor quality biomass that would not be converted into charcoal can be used. This type of biomass could be the leaves and the very tiny branches from the harvesting of wood for charcoal. This increases the overall useful charcoal yield.
61. When the wood in the retort has been heated to the right temperature, carbonization begins and heat and by-products are given off and little additional outside heat is required at this stage. The gaseous by-products can be channeled through the fire box to provide the additional needed heat to complete the carbonization process. Since the by-products contain PIC, their channeling into the fire box provides the opportunity to completely burn them to CO_2 and H_2O . The resultant effect is that the dangerous GHG are reduced tremendously. The other advantage of the retort technology is that it minimizes the crushing of the lump charcoal as a result of handling during the harvesting process compared to earth covered kilns. Many designs for small scale charcoal producers now exist and two of these will be piloted
62. The **Adam Retort**, also known as the Improved Charcoal Production System (ICPS), is one of the most efficient means of producing good quality charcoal. The kiln returns the wood gases back to the carbonization chamber, burns the volatiles and a high proportion of the tar components almost completely and uses the heat for the carbonization process. Efficiency can be as high as 40% and noxious emission can be reduced by 70%. In addition, the production cycle is completed within 24 to 30 hours. The retort is suitable for semi-industrial production.

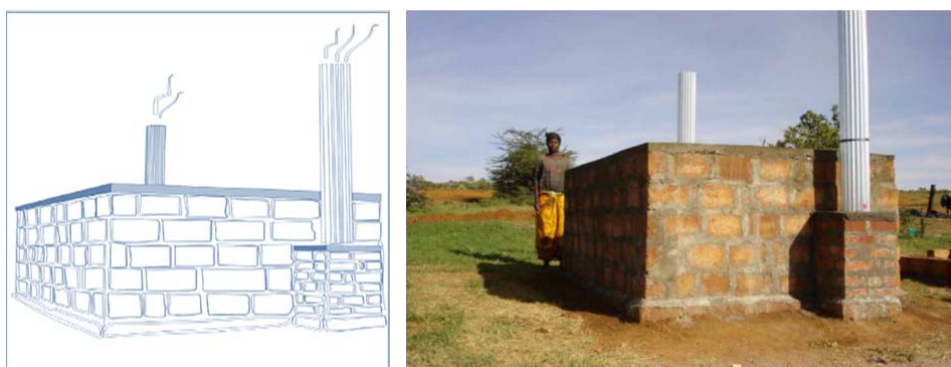


Figure 6: Adam Retort

63. Disadvantages of the Adam Retort include: it is a stationary kiln, investment costs exceed US\$ 1,000 depending on location and special skills are required for construction. Nevertheless, the Adam Retort has been introduced in several countries (Senegal, Madagascar, Peru, etc.) on a pilot basis. Currently, the method is being further refined for up-scaling.
64. The **Sam1 Brick Retort** operates in a manner similar to the Adam Retort. The major difference is that the fire box is within the retort as opposed to the external fire box. The heat losses to the walls of the fire box are minimized. The result is that it takes a shorter time and less fire wood to be fired. However because the fire box is directly under the retort, the retort is slightly higher than the Adam retort for the same capacity. But the retorts take the same quantities of cement, sand and bricks.

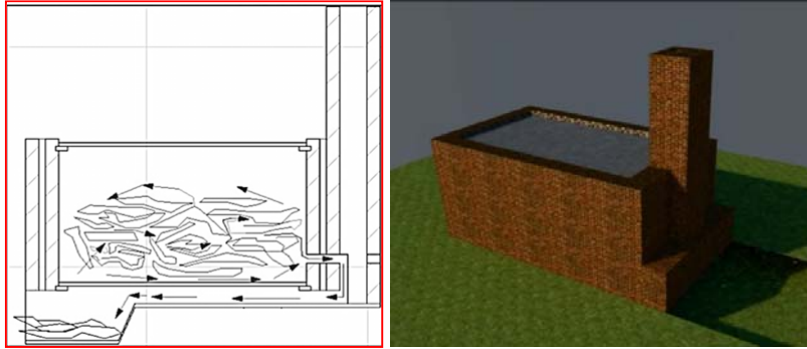


Figure 7: Cross-

sectional View and Architectural Impression of the Sam1 Brick Retort

1.2.4 Stakeholder Views on Sustainable Charcoal and Technology Transfer

65. During the stakeholder meeting held on the 11 December 2012, stakeholders discussed the following issues: i) The main reasons for current charcoal technology choices; ii) the barriers to new, better technologies; iii) approaches and incentives to be put in place for new technology introduction and adoption in the districts; iv) knowledge management – how to diffuse or share knowledge on the new technology to encourage their promotion
66. Main reasons for current charcoal technology choices were availability, cost-effectiveness and simplicity in the operation. As such, the most common technology for charcoal production was the earth mound, commonly referred to as *Kasisira* (the hut or earth kiln) in the pilot district and indeed most of Uganda because *Kasisira* outcompetes *Kadinda* (half orange brick kiln) producing good quality charcoal, allows for uniform carbonization and charcoal harvesting is flexible. It is also easier to assemble large wood quantity in the kiln. The kiln requires less labor compared to *Kadinda*, is often available, acquired at no cost (free labor), and easier to operate.
67. Main technology barriers in the pilot districts were listed, in order of priority as: i) The lack or inadequate availability of the improved technology was given as the main barrier to uptake of technology in the district; ii) where available, it was expensive to acquire, install and maintain in addition to the fact that most local people do not have iii) the technical ability and capacity to operate the technology. Other barriers include immobility of the technology - it cannot be moved to where the wood is, is not flexible in terms of taking up more or less wood, there is little awareness on harvesting of the yield and there exists a policy limitation in terms of government support.
68. On approaches and incentives to overcome the technology barrier listed above, the focus group suggested a need for **gradual introduction of the technology** and promotion of local adaptation and **capacity building at community level**. The need for **appropriate by-laws and ordinances** at district level to support the technology as well as consumer financing through local micro-financing infrastructure was also advocated. **Research** on the adaptation and uptake of the technology to identify weaknesses of the current technologies should be addressed by

government. Other measures advocated are the **Knowledge Management** to promote new technology awareness raising, trainings and workshops, exchange visits, farmer field schools, documentation of best practices and knowledge sharing through simple manuals were given as ways of promoting the new technology.

1.3 Governance of the Charcoal Sector

1.3.1 Relevant National Policy Framework

69. The Uganda Forestry Policy 2001 is the main policy that is relevant to the charcoal supply side and SLM/SFM. The objective of this policy is to establish an integrated forest sector that achieves sustainable increases in the economic, social and environmental benefits from forests and trees by the people of Uganda, especially the poor and vulnerable. The policy provides information that is relevant to charcoal and SLM/SFM. The relevant information includes the following:
 - a. Forests on both private and government lands are a key component of many rural livelihoods, for both subsistence and commerce.
 - b. Private forest is poorly managed or being converted to agriculture or grazing land, with charcoal as a major by-product.
 - c. The majority of the urban and rural poor depend on firewood as a source of energy
 - d. Forest resource processors include charcoal makers.
 - e. There are high rates of forest clearance on private lands for agriculture and charcoal production because forests on private land basically not regulated or managed.
 - f. Population growth (estimated at 2.5% per year) is leading to an increase in the demand for fuel wood.
 - g. Several districts are already experiencing shortages of firewood and hence rising costs and increased burdens on women and children who collect firewood.
 - h. Fuel wood and charcoal production creates jobs in the informal sector.
70. **Land Tenure System:** The Uganda Forest Policy 2001 concedes that land tenure issues have relevance to the way forest resources are managed in Uganda. It also acknowledges that there are considerable uncertainties over land ownership, land and tree tenure and permitted land uses. The consequences of this uncertainty are that there are few incentives for individuals or private businesses to invest in tree growing or forest management when tenure is so uncertain. The problem is compounded further by the general perception that natural forests are considered to be open-access resources, including those on government land, to be used without regard to planned management or sustainable yields. The Constitution (1995) and the Land Act (1998) give direction on questions of land ownership and tenure in which four categories of land is recognized: Customary, freehold, Mailo and leasehold land. In the context of forestry, it is significant that customary ownership of land is valid and legal, whether registered and titled or not. According to Ugandan law also, all land is owned (by someone or a group of people), including the trees growing on it, whether government or private land. According to the Land Act 1998, the following definitions hold with respect to land ownership in Uganda:
 - Customary land tenure: A system of land tenure regulated by customary rules which are limited in their operation to a particular description or class of persons the incidents of which are described in section 4 of the Act.
 - Freehold land tenure: The holding of registered land in perpetuity subject to the statutory and common law qualifications the incidents of which are described in section 4 of the Act.
 - Mailo land tenure: The holding of registered land in perpetuity having the roots in allotment of land pursuant to the 1900 Uganda Agreement and subject to statutory qualifications the incidents of which are described in section 4 of the Act.
 - Leasehold land tenure: The holding of land for a given period of time from a specified date of commencement, on such terms and conditions as may be agreed upon by the lessor and lessee the incidents of which are described in section 4 of the Act.

- The current land tenure system in the project area provides opportunities for tree farmers and charcoal producers who are non-native to the area to lease land from landlords and use it for establishing woodlots. In the case of Bibanja holders (lawful bonafide occupants) the Land Amendment Act 2010 has increased their security of tenure by empowering them to obtain certificate of tenancy which allows them to undertake long term development activities including tree planting. In February 2013, Cabinet approved the Uganda Land Policy. Approval of the land policy is major reform in the land tenure system. The policy provides that Uganda shall maintain multiple tenure systems as enshrined in the Constitution' and makes it clear that 'all land tenure systems will be defined in detail to confer social, economic, environmental and political security to land owners, occupiers and users'. These land reforms are expected to address hitherto tenure insecurity for tenants "bibanja" holders to invest in long term activities such as tree planting.
- Through the GEF-Enabling Environment for SLM, a review of policy framework for sustainable charcoal production has been completed. Key recommendations of the report include development of a standalone charcoal regulatory framework, need to designate forest reserves as demonstrations for raising energy tree species, revision of the Local Government Act with a view of decentralising biomass energy management and strengthening staffing and capacity of the Division of Biomass Energy Management in Ministry of Energy and Mineral Development to continually improve and monitor the policy framework for biomass energy, introduce well targeted incentives to support SCP especially among land owners, private firms and Non-Governmental Organizations. These recommendations have been taken into account and informed the design of this project.

71. On the demand side, the most prominent policies are Uganda's **Energy Policy (2002)** and **Renewable Energy Policy (2006)** whose main aims are to meet the energy needs of the Ugandan population for social and economic development in an environmentally sustainable manner. The development of renewable energy resources for both small and large-scale applications is emphasized. One of the objectives of these policies is to increase access to modern, affordable and reliable energy services as a contribution to poverty eradication. This is to be achieved through supporting the dissemination of biomass and other renewable energy technologies to increase positive impact on the energy balance and the environment, and supporting efforts to develop biomass resource in agreement with the Uganda Forestry Policy and the National Forest Plan. The policy recognizes biomass (firewood, charcoal and crop residues) as an important renewable source of energy which can provide almost all the energy used to meet basic needs of cooking and water heating in rural and most urban households, institutions and commercial buildings. The policy recognizes the following:

- Charcoal is generally produced on non-state land.
- Biomass (firewood, charcoal and crop residues) provides almost all the energy used to meet basic needs of cooking and water heating in rural and most urban households, institutions and commercial buildings and it is the main source of energy for rural industries.
- Trading in biomass energy, especially charcoal contributes to the economy in terms of rural incomes, tax revenue and employment.
- Most of the traditional energy technologies (wood and charcoal stoves and charcoal production kilns) currently used in Uganda are inefficient.
- Charcoal production and transportation is not properly regulated and the disposal of biomass waste by burning, without extracting the energy content, is a common practice countrywide.
- The provision of incentives for the growing of energy crops contribute to reforestation and sustainable use of biomass.
- There is a need for developing appropriate legislation to operationalize policy measures which include regulation of charcoal production and transportation
- There is a need to license charcoal production and transportation and encourage its commercial production in an efficient and sustainable manner.

72. The National Environment Management Policy's (NEMP 1994) overall goal is to establish sustainable social and economic development, which maintains or enhances environmental quality and resource productivity on a long- term basis that meets the needs of the present generations without compromising the ability of future generations to meet their own needs. The policy has statement on forest conservation and management. The objective of this policy is to manage sustainably, forest resources in protected areas and public and private land, and to promote increased forest production by the private sector and communities. One of the strategies of the policy to provide economic incentives and the necessary legal framework and technology to encourage and facilitate rural communities, wood fuel using industries and institutions and the private sector to be self-sufficient in forest product requirements.
73. Other policies relevant to charcoal include:
74. **The National Water Policy (1995)** which has a provision that community groups and local committees will monitor activities having local impacts on water resources such as use of wetlands and forests.
75. **The Uganda Wildlife Policy (1999)** which recognizes forests as one of the most important resources of the wildlife and aims to promote the long term conservation of the country's wildlife and biodiversity in a cost effective manner which maximizes the benefits to the people of Uganda. It also encourages a range of participatory approaches such as empowering citizens to participate in the conservation and management of the country's natural resources, and related decision making processes that affect their livelihoods.
76. **The National Soils Policy for Uganda (1999)** contains government policy directives, plans of action and statements of aim and objectives to ensure sound sustainable management of Uganda's soils. The objectives of this policy include the promotion of optimal land use without unnecessarily compromising the environment through the use of soils. It aims to establish a structure for continuous monitoring and assessment of Uganda's potential in terms of its soil properties and weather, soil degradation and undertake technical measures required to control it. One of the strategies for policy implementation includes land use improvement which requires the land resources inventory to provide up-to-date information and reliable data on land resources such as soil, water, climate, vegetation, wildlife and forestry. The policy provides the legal strategies to include review of existing legislation with a view to enacting a comprehensive Soil Conservation Act and urge districts to make ordinances and by-laws on soil conservation.
77. **The National Agricultural Research Policy's (2003)** aim is designed to generate and disseminate appropriate, safe and cost-effective technologies, while enhancing the natural resource base. The policy recognizes the need to address market opportunities and promote the participation of the private sector, civil society and farmers. It suggests that opening up provision of agricultural research services to competition may increase the efficiency and effectiveness of agricultural research. This requires separating public funding from the delivery of research services.

1.3.2 Relevant Government Plans and Programmes

78. Relevant plans and programmes have been developed that affect charcoal production.
79. These include the **National Development Plan (NDP)** which is a development strategy that aims at directing Uganda's development towards a vision of a transformed Ugandan society from a peasant to a modern and prosperous country within 30 years. The NDP emphasizes the need for sustainable development through preservation of natural resources such as forests. It proposes strategies which are relevant to charcoal production and includes restoration of forest cover through re-forestation and afforestation; promotion of commercial tree planting on private land; increasing involvement of the population in tree planting; supporting research and development to promote high yielding and appropriate tree varieties; strengthening the capacity of relevant sector institutions to effectively enforce forest and environmental laws and regulations; reducing pressure on forest cover as a source of wood fuel and construction materials; scaling up incentives to promote investment in generation and use of alternative energy; promotion of the use of

efficient energy saving stoves; investing in research and development for alternative energy sources; and regulating forestry activity on private land in line with the land use policy.

80. The **National Forest Plan (NFP) 2011/12 -2021/22** is a sector-wide national instrument for managing and utilizing the forestry resources in Uganda whose objective is the management of tree and forest resources as a business that contributes to economic, social and environmental benefits for all the people of Uganda. In relation to charcoal production the NFP recognizes the following: Firewood and charcoal is one of the products and services which have high contributions towards accelerated social-economic transformation and thus need to be promoted under this NFP. With the increasing population, there is greater demand and increased consumption of forest products charcoal and firewood. Therefore, the strategies for the management and conservation of forests and trees urgently need to be recast to address the increasing demands. Fuel wood (firewood and charcoal) accounts for 94% of the total wood used. By 2002, about 73% of all the districts in Uganda were already experiencing a deficit of accessible woody biomass for fuel wood and the Ministry of Energy developed a strategy for sustainable charcoal production and licensing targeting 14 charcoal producing districts. However, this has not been implemented. Challenges recognized by NFP include high cost of investment and long rotation period which discourages many small-scale investors in venturing into the sector. Investment risks, such as fires and diseases, have not been addressed and incentives are insufficient to attract investment especially among the local population and encroachment in CFRs is also a big hindrance to private forest plantation developers in the country.
81. The **Environment and Natural Resources Sector Investment Plan 2008-2018** recognizes forestry as one of the sub-sectors under the Environment and Natural Resources Sector whose ten-year Sector Investment Plan (SIP) runs over the period 2008/09 to 2017/18. Within the key result areas, the forestry sub-sector addresses the following strategic objectives: Sustainable harnessing/use of natural resources so as to improve the ability of forests and trees to yield increases in economic, social and environmental benefits for all people especially the poor and vulnerable now and in future generations; comprehensively establish laws, policies, regulations, standards and guidelines for efficient and effective management of the ENR sector; significantly strengthen the capacity of lead agencies and other institutions to implement programmes on environmental management; progressively make changes in the restoration of environmentally degraded ecosystems; promote research for the improvement of Environment & Natural Resources; and promote incentive mechanisms for SLM adoption and biomass energy/charcoal saving technologies as some of the activities to implement the plan.
82. The **Forest Nature Conservation Master Plan (2002)** was developed through the 1990s and published in June 2002. It details steps to integrate the conservation of biodiversity and other environmental protection measures into forestry sector programmes. In relation to charcoal production it provides the following strategies: Outline a broad strategy for integrating nature conservation and other forest management objectives that the relevant forestry agency and its partners can refer to as a guide and describe the specific actions which need to be taken to protect biodiversity and other environmental values within the forest estate, including those related to the establishment, demarcation and management of Nature Reserves; protection activities in other management zones; institutional and financial arrangements; local community involvement; and legislation and policy requirements.
83. The **Plan for the Modernization of Agriculture (PMA, 2000)** provides a holistic framework for eradicating poverty through multi-sectoral interventions that enable people to improve their livelihoods in a sustainable manner. The PMA includes forestry as one of the main sectors that contribute to the livelihoods of poor people, along with agriculture, fisheries and livestock.

1.3.3 Relevant Legal Frameworks

84. The **Constitution of Uganda (1995)** is the details laws for environmental protection and conservation. It requires that the utilization of the natural resources of Uganda be managed in such a way as to meet the development and environmental needs of present and future generations

of Ugandans. It requires the state to promote and implement energy policies that will ensure that people's basic needs and those of environmental preservation are met.

85. The **National Forestry and Tree Planting Act (2003)** provides for the conservation, sustainable management and development of forests for the benefit of the people of Uganda. The Act establishes the National Forestry Authority (NFA) whose functions are to manage all the CFRs. Under Section 13, a forest reserve shall be managed to conserve biological diversity, ecosystems and habitats, sustain the potential yield of their economic, social, health and environmental benefits. Sections 14 and Section 32 of the Act restrict activities in the CFRs and community forests. Thus, no person can take or remove or disturb, damage, burn or destroy any forest produce or receive produce. Nor can the forests be cleared, used or occupied for any land for grazing, camping, livestock farming, planting or cultivation of crops or erecting of a building or enclosure or recreational, commercial, residential, industrial or hunting purposes except with a license. A person involved in charcoal production using the trees from CFRs requires a license from the National Forestry Authority (NFA). The Act allows ownership of private natural forests and private forest plantations so that anyone may register with the District Land Board, private forest plantations on his or her land, and a licensed or natural forest. All forest produce in a registered natural forest belongs to the owner of the forest and may be used in any manner that the owner determines, as long as it is harvested in accordance with the management plan. A District Forest Officer may issue directions to the owner of a plantation forest, whether registered or not, requiring the owner to manage the forest in a professional and sustainable manner.
86. Under Section 23, the Act permits any person to enter into a contractual or other arrangement with the owner or holder of an interest in a private forest, for the right to harvest, purchase, sell or manage all or any part of the forest produce in the private forest. Section 25 notes that a traditional or cultural institution or leader may hold, own or manage a forest, subject to such directions as the Minister may prescribe. The government or a local government has no ownership over trees or forest produce situated on private land.
87. The Act obliges the Minister, the NFA or a local government to provide technical services to local communities, organizations, cultural or traditional institutions and other persons involved in the development of community forests and private forests and forestry activities in general. The NFA or local government may charge fees for services such as the promotion of seed production, agroforestry, tree growing and growing fruit species.
88. **The National Environment Act (NEA), Cap 153** emanated from the National Environment Action Plan (NEAP), which ended in 1995 and aimed at providing for the sustainable management of the environment and natural resources. It is the framework legislation for environmental law in Uganda. Under the Act, the National Environment Management Authority (NEMA) was created with the responsibility of supervising and coordinating activities related to the management of the environment. The Act mandates NEMA, in collaboration with relevant lead agencies, is empowered to issue guidelines and measures relating to the management and conservation of: lakes, rivers, wetlands, hilltops, hill-sides and mountainous areas, biological resources, forests, wood lots, range lands and land use planning. In order to operationalize the broad measures above, NEMA has issued regulations and standards to guide the sustainable use of environmental resources that are relevant to charcoal production.
89. Relevant NEA regulations include: The National Environment (Hilly and Mountainous Area Management) Regulations (2000). The Regulations facilitate the sustainable utilization and conservation of resources in mountainous and hilly areas to promote the integration of wise use of resources in such areas and that efficient and sustainable use of such resources are maintained for the present and future generation. Under Regulation 4, utilization of land in mountainous and hilly areas requires that occupiers observe the carrying capacity of the land; carry out soil conservation measures; utilize underground and surface water catchments areas and use available technologies to minimize significant risks to the ecological and landscape aspects and maintain vegetation cover as may be determined by an agricultural extension officer. These are important regulations; however, their implementation is being affected by human, technological and financial capacity. The National Environment (Minimum Standards for Management of Soil quality) Regulations,

2000 establish and prescribe minimum soil quality standards to be maintained for the management of the quality of soil, the criteria and procedures for the measurement and determination of soil quality and guidelines for soil management. Soil conservation in these areas is required as a basis for environmentally sound production of food, wood and other commodities based on the sustainable use of land, species and ecosystems. Like the Regulations on Hilly Mountains, these regulations also lack financial and technological capacity for their implementation. The National Environment (Wetlands, Riverbanks and Lakeshores Management) Regulations 2000 provide for the conservation and wise use of wetlands and their resources and to facilitate the sustainable conservation of resources on riverbanks and lakeshores by and for the benefit of the community living in the area.

90. The **Local Government Act 1997** as amended 2005 consolidates and streamlines the existing law on local governments in line with the Constitution to give effect to the decentralization and devolution of functions, powers and services. The Act also provides for revenue, the political and administrative set-up of local governments and election of local councils and any other matters that relate to local governments. Subsequent to the decentralization policy, the Act provides that it is the responsibility of the local government to protect and preserve the resources from abuse, pollution and degradation, and to manage the resources for sustainable development within the district. The District Council is the highest political authority in the district and the Second Schedule to the Act prescribes its functions. These include overseeing forests and wetlands, and protecting streams and lakeshores. The district councils have power to enact district laws (ordinances) while urban, sub-county division or village councils may in relation to its specified powers and functions, make by-laws. Through this method, the district and other lower local councils are to effectively control and manage their natural resources and environment within their local areas and jurisdiction. The Second Schedule to the Act also details the functions of the government that the district council is responsible for. These include forests and wetlands management. The Fifth Schedule of the Act and Local Government Revenue Regulations mandate the district and urban councils to collect charcoal burning licenses. Some districts such as **Jinja** and **Mukono** have developed by-laws on charcoal but most of them relate to banning charcoal burning activities without permission from the district authorities and not make provisions for sustainable charcoal production. The by-laws restrict charcoal burning by imposing a heavy tax which is very difficult to enforce.
91. The **Land Act Cap 227** provides for the tenure, ownership and management of land in Uganda. The Land Act defines four land tenure systems: Mailo, customary, freehold and customary tenure. Section 43 of the Act requires a person who owns or occupies land to manage and utilize the land in accordance with the Forest Act, the Mining Act, the National Environment Act, the Water Act, the Uganda wildlife Act, and any other law.
92. Other Relevant Acts include:
93. the **Water Act Cap 152** which provides for the use, protection and management of water resources as well as water catchments;
94. The **Traditional Rulers Restitution of Assets and Properties Act (1993)** intended to return all properties including forests that were confiscated from Buganda;
95. the **National Agricultural Advisory Services Act (2001)** which established NAADS programme whose objectives include increasing incomes and improving the quality of life of poor subsistence farmers through increased productivity and shares of market products; as well as promoting sustainable use and management of natural resources by developing land use and management policy and promoting environmentally friendly technologies;
96. The **Agricultural Seeds and Plant Act Cap 29** which was intended to promote, regulate and control plant breeding and variety release, multiplication, conditioning marketing, importation and quality assurance of seeds and other plant materials. Under Section 2 of the Act, a National Seed Industry Authority is established to formulate and advise government on national seed policy, establish a system of implementing seed policies, constantly review the national seed supply, coordinate and monitor the public and private seed sector.

97. The **Prohibition of Burning Grass Act, Cap 33** prohibits burning of grass unless authorized by a veterinary officer or agriculture officer or forest ranger or wildlife officer authorized by the board of trustees. Under the Act, 'grass' is defined to include all vegetation and is wide enough to cover even scattered forests. The Act prohibits the burning of grass by any person in all areas of Uganda. However, the sub-county chief may after consultation with an officer of the veterinary or agricultural departments, authorize controlled burning of grass for a specific purpose; and such burning has to be under the supervision of a parish or sub-parish chief. In the case of the burning of grass in a forest reserve, the burning has to be carried out, or authorized by an officer of the forest department not below the rank of a forest ranger.

1.3.4 Institutions Framework for Charcoal Development

98. There are two line ministries and two sets of government policies that govern the charcoal sector in Uganda:
99. The **Ministry of Water and Environment (MWE)** primarily deals with the supply side of charcoal which includes both the feedstock supply as well as all processes leading to actual production.
100. **The National Forestry Authority (NFA):** At the supply end, the charcoal sector is regulated by the Ministry of Water and Environment through the semi-autonomous NFA. The NFA is responsible for the sustainable management of CFRs, supply of seed and seedlings, and the provision of technical support to stakeholders in the forestry sub-sector on contract. The Uganda Forestry Policy provides (2002) for the establishment of the NFA as a government semi-autonomous organization to take over the soon-to-be defunct Forest Department. The NFA was subsequently established after the enactment of the National Forestry and Tree Planting Act, 2003 (NFTPA) and has a key responsibility in ensuring sustainable forest management by enacting strategies and actualizing steps to reduce forest depletion and degradation. Its mandate is explicitly stated as "sustainable management of the government's Central Forest Reserves (CFRs) and promotion and development of private forestry", with specific functions enshrined in section 54 of the NFTPA. The main functions can be summarized to include four main areas: i) All managerial aspects of CFRs in Uganda including community participation in forest management; ii) coordinating other regulatory bodies in controlling and monitoring all forest reserves; iii) legal responsibility for all agreements entered into for the provision of services within the forest reserves including tourism activities; and iv) responsibility for training and research for the purpose of forest conservation and sustainable forest management. The NFA is the official body responsible for the management of gusseted forest estates and controls the access and use of forest resources by three methods: i) Clear demarcation of CFR boundaries. These boundaries communicate to the public, specific geographic locations that are out-of-bounds thus avoids possible resource use and ownership conflicts between the public and the government; ii) issuance of licenses. Any activity within the CFR is considered legal if the persons engaged have permits issued by NFA and vice versa. Licenses are issued to activities that are in line with the Uganda Forestry Policy and which ensure general sustainability of the forestry sector; iii) compensation to persons who have been inhabiting the CFR before 1992. The MWE holds the NFA responsible for surveying for people who have settled within the CFR's boundaries before 1992. These persons are considered legal inhabitants although since the CFR boundary was demarcated after 1992 and is currently existent, they are normally compensated by the NFA so as to enable them relocate. Persons settled within the CFR boundaries after 1992 are committing an illegal act; and iv) NFA is also involved in tree planting initiatives which aim at increasing the CFR's cover.
101. The **Ministry of Energy and Mineral Development (MEMD)** mandate is "to establish, promote the development, strategically manage and safeguard the rational and sustainable exploitation and utilization of energy and mineral resources for social and economic development." There are many overlaps not only between the mandates of these two ministries but also with other ministries which have their own specific mandates but sometimes complement the activities of the two. These policies also operate within the framework of the

country's current National Development Plan (NDP) 2010/11 – 2014/15 which aims to “transform Uganda to a middle-income economy through promoting growth, employment and socio-economic transformation for prosperity” (Republic of Uganda, 2010). The NDP highlights challenges of poor compliance with environmental policies, laws and regulations to address degradation of the environment and natural resources and weak policy and legal framework for mainstreaming of climate change into development plans at all levels. It recognizes the important role of the forestry sector, and the need to rejuvenate the sector, including raising the per cent forest cover to 30%, up from the current 18% reported by the NFA.

102. It is clear from the above that the management of the charcoal industry is disorganized. There is overlap of roles of institutions which causes confusion. The NFA and district councils deal with the supply while the Ministry of Energy and Mineral Development is responsible for managing demand. The corruption bedeviling issuing of licenses ensures that charcoal goes on the market without specifying the source. Charcoal burners do not know how to manage dry wood as there are no standards in place to specify the quality of fuel wood (fire wood and charcoal) permissible on the market. A good standard should specify the tree species for both firewood and charcoal, the size of fire wood and its moisture content and the quality of the charcoal. Without these standards, any tree can make it on the market including the endangered species, fruit trees and trees from protected areas. The above factors make it very difficult for the sector to attract investments and financing.

1.3.5 District Level Governance of the Charcoal Sector

103. Uganda has a decentralized system of governance composed of Higher Local Governments (HLGs) and Lower Local Governments (LLGs) where decisions are made that impact on charcoal production. HLG & LLGs directly relate with the Ministry of Local Government (MOLG) which gives them relevant policy directions. MOLG also develops and formulates national policies on all fees, levies, taxes for local governments through its Local Government Finance Commission (LGFC) which has responsibility for planning and raising local revenues, including revenues from charcoal. Equally, other national Ministries have close working relationships with Local Governments based on their specific mandates.
104. With regards to energy resources, the Division for New and Renewable Energy of the Ministry of Energy and Mineral Development (MEMD) has the mandate to ‘establish, promote the development, strategically manage and safeguard the rationale and sustainable exploitation and utilization of biomass energy resources, including charcoal. However with regards to Local Governments, the main limitation with respect to energy in general and charcoal in particular, is that:
 - a. Energy was not decentralized under Local Government Act
 - b. The Division of New and Renewable Energy Sources has few technical staff, who therefore, would find it very difficult to interface with local governments on regular basis
 - c. Although a request has been made to the Ministry of Public Service to consider the post of Energy officers, the request has not been met yet.
 - d. Issues of charcoal are uncoordinated at district level, being propagated for some of the time by the District Environment Officer (DEO), and District Forestry Officer (DFO)
 - e. MEMD does not own forests or regulate activities in forestry/ wood fuel from which charcoal is made and therefore it can only work in partnership with National Forest Authority, District Forestry Services (DFS), Local governments and the private sector.
105. The issues of forest management in local forest reserves and on private land fall under the DFS. Policy guidance at local level is offered by the Forestry Sector Support Department (FSSD) of the Ministry of Water and Environment (MWE), including formulating guidelines and regulations they can use. The main challenge of District forest service is understaffing. NFA considers its core product as timber, and certainly not charcoal. To make matters worse, its Tree seed Centre supplies 4 categories of trees, namely for timber, agroforestry, fruit trees and others or ornaments but not for charcoal.

106. Centrally, the mandate for central forest reserves falls under NFA under the Ministry of Water and Environment. NFA has control of over 15% of all the forest estate in Uganda. Another 15% falls under the Uganda Wildlife Authority as parks. The remaining 70% of the forest estate is under the management of private sector on their land. Local governments manage less than 1% of forest estate as Local Forest Reserves, and even then, not all districts have them. Also at central government level, NEMA is mandated in consultation with the lead agency to promote the use of renewable energy by promoting research in them, and creating incentives for the promotion of renewable energy, and taking measures to encourage the planting of trees and woodlots by individual landowners, institutions and community groups.
107. DFO works closely with the District Environment Officer. Given that issues of energy were not decentralized, it's these officers who use part of their time to sensitize matters of energy. Some of the challenges that are faced by the District Forest Officer (DFO) in enforcement and carrying out forest conservation and management activities include:
- a. Understaffing and lack of adequate financial support from the district. The forest sector generates a lot of revenue from charcoal through transport fees and tree felling permits, transportation of timber from local forest reserves but very little, if any is ploughed back to conserve and manage the forest resources.
 - b. Although charcoal contributes about 70- 80% of the total revenue generated from the forest sector, political interface from some leaders who prioritize voters to forest conservation and demand that those without permits for forest produce be released when they are arrested undermines sustainable charcoal production
 - c. Existing conflicting laws and policies which handicap the DFS specifically the forest policy, land and forest resource ownership which give private land owners to own their produce and manage their forest without regards to sustainability and conservation
108. However, the District Environment Committees (DECs) have the mandate to assist development and formulation of byelaws relating to the management of environmental resources . Working closely with the local environment committees (LECs), the DECs has mandate to mobilize the people to conserve natural resources through self-help groups in addition to sensitizing local communities on the environmental concerns of using wood charcoal and deforestation in Uganda.
109. **The Ministry of Local Government's (MOLG)** .The current local government is organized into a five-tier system of elected representatives called Local Councils (LCs), from level one (LC1) to level five (LC5). The responsibilities of the local government include income tax collection (including from charcoal), service provision, formulation of policies and laws and managing the environment. Government decentralized forest management; forest reserves were categorized into CFR whose management mandate is vested NFA and Local Forest Reserves (LFR) whose management mandate was vested in District Forestry Services (DFS) within District Local Governments. Following concerns that followed almost immediately, namely, that the district local governments were abusing their new powers to deplete forest reserves, the central government issued the Forest Reserves (Declaration) Order (1998) that limited district prerogative in management of forests to those that were less than 100 hectares in size, or local forest reserves. Powers over forests above 100 hectares (central forest reserves) were shifted back to the central government.
110. There is incoherence between the Local Governments Act and the Forests Act which does not clearly define the local government's role in private forest and CFRs thus acts a hindrance to effective and efficient forest management.
111. **District Forest Services (DFS):** The National Forestry and Tree Planting Act, 2003 also established the District Forestry Services to manage Local Forest Reserves which represent about 85% of the forest cover in Uganda according to the Office of the Auditor General. In accordance with the Act, the DFS also advises private landowners on how to sustainably manage the forests on their land and on-farm forestry matters. The Forestry Sector Support Department (FSSD) in the MWE offers supportive back-up to both the NFA and District Forest Services (DFS). Although the governing Act gives a specific mandate for the establishment of the DFS, the Office of the Auditor General has noted that this mandate of the districts in regard to the sustainable

forests management is not being adequately undertaken. The Audit Office found in previous audits that majority of the districts in Uganda has not set up DFS'. Even where the DFS' have been established, they are under staffed, insufficiently funded and poorly facilitated, hampering effectiveness.

1.3.6 Stakeholder Views on Charcoal Governance

112. During stakeholder consultations, the following issues were discussed: i) Key points that an adequate national charcoal policy and legislation should address; ii) key elements needed in the by-laws and guidelines to enhance sustainable charcoal production at district level; iii) how to enhance licensing procedures at the district level; and iv) policy measures to be put in place to enhance popular participation in sustainable charcoal production at the district level.
113. **Tree planting** was singled out as one of the elements that a policy should stress in order to ensure sustainability of the industry. The group felt that the policy should specify **tree species** that should be used for charcoal and gazette them and those that need to be protected. In addition, the need for new high yielding tree varieties for charcoal production should be identified and promoted. With regards to **licensing** and **taxation**, the policy should standardize charges such that they are uniform to all districts. Such licensing should also give guidelines to producers to avoid indiscriminate felling of trees, provide for storage of charcoal and regulate transportation and marketing. Consumers should be in a position to know where charcoal vendors (both wholesalers and retailers) are located for ease transaction as opposed to the current situation where charcoal vendors are not allocated official space by the local authority. The group also discussed the need for the industry players to diversify and produce both charcoal and briquettes without solely relying on woody species for their final product. A professional body was recommended to provide such guidelines including the need for producing for the export market. The government was encouraged to make provision for research in charcoal production because it is a national issue.
114. Crucial elements needed in the district by-laws to regulate sustainable charcoal include compulsory tree planting; fines for defaulters; regulation of numbers for charcoal burners in the district; reduction in tree cutting; abolishment of use of power saws and other heavy machinery; charcoal producers should be encouraged to formulate groups (e.g. advocacy activities); every tree cutter should be given specific allocation of the amount of tree volume.
115. With regards to licensing procedures, the recommendation was the need to make uniform licensing procedure throughout all the districts of Uganda and sensitizes communities and the public on the same. Licensing fee should be fair and according to the amount being transported according to carrying capacity of the trucks/vehicles. A lorry should not pay same fee as a donkey load of charcoal
116. Other measures that were suggested to improve sustainability of charcoal include: The district by-laws should advocate introduction of improved technology and if need be incentivize those using improved technology; tree management extension services should be encouraged and Standardization, grading and pricing for charcoal and revision of funding allocations.

1.4 Financing and Investment in Sustainable Charcoal Technologies

117. **Financing for Charcoal Investments:** Both the **Energy Policy (2002)** and the **Renewable Energy Policy (2007)** highlight the establishment of an appropriate financing and fiscal policy framework for Renewable Energy Technologies (RET) investments as one of the key policy objectives. However, an in-depth analysis into the specific strategies for attaining this objective shows that charcoal is not specifically addressed although it is recognized as part of the renewable energy mix. The Energy Policy has identified financing options for addressing the key components of renewable sector in its Short and Medium (0 – 10 Years) Term Policy Priorities as shown in the table below. Carbon financing is included as an option. It however does not specify what proportion of that allocation will go towards charcoal.

Table 4: Uganda's Energy Short and Medium (0 – 10 Years) Term Policy Priorities

Priority Policy Action	Strategic Intervention	Required Financial Resources	Funds Already Committed	Source of Funding	Timing	Other Comments
Promote use of RE and RETs	Evaluate Renewable Energy Resources	US\$ 3.2 Million	US\$ 2.5 Million	ADB IDA/GEF GOU	2002 – 2005	Study launched in 2002
	Promote through awareness and capacity building RE and Energy Efficient Technologies	US\$ 6 Million	US\$ 4 Million	GOU IDA/GEF GTZ	2002 – 2005	Public sector investment
Manage energy related environmental impact	Monitor the implementation of environmental impact assessment of energy investments (e.g. large hydropower dams, petroleum exploration)	US\$ 10 Million	0	IDA GOU	2002 - 2012	GOU Institutional support
	Negotiate for benefits accruing out of the Kyoto Protocol	US\$ 3.9 Million	US\$ 3.8 Million	Prototype Carbon Fund (PCF)	2002 - 2012	Emissions certificates will be established
Improving Energy governance and administration	<ul style="list-style-type: none"> Build capacity of the regulatory Establish a regulatory framework on atomic energy/ionizing radiation 	US\$ 8 Million	US\$ 4Million	GOU Donor Agencies (IDA, NORAD, GTZ, IAEA)	2002 - 2009	Operational costs for these institutions are not covered

118. Access to Financing by Charcoal Producer Groups: Besides the lack of government investment in charcoal, formal banking institutions are reluctant to provide financing for actors in the sector. In the first place, although current licensing regulations for charcoal require the producers to form organized groups, there is no evidence that such functional groups exist. The primary charcoal actors can increase their returns by working in associations, which can provide an opportunity for negotiating for loans, inputs and better prices. The Renewable Energy Policy lists eight strategies for establishing an appropriate financing and fiscal policy framework for RET investments, four of them listed below are very relevant to the charcoal sector:

- Introduce fiscal measures that favor renewable energy investments.
- Implement innovative risk mitigation mechanisms and credit enhancement instruments.
- Enhance social service provision through grant financing of renewable energy projects.

119. Investment Barriers: Currently the charcoal sector is largely informal with many unchecked taxes both official and unofficial. Majority of actors in the sector lack business and technical skills. Furthermore, although charcoal is one of the key sources of revenue to the local governments and at the same time a source of employment and income to many households; it is generally perceived as an illegal activity by the authorities and there are no allocations for streamlining the sector at local level. The local government responsibility coordinated by the DFS under the District Forestry Office gets guidance from the Finance Office on matters of taxing and licensing assisted by other sectors such as the law enforcement sectors. Hence local government involvement is only to the extent of revenue collection. Notably, governance along the value chain misses a link at the lowest local government sub-county level. There is no office responsible for forestry or environment sectors, despite the fact that the forest resources are produced and harvested at that level, hence need for strong governance. This effectively makes charcoal production unattractive to many potential investors and is a deterrent to serious investors in the

sector. The lack of standards in the sector has also hindered market development and a formal market infrastructure is grossly lacking. It is therefore very difficult to plan, regulate and effectively monitor the charcoal sector. This makes charcoal production and marketing difficult to finance and collect revenue.

120. During a stakeholder consultation workshop, the break-out group on Financing and Investment in Sustainable Charcoal had consensus that in order to ensure a sustainable environmental management, better quality charcoal and improved incomes for the people in the charcoal industry, there was need for external financing. The government needs to provide a budget for research on suitable tree feedstock and multiplication; improved charcoal production technology promotion; enhancing better management of charcoal trade. At the local level, the group felt that there was need for financing awareness raising and dissemination of information, inspection and monitoring throughout the value chain from production, transportation, marketing and licensing, forming of association, technology promotion and extension services as well as standardization, specification and branding.
121. The source of financing could be conditional grants to local authorities from the national government. Sloughing back percentages from revenues and forest produce is also an option as well as encouraging NGOs and development partners to fund research and technology dissemination. Other sources were commercial banks issuing concessionary loans and grants. However, the group recognized that in order for the private sector to finance the industry, there was need for a clear charcoal policy and legal and institutional frameworks just like any other forestry/agricultural commodity. Readily accessible reliable information and data on the charcoal value chain and improved infrastructure in the production, transport and marketing as well as removal of taxes and duties on proved efficient charcoal producing equipment (e.g. retort that is specific for charcoal-making) would incentivize the private sector, including carbon finance from the carbon market.

1.5 Developing a Carbon Finance Project for Sustainable Charcoal

122. Opportunities (in the form of standards) exist both in the compliance and voluntary carbon markets for sustainable energy projects in general, and the charcoal sector in particular. These projects address either the supply side (charcoal and feedstock production) or the demand side issues (improved cook stoves and efficient charcoal/energy utilization). However, the applicability criteria for many of the existing standards significantly narrow down the options that can be harnessed for carbon finance in this project. Table 5 below summarizes the existing standards and assesses their applicability to the project at hand. From the table, it can be seen that the Small scale CDM methodology AMS-III.BG: "Emission reduction through sustainable charcoal production and consumption" is the most suitable methodology as it has all the elements present in the current project:

- Envisages small-scale charcoal production
- Involves shifting from non-renewable to renewable biomass feedstock
- Allow a range of charcoal kilns
- Promotes formation of charcoal associations for easier contracting
- Methane capture may or may not be undertaken as a project activity

Table 5: Existing Carbon Standards for Charcoal and/or Energy Projects

Standard	Type of Market	Project Scope	Comments on Suitability for this Project
1. VM0018 - Energy Efficiency and Solid Waste	Voluntary Markets using the Verified Carbon	This methodology provides a procedure to determine the net CO ₂ , N ₂ O and CH ₄ emissions reductions associated with grouped projects that focus on	Unsuitable: <ul style="list-style-type: none"> • Addresses the demand side only and although efficient charcoal use may be applicable, difficult to identify and set boundaries.

Diversion Activities within a Sustainable Community	Standard (VCS)	energy efficiency and solid waste diversion activities for an assortment of facilities within a set territory	
2. Methodology for Improved Cook-stoves and Kitchen Regimes	Voluntary Markets using the Gold Standard	This methodology is applicable to programs or activities introducing improved cook-stoves or water treatment technology (e.g. water filters) and practices to households and institutions that result in improved kitchen regimes within a distinct geographical area.	May be applicable at the demand side but scope for emissions reductions is limited
3. AM0041 - Mitigation of Methane Emissions in the Wood Carbonization Activity for Charcoal Production	Compliance Market (CDM)	This methodology is based on the project activity "Mitigation of Methane Emissions in the Charcoal Production of Plantar, Brazil". Only methane (CH ₄) emitted directly from charcoal production facilities, in particular the charcoal kilns, is monitored and its emissions calculated for the baseline and project scenarios, except for the provisions on leakage.	Unsuitable: <ul style="list-style-type: none"> • Project activity limited to methane capture and/or flaring • Suitable for large scale industrial plants • Involves use of retorts only
4. ACM0021 - Approved consolidated baseline and monitoring methodology. "Reduction of emissions from charcoal production by improved kiln design and/or abatement of methane".	Compliance Market (CDM)	This consolidated methodology applies to project activities that reduce methane emissions in the residual gas from the carbonization process at existing and/or new charcoal kilns and is based on the AM0041 methodology and proposed new methodology: NM0341 "Mitigation of methane emissions from charcoal production by recovering and burning carbonization gases" prepared by Marcelo Mittal.	Unsuitable: <ul style="list-style-type: none"> • Project activity limited to methane capture and/or flaring • Suitable for large scale industrial plants • Involves use of retorts only
5. AMS-III.BG: Emission reduction through sustainable charcoal production and consumption	Compliance Market (CDM)	This methodology is applicable to project activities that displace the use of non-renewable biomass in the production of charcoal supplied to identify consumers included in the project boundary. Project activity shall introduce efficient charcoal production technologies using renewable biomass feedstock such as biomass residues to displace the production of charcoal in unimproved traditional kilns by the informal sector thereby leading to emission reductions.	Most suitable as it encompasses activities envisaged under this project. <ul style="list-style-type: none"> • Small scale • End users of charcoal shall be: (i) households; or (ii) small and medium enterprises (SME); or (iii) a group of households served by a charcoal market. • End users do not include large scale industries. • Promotes formation of charcoal associations • Applicable technologies include but not limited to Retorts, Tones, Improved Earth Kilns, etc. • Methane capture may or may not be included as a project activity. NB: Entry into force is the date of the publication of the EB 70 meeting

		report on the 23 November 2012.
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123. The first step in developing the carbon finance aspect of the project is to organize the project beneficiaries into associations so that the carbon benefits can be aggregated to make project development feasible. This also makes easier the process of contracting – carbon finance involves a lot of contractual arrangements in order to manage risks associated with permanence of emissions reductions and to ensure their integrity. Once this has been done, the steps outlined in Section 4.1 above will need to be supported following established procedure as elaborated in the table below.

Table 6: Developing the Carbon Finance Aspect of the Project

Step/Activity	Significance	Issues to be Addressed
STEP 1: Feasibility Assessment	To establish the financial viability of the charcoal enterprise from feedstock production to the final product	<ul style="list-style-type: none"> • Is there a viable market to sell the charcoal and increase sales, is sustainable charcoal a profitable enterprise? • What is the baseline for charcoal demand? • What is the charcoal use patterns including end use technologies? • Is there a sufficient amount of emissions reductions for which the beneficiaries could receive carbon finance? • What is the difference between the present and expected situations?
Step 2: Baseline study and study of methodology	To establish that the baseline scenario (current technologies, feedstock sources, etc) represent an undesirable outcome in the long run if no remedial action is undertaken	<ul style="list-style-type: none"> • How much emissions result from unsustainable biomass use? • How much emissions result from inefficient carbonization technologies • What is the outlook in the without-project scenario? • What is the outlook for with-project scenario? • What is the best methodology (carbon standard) to use to account for all these?
Step 3: Monitoring Plan	Develop a framework for monitoring the emissions reductions and the social, economic and environmental benefits including	<ul style="list-style-type: none"> • What system works best? • What data needs to be collected and how will this is done? • How frequent is the data collection? • Who will collect the data?
Step 4: Project Documentation	The data collected will be consolidated into a Project Design Document (PDD) following procedures and formats prescribed in the selected carbon standard, and which includes all calculations and their references. This document is also the basis of independent validation and if successfully granted registration, subsequent verification before carbon credits can be awarded	<ul style="list-style-type: none"> • Can all the data required in the PDD be obtained and presented in the correct format? • What is the crediting period? • Is there project Additionality?
Step 5: Independent validation of calculations and registration	The Project Design Document (PDD), including the baseline, the estimated CO ₂	The project technical consultant will need to work with the independent validator/verifier, helping clarify issues and effecting changes in

	savings and the monitoring plan, will need to be checked and approved by an independent validator to establish conformity with the requirements of the selected carbon standard	design as advised by the validator.
Step 6: Implementation, ongoing monitoring and verifications	Good record keeping is crucial to ensure compliance with the approved PDD and as proof during verification before carbon payments can be made.	<ul style="list-style-type: none"> • Have the projected emissions reductions been achieved? • Is there need to adjust any aspects of the project based on the monitoring data?

1.5.1 Standardized Baseline Development in Uganda for Carbon Finance

124. Uganda is unique because some of the pioneer efforts towards the development of practical standardized baselines of the CDM continue to be proposed to be tested in Uganda. In 2011, Perspectives GmbH developed a proposed methodology for a new standardized baseline for charcoal projects⁵ in Uganda. The proposal has among others, the following objectives which directly address the issues discussed earlier within the charcoal sector:

- Explain why a simplification of CDM projects is required
- Establish the compliance of the proposal with applicability conditions
- Establish a standardized baseline to facilitate the calculation of emission reductions leading to the development of a “consolidated GHG database for the informal charcoal sector”
- Establish ex-ante the additionality in such projects

125. The prospective proposal was submitted to the CDM Executive Board (EB) on 16 May 2012 and updated on 30 May 2012. At the 73rd CDM Executive Board meeting, the standardized methodology was formally approved as well as the related small scale methodology, allowing for significant simplification of the process to earn carbon credits from producing sustainable charcoal in Uganda. The proposal identifies three main sources of GHG emissions in the charcoal sub-sector, namely:

- Unsustainable biomass sources for raw material (non-renewable)
- The prevalent use of inefficient carbonization technologies (typically 10 -20%)
- The use of carbonization technologies that result in high Methane (CH₄) emissions (methane is a very potent greenhouse gas)

126. Consequently, the document identifies two main opportunities for emissions reductions in the charcoal sub-sector:

- Carbonization technology improvement to reduce CH₄ emissions as well as improve conversion efficiencies up to 40% (which has the effect of reducing by half the amount of wood required to produce the same amount of charcoal).
- Decrease in the share of non-renewable biomass through the use of dedicated biomass plantations as a source of charcoal feedstock and as well as briquetting of biomass wastes.

127. As discussed earlier, previously available CDM methodologies within the charcoal sub-sector failed to find any applicability in the African context not only due to their complexity, but also because they i) tend to focus only on reducing CH₄ emissions through capture and flaring, ii) involve the use of large-scale industrial retorts for carbonization none of which is available in Africa, iii) ignore the carbon benefits of adopting improved carbonization technologies and iv) ignore the significant benefits of switching from the carbon-intensive non-renewable biomass (NRB) to the more carbon-neutral renewable biomass (RB).

⁵Nicolas Müller, Axel Michaelowa, and Michael Eschman (2011). Proposal for a New Standardized Baseline for Charcoal Projects in the Clean Development Mechanism to be Considered by the Executive Board of the Clean Development Mechanism. Prepared by Perspectives GmbH. Zurich, Switzerland.

128. The proposed standardized approach promises to assist the CDM to overcome the limitations observed in the existing methodologies, such as AM0041 and AMS-III.K, by providing standardized factors for the determination of the baseline. It will also help project developers to substantially reduce the complexity in the determination of baseline emissions.
129. The stringency and accuracy of the baseline so-developed would be realised through carefully tested field conditions (**performance testing**). The GEF Charcoal project in this regard is therefore considered to be complementary to these efforts towards standardization of baselines because carefully designed field trials and studies have been conducted as part of the data collection component. It is expected that these performance tests will also help fix the discrepancies that are to be found in the little existing charcoal data, either because of the application wrong procedures or inconsistent application of similar procedures.

1.5.2 Approach for developing Standardized Baseline in Project Area

130. This section outlines an approach that will be used in order to develop a standardized baseline (SB) for sustainable charcoal in the pilot districts, taking into account the fact that currently there is no consensus on an appropriate approach for developing SBs. The table below gives a proposed approach based on practical site specific input which will put in place a reliable and tested charcoal baseline which is replicable across the districts in Uganda. The **system boundary** within which the project activity takes place has been determined and comprises those emission sources that are significant, measurable and under the control of project participants in the pilot districts. The emissions that would have taken place within the system boundary without the carbon project have been described, making it possible to determine a baseline scenario and additionality. Justification for **physical boundaries** is based on carbon impact of charcoal activities and relative ease of measuring emission levels. The **aggregation levels** for the standardized baseline have been set for both accuracy and cost-effectiveness and will be based on analysis of *production process*; cross-comparison of efficiencies among different *ecological zones*, *duration* of carbonization and time series analysis with regards to *technology evolution*. To facilitate monitoring and ensure accuracy of the SB, there will be need to identify and establish **Performance Benchmarks**, which will be carefully tracked using suitably defined key performance indicators (KPIs). The KPIs will typically comprise easily observable and measurable outcomes resulting from proposed project activities.
131. Key performance indicators (KPIs) for the SB will be measured and evaluated through the monitoring of:
- Efficient harvesting and conversion technologies
 - Change in cultural practice to include better preparation of feedstock prior to carbonization
 - Rate of absorption of technology
 - Amount of charcoal per unit of feedstock
 - Income generated from charcoal sales
 - Revenue generated including revenue to the district governments in form of taxes. This may also include revenue from auxiliary activities depending on the system boundary adopted, which in turn is dependent on the practicality as well as cost-effectiveness of data collection.
 - Emission reduction levels

Table 7: Summary of Steps for Developing Standardized Baselines

Crucial Elements	Activities	Data Requirements	Remarks/Comments
Establishment of System Boundary	Baseline and situational analysis in the pilot districts	Charcoal production, feedstock, conversion technology, relevant policy, stakeholder analysis etc	Data updating on-going There is availability of most of the data. Piloting of technology and full value chain will firm up existing data/information
Justification for Physical Boundaries Selected	Relative carbon impact of charcoal related activities	Relative ease of measuring emission levels/impact of the different activities	Detailed analysis of the relationships between different activities to be carried out
Aggregation level: Criteria for identification of peers for the emission performance comparison	Analysis of production process; cross-comparison of efficiencies among different ecological zones; carbonization time; Time series analysis with regards to technology evolution	Data on harvesting; feedstock source and preparation; carbonization method; recovery efficiency ; historical analysis of available technology	Manageable levels of aggregation which are amenable to monitoring will be adopted.
Key Performance Indicators (KPI)	Monitoring of: Efficient harvesting and conversion Change in cultural practice to include better preparation of feedstock Rate of absorption of technology Amount of charcoal per unit of feedstock; Income generated And genera revenue to the district Emission level		

132. **Determining the Stringency Level and Updating Frequency for the project:** The significance of both the stringency level and updating frequency has been underscored and thus will require careful consideration. **Stringency Level:** to ensure there is no under-crediting that would compromise earnings from the sale of Certified Emission Reductions (CERs) while instilling buyer confidence based on the perceived integrity of the CERs generated, there will be a need to perform all required measurements based on global best practices and most importantly, by the strict application of all tools prescribed under the selected CDM methodology. These will include:

- Additionality calculation tools
- Tools for sample size calculation
- Tools for calculation of leakage
- Monitoring tools
- Any other tools as prescribed

133. This will mean that the selected confidence interval during all sampling activities shall not be set below 90% which is considered an acceptable threshold in forestry related work. Similarly, attention will be paid to the **accuracy** of all measurements (i.e., the degree of closeness of

measurements of a quantity to that quantity's actual (true) value, such as during determination of recovery efficiency), as well as the **precision** (the degree to which repeated measurements under unchanged conditions show the same results). This will particularly be crucial during validation, verification and future monitoring. These will similarly be set above 90% (typically 95%).

134. **Updating frequency:** This will be determined through ongoing monitoring. Initially, monitoring will be done more frequently (biannually). Based on consistency and accuracy of the data collected, this will gradually be reduced to annually and ultimately every five years or to coincide with every crediting period. During the initial monitoring, it may well be that certain trends will be observed in the parameters being measured and that hence there is need to update the established baseline. Such trends will be carefully logged and any emerging patterns analyzed to arrive at a suitable frequency. Since there is currently no such system, we recommend that the first five years of project implementation should provide a trend from which future updates will be carried out in the long term.

1.5.3 Steps to Be Followed in Developing Carbon Project in Pilot Districts

135. Steps for developing a sustainable charcoal carbon finance project in the pilot districts:

After a review of the existing methodologies for deriving carbon finance through improved charcoal production technologies, including their applicability criteria and taking into account the need for standardized baselines, the small-scale CDM methodology AMS-III.BG: “*Emission reduction through sustainable charcoal production and consumption*” emerged as the most suitable methodology for doing this. The AMS-III.BG contains the following elements that are also present in the current project and which make it most suitable:

- Envisages small-scale charcoal production
- Involves shifting from non-renewable to renewable biomass feedstock
- Allow a range of charcoal kilns and promotes formation of charcoal associations for easier contracting and methane capture may or may not be undertaken as a project activity.

136. This methodology is applicable to project activities that displace the use of non-renewable biomass in the production of charcoal supplied to identify consumers included in the project boundary. The methodology requires that the project activity proposed for carbon financing shall introduce efficient charcoal production technologies using renewable biomass feedstock such as biomass residues to displace the production of charcoal in unimproved traditional kilns by the informal sector thereby leading to emission reductions. The relevant conditions of the GEF project that make it suitable under this methodology are:

- It is small scale and the end users of charcoal shall be: (i) households; or (ii) small and medium enterprises (SME); or (iii) a group of households served by a charcoal market.
- The end users (of the charcoal) do not include large scale industries.
- The project promotes formation of charcoal associations.
- The proposed technologies for piloting include but are not limited to retorts, , improved earth kilns, and etc. methane capture may or may not be included as a project activity.

Text Box 1: Specific Activities to be undertaken to Realize This Goal

STEP 1: Feasibility Assessment – this will help to establish the financial viability of the charcoal enterprise from feedstock production to the final product. By the end of the data collection for the PRODOC, most of the feasibility questions for this project will have been answered.

STEP 2: Baseline study - This will help to establish that the baseline scenario (current technologies, feedstock sources, etc.) represent an undesirable outcome in the long run if no remedial action is undertaken. It will also establish project **Additionality**. The baseline study will be conducted in the context of the need to develop **Standardized Baselines (SBL)**. The GEF project will provide an opportunity to refine and validate the data needed for a SBL through carefully tested field conditions (**performance testing**). The GEF Charcoal will complement the efforts so far towards standardization of baselines because carefully designed field trials and studies have been conducted as part of the data collection component. The performance tests will also help fix the discrepancies that are to be found in the little existing charcoal data, either because of the application wrong procedures or inconsistent application of similar procedures.

STEP3: Monitoring Plan – In this step, a framework for monitoring the emissions reductions and the social, economic and environmental benefits of the pilot project will be developed.

STEP 4: Project Documentation – A successful outcome in steps 1 and 2 (i.e. that the project is viable and additional) will lead to a formal consolidation and documentation of all the data collected through a Project Design Document (PDD) following procedures and formats prescribed in the Small-scale CDM methodology AMS-III.BG, and which will include all calculations and their references. This document will also be the basis of independent validation and if successfully granted registration, subsequent verification before carbon credits can be awarded.

STEP5: Independent validation of calculations and registration - The project technical consultant will work with the appointed independent validator/verifier, helping clarify issues and effecting changes in design as advised by the validator in order to establish conformity with the requirements of the selected carbon standard.

STEP 6: Implementation, ongoing monitoring, reporting and verifications (MRV) – The technical consultant will guide the stakeholder through appropriate record keeping procedures to ensure compliance with the approved PDD and as proof during verification before carbon payments can be made. This will be combined with capacity building at all levels to ensure that the project stakeholders can gradually take over the responsibility for all MRV requirements.

1.6 Stakeholder Analysis and Involvement

137. The Forest Policy takes cognizance of the diversity of stakeholders in the forestry sector, and concedes that not all their interests are being fully addressed at the moment, and hence the need to define and coordinate each stakeholder's roles and responsibilities. Stakeholders in the sector include:

- Forest resource producers (farmers, commercial tree growers and forest owners);
- Forest resource users (both commercial consumers, and the majority of the urban and rural poor who depend on firewood and other forest products for subsistence);
- Forest resource processors (charcoal makers, pit-sawyers, saw-millers, artisans and traders);
- The concerned general public;
- Government and non-government organizations and individuals involved in providing services of management, training, research and support.

138. A survey of the charcoal sector in the four pilot districts identified three key actors in the charcoal value chain categorized in three as follows:

139. The first category is the migrant pastoralists and or ranchers, who have acquired land in the recent past with the intention of developing it into pastureland/ranches. This category's priority is to have their land cleared of trees to pave way for the animals. The cheapest and yet profitable way of clearing these trees at the moment is turning the trees into charcoal. The farmers therefore invite charcoal producers to cut all the woody biomass in a given area in return for the rights to produce and market charcoal from the clearance process (World Bank, 2009). For this category of

people, trees are taken to be just an encumbrance and the production of charcoal is therefore a by-product of other economic activities.

140. The second category is the traders/business people who want to invest their money for short term returns. These people obtain expensive short term loans from either money sharks or microfinance institutions (whose interest rates are normally very high) in order to make quick profits and invest elsewhere. These investors are normally in a hurry to pay off the loans. The high demand for charcoal as a fuel provides this opportunity for quick returns. The “quick return investors” achieve their goals by mobilizing redundant and desperate labor from the rural areas to offer the needed cheap labor.
141. The third category are those people who own or have access to land/tree resources, but occasionally when they are confronted with an urgent need like paying medical bills, school fees or marriage, may decide to either sale the trees or convert them into charcoal. These are the people who sometimes convert fruit trees into charcoal due to lack of alternative sources of income, but charcoal cannot be classified as their major source of livelihood. This is the category that dominates the charcoal production sector and any meaningful intervention will have to focus on these people. This observation supported by the findings of Kazoora, et.al, (2010).
142. The common characteristic for the three categories is that none has a long term vested interest in charcoal production as a trade, or business/career. Charcoaling is practiced for convenience or is simply a means to an end. The hypothesis that unsustainable charcoal production practices are majorly a result of ignorance by the charcoal producers is thus shown to be actually false. The feasibility of achieving an environmentally sustainable charcoal production process by merely training and provision of improved technologies to these groups therefore, is not adequate. It therefore calls for interventions that will motivate interest for long term and sustainable charcoal production.
143. A stakeholder Analysis and Plan for the Charcoal Sector is in the annex. For the implementation of this project to be successful, stakeholders along the value chain must play their roles. As such, a broad range of stakeholders at national, regional and local levels were involved in the development of this project. MEMD in close consultation with MWE and NAFA organized local consultation workshops and focused group discussions (FGDs) in each of the four districts to address the critical constraints to adoption of sustainable charcoal technologies. At the national level, MEMD and UNDP Uganda country office hosted a series of consultations to ensure that national stakeholders were informed and brought on board.
144. Key stakeholders in the implementation of this project will include MEMD, MWE, NAFA, local authority (local district councils), NGOs and CBOs. Other important stakeholders will include international organizations such as GIZ, FAO, that are implementing energy projects in the pilot districts. This project will encourage a cross-sectoral approach to include agriculture, water, livestock and natural resources essential for its success. The key stakeholders and beneficiaries however, will be the land-users, local communities, local government agencies and the private sector in the four pilot districts
145. **The Ministry of Energy and Mineral Resources (MEMD)** is the lead organization. The mandate of the MEMD is "to establish, promote the development, strategically manage and safeguard the rational and sustainable exploitation and utilization of energy and mineral resources for social and economic development". One of the ministry's policy goals is to meet the energy needs of Uganda's population for social and economic development in an environmentally sustainable manner. Over the years the ministry has implemented a number of biomass energy interventions including the National Biomass Energy Demand Strategy 2001 – 2010.
146. Through Memorandum of Understanding (**MEMD**) will work closely with DFS at the local level and with NGOs that are active in the field of environment and natural resources management. Several interventions have been undertaken by these NGOs over the years. CARE International in Uganda working in partnership with Joint Effort to Save the Environment (JESE), a local CSO, implemented a project aiming at combating illegalities in trade of timber and charcoal through stakeholder cooperation in Kyenjojo, Kyegegwa and Mubende Districts. The project was part of

CARE International in Uganda's strategic objective of improving good governance and the Rights Equity and Protected Areas (REPA) Programme. The GTZ Energy Advisory Project in cooperation with MEMD conducted a study in 2006 on charcoal production and licensing in 15 districts of Uganda.

Table 8: Main Stakeholders and Key Responsibilities

	Key Activities											
	Financing	Implementation, Management, M&E	Policy & Regulatory Frameworks	Institutional Coordination	Data Collection	Awareness Creation, Awareness & Capacity Building	Carbon Finance Development	Technology Demonstration SFM/SLM	mainstreaming	Investment Planning	Woodlot Development	Charcoal Value Chain Management
Organization or Entity												
UNDP	P R	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
GoU (MEMD SUPPORTED BY MWE, NFA, FSSD, District Governments, etc.)	✓	PR	PR	P R	P R	PR		✓	P R	P R	P R	PR
GIZ (PREEP)		✓		✓					✓		✓	✓
Belgium Technical Cooperation							✓					
FAO				✓	✓			✓	✓		✓	
<i>CleanStart</i> program and affiliates		✓		✓	✓	✓		✓				✓
NGOs						✓		✓				✓
Private Sector Entrepreneurs	✓				✓		✓	✓		✓	✓	✓

PR = Primary Responsibility; ✓ = Support Role

1.7 Project Linkages with Sustainable Forest Management (SFM) Activities

1.7.1 The Concept and Main Principles of SFM

147. This project's success is hinged upon establishing an aggressive reforestation campaign and agroforestry practices and the sustainable management of existing forest in order to ensure sustainable feedstock supply as well as avoid deforestation. In this section the concept of forest sustainability is elaborated and its linkage to the project made clear.

148. Sustainability in forestry is centuries old, although the understanding of sustainable forest management (SFM) as an instrument that harmonizes ecological and socio-economic concerns is relatively new. The change in perspective occurred at the beginning of the 1990s in response to an increased awareness of the deterioration of the environment, in particular of the alarming loss of forest resources. The definition of SFM was developed by the Ministerial Conference on the Protection of Forests in Europe (MCPFE), and has since been adopted by the Food and Agriculture Organization (FAO). It defines sustainable forest management as: *The stewardship and use of forests and forest lands in a way, and at a rate, that maintains their biodiversity, productivity, regeneration capacity, vitality and their potential to fulfill, now and in the future,*

relevant ecological, economic and social functions, at local, national, and global levels, and that does not cause damage to other ecosystems. The General Assembly of the UN has adopted the most widely, inter-governmentally agreed definition of SFMas: *a dynamic and evolving concept aims to maintain and enhance the economic, social and environmental value of all types of forests, for the benefit of present and future generations* (UN 2008, Resolution 62/98). In simpler terms, the concept can be described as the attainment of balance – balance between societies' increasing demands for forest products and benefits, and the preservation of forest health and diversity. This balance is critical to the survival of forests, and to the prosperity of forest-dependent communities.

149. In summary, the concept of SFM has grown into an industry of proving responsibility of sustainable management of forest based on a set of principles, criteria and indicators. These principles, indicators and criteria once developed must be applied, and an assessment made as to their applicability on the one hand, and their being met by the body responsible for forest management (this could be at national level or at the level of the forest management unit, and or both).
150. Other definitions of SFM include that of the Center for International Forestry Research (CIFOR) which has been hailed as a working definition for SFM: *“set of objectives, activities and outcomes consistent with maintaining or improving the forest’s ecological integrity and contributing to people’s well-being both now and in the future* “In summary, the concept of sustainable forest management has grown into an industry of proving responsibility of sustainable management of forest based on a set of principles, criteria and indicators.
151. SFM is an evolving and dynamic idea that has been at the centre of debate and discussion for decades and different organizations and agencies across the world have established varied but interrelated Principles, Criteria and Indicators to better obtain an understanding of the terminology. The most prominent are the seven thematic elements of SFM which include: Extent of forest resources; forest biological diversity; forest health and vitality; productive functions of forest resources; protective functions of forest resources; socio-economic functions of forests; and legal, policy and institutional framework.
152. The **Ten Forest Stewardship Council (FSC) Principles** which are: 1) Compliance with laws, regulations, treaties, conventions and agreements, together with all FSC Principles and Criteria; 2) Tenure and use rights and responsibilities – to define, document and legally establish long-term tenure and use rights; 3) Indigenous peoples' rights – to identify and uphold indigenous peoples' rights of ownership and use of land and resources; 4) Community relations and worker's rights – to maintain or enhance forest workers' and local communities' social and economic well-being; 5) Benefits from the forest – to maintain or enhance long term economic, social and environmental benefits from the forest; 6) Environmental impact – to maintain or restore the ecosystem, its biodiversity, resources and landscapes; 7) Management plan – to have a management plan, implemented, monitored and documented; 8) Monitoring and assessment – to demonstrate progress towards management objectives; 9) Maintenance of high conservation value forests – to maintain or enhance the attributes which define such forests; and 10) Plantations – to plan and manage plantations in accordance with FSC Principles and Criteria.
153. Revised International Tropical Timber organization (ITTO) criteria and indicators for the sustainable management of tropical forests: **Criterion 1: Enabling conditions for sustainable forest management;** *Policy, legal and governance framework; Economic framework; Institutional framework and Planning framework;* **Criterion 2: Extent and condition of forests;** **Criterion 4: Forest production;** *Resource assessment; Planning and control procedures; Silvicultural and harvesting guidelines;* **Criterion 5: Biological diversity;** *Ecosystem diversity; Species diversity; Genetic diversity and Procedures for biodiversity conservation in production forests;* **Criterion 6: Soil and water protection:** *Extent of protection and Protective functions in production forests;* **Criterion 7: Economic, social and cultural aspects:** *Socioeconomic aspects, Cultural aspects and Community and indigenous peoples' rights and participation*

154. The African Eco-Labeling Mechanism (AEM) called Sustainable Forest Management Principles (In preparation) 1) Management planning; 2) Legal compliance; 3) Monitoring and assessment; 4) Environmental management; 5) High conservation value; 6) Indigenous people and community rights and responsibilities; 7) Workers rights; 8) Forest production capacity; 9) Forest benefits; and 10) Forest ecosystem contributions to ecological cycles
155. The 6 CIFOR (Center for International Forestry Research) Generic Template of Criteria and Indicators: 1) Policy, planning and institutional framework are conducive to sustainable forest management; 2) Maintenance of ecosystem integrity; 3) Forest management maintains or enhances fair intergenerational access to resources and economic benefits; 4) Concerned stakeholders have acknowledged rights and means to manage forests cooperatively and equitably; 5) The health of the forest actors, cultures and the forest is acceptable to all stakeholders; and 6) Yield and quality of forest goods and services are sustainable

1.7.2 Barriers to Implementation of Sustainable Forest Management

156. Uganda has had challenges practicing and complying with SFM FSC Principles since 1950s (Webster and Osmaston, 1965). The preparation of management plans, the training of staff and the advantages and problems of devolution of management responsibilities to local governments remain of central importance to date. However, Uganda has complied with some of the principles of SFM, with regards to policies and laws (Principle 1 of FSC). Analysis has shown that Uganda's policies and legislation are adequate for the implementation of SFM and particularly for compliance with all laws, regulations, treaties, conventions and agreements, together with all SFM Principles and Criteria. The evidence that Uganda conforms with this Principle include: i) Uganda has ratified most of the forest and related conventions (for example the convention on UNFCCC, CBD, UNCCC.UNFF is voluntary and does not require such an action); ii) it has domesticated many of these conventions through national legislation or policy document and action plans formulation; iii) many protected forest management unit areas have management plans which also comply with this principle (all the 560 CFRs and all the Wildlife Conservation Areas have plans at different stages of approval and implementation) that comply with some of the laws and policy obligation; iv) at the national level, there is full knowledge of applicable fees, royalties and other charges payable; v) there is evidence that national forest management areas (especially protected areas) are protected from illegal harvesting, settlement and other unauthorized activities vi) procedures have been put in place and known to all responsible stakeholders, to protect the management unit from illegal and unauthorized activities and as such there is commitment to sustainable forest management and maintenance of Permanent Forest Estate and vii) these procedures also stipulate for full and effective stakeholder participation (private sector, academia, and communities, forest dependent people).
157. Barriers to Compliance with Principle 2: Tenure and Use rights and responsibilities: Several authors (among them Stephen Khaukha and Steve AmootiNsita (2013)) have analyzed Uganda's policy and legal status of land and forest tenure, institutional arrangements, the existing customary and statutory rights and the mechanisms for participation of non-state actors; and identifying the extent to which the existing land and forest tenure systems impact gazetted, community and private forests. They conclude as follows:
158. The existing policy, legal, and planning frameworks provides a firm foundation for governing land and forest tenure. However, the actual implementation of these frameworks is inadequate. There is need to build the capacity of relevant institutions (financial and human) and increase the space for the agencies responsible for enforcing the laws on good governance to operate professionally and act unhindered;
159. Although customary tenure is expected to be at par with the other forms of tenure, most people do not know the procedures for acquiring the certificate of customary ownership (CCOs), and the process itself is cumbersome and not easy for most people in rural areas. Consequently, customary land holdings without CCOs do not provide long-term security of tenure, they are vulnerable to land grabbing, and they do not attract serious investment. Therefore, there should be deliberate public awareness & education, and simplification of the process of obtaining the CCOs

so that it can be completed at the sub county level. The District Land Board can remain at an appellate level.

160. The current land tenure system in the project area provides opportunities for tree farmers and charcoal producers who are non-native to the area to lease land from landlords and use it for establishing woodlots. In the case of Bibanja holders (lawful bonafide occupants) the Land Amendment Act 2010 has increased their security of tenure by empowering them to obtain certificate of tenancy which allows them to undertake long term development activities including tree planting. In February 2013, Cabinet approved the Uganda Land Policy. Approval of the land policy is major reform in the land tenure system. The policy provides that Uganda shall maintain multiple tenure systems as enshrined in the Constitution and makes it clear that 'all land tenure systems will be defined in detail to confer social, economic, environmental and political security to land owners, occupiers and users'. These land reforms are expected to address hitherto tenure insecurity for tenants "bibanja" holders to invest in long term activities such as tree planting.
161. Through the GEF-Enabling Environment for SLM, a review of policy framework for sustainable charcoal production has been completed. Key recommendations of the report include development of a standalone charcoal regulatory framework, need to designate forest reserves as demonstrations for raising energy tree species, revision of the Local Government Act with a view of decentralising biomass energy management and strengthening staffing and capacity of the Division of Biomass Energy Management in Ministry of Energy and Mineral Development to continually improve and monitor the policy framework for biomass energy, introduce well targeted incentives to support SCP especially among land owners, private firms and Non-Governmental Organizations. These recommendations have been taken into account and informed the design of this project.
162. The private sector and local communities are increasingly channeling investments into forest production (tree growing, tourism, beekeeping, etc). Incentives such as secure land tenure and finances play important roles in encouraging the expansion of investments into the forestry sector. As more investments flow into forest production, the perceived contribution to national development will increase, and this will in turn serve to enhance the security of tenure of forestlands in the country. Therefore, these investments, even where they are modest, should be deliberately promoted as incentives and means of leveraging finance into forest production in Uganda. Even though the law has pronounced itself on the different tenure and forest use rights, these rights are not well known to all the stakeholders and interested parties in forest management. In addition, sustainable management of forests has introduced combinations of products, goods and services that cut across several tenure use right regimes and require that they be clarified as well. An example is the new rights (including tenure) associated with several payments for ecosystems services and products such as carbon, water and biodiversity rights.
163. The percentage of forest management areas owned by non-state entities that is not titled is not known but it is substantial (given the fact that nearly 70% of all forest land in Uganda falls under this category of non-state ownership); moreover, these lands are not described nor included in management plans.
164. Although there is evidence that communities are increasingly being involved in the planning of forest management plans (they be for forests or for wildlife conservation areas), this is still short of their full and effective participation.
165. Except for the formal ones, there are no dedicated dispute resolution procedures known to all members of communities (especially the forest dependant and vulnerable and disadvantaged). The Government of Uganda (2011) (as part of the REDD+ proposal) summarized the relationship between land use, land tenure, forest resources and deforestation and forest degradation in the country. The assessment done in REDD+ proposal document is directly applicable to the requirements for sustainable forest management (SFM) because SFM is actually an element of REDD+.

Table 8: Assessment of Land tenure in Relation to Deforestation and Forest Degradation (with Direct Implications for SFM)

Category	Implications for Deforestation and Forest Degradation
Freehold	Has a significant role in deforestation and forest degradation trends since most privately owned forests and agricultural activities and other developments fall on freehold lands. Enforcement of environmental policies and laws to regulate use of these lands is cumbersome and ineffective in most cases.
Mailo	Has a significant role in deforestation and forest degradation trends especially in the Central region/Lake Victoria and western region where this form of land tenure is dominant. Enforcement of environmental policies and laws to regulate use of these lands is cumbersome and ineffective in most cases. Incentives for forestry resources development and management are weak poor due relationships between Land owners and tenants in as far as security of tenure is concerned.
Leasehold	This category of land tenure ownership in Uganda accounts for a very insignificant proportion of land outside urban areas. Little incentive for leaseholders to invest in forest conservation.
Customary	This is major form of land tenure ownership in Uganda. Most agricultural activities take place on this land. Use of forests and woodlands is virtually open-access, and there is no incentive for an individual's to invest in sustainable practices. Profits from woodlands are low and there are strong benefits from conversion to private tenure and agriculture. It stands as most influential form of land use in terms of deforestation and forest degradation.

166. In summary, many of the critical issues related to ownership and tenure highlight the need for developing better governance. This includes issues such as:

- Ensuring clarity and long-term security of ownership and tenure rights
- Proper enforcement of rights and responsibilities, and cost-efficient arrangements for rights transfer
- Capacity-building for administrators and rights holders, particularly new rights holders
- Facilitating stakeholder participation, e.g., in developing management rules
- Promoting efficient markets and market access for small producers
- Balancing the need for overall sustainability with the profit interests of owners and tenure holders
- Improved access to information on forest ownership and tenure.

1.7.3 Sustainable Forest Management Stakeholders

The issue of maximizing community involvement, benefit sharing and ownership of project activities was central in the design of the project, as evidenced by the following activities and analyses conducted during the PPG phase:

The chosen districts (and in turn communities who will participate) were selected during the PPG phase based on the following criteria which testifies as to their readiness to benefit from project activities: (i) high current charcoal production rates and deforestation rates; (ii) available wood fuel resources; (iii) secure land tenure as most households own land; (iv) access to markets (charcoal produced in these districts is sold in Kampala and some of the nearest urban areas); (v) a demonstrated high level of stakeholder engagement and interest in the project; and (vi) potential co-financing resources from stakeholders for operations and maintenance of kilns, particularly by local government and NGOs working in the districts. Further key considerations were overlap with FAO Agro-Pastoralist & Farmer Field Schools (APFFS and FFS); the proven capacity of district stakeholders and local communities to manage the chosen technologies; technical/agronomic considerations; and linkages with the Uganda Reducing Emissions from Deforestation and Forest Degradation (REDD)-Readiness Proposal Plan.

It is also important to note that the PPG phase included an extensive baseline survey and the pre-piloting of technologies at selected village locations in all four districts. Information was gathered using field survey methods and participatory stakeholder consultation processes and also included biomass estimation and demonstration of improved retort and kiln construction and use. During the PPG phase two retort kilns – Adams and Sam1 – as well as Casamance retorts were piloted for demonstration at the village level in the four target districts. The assessment included an in-depth assessment of the social, institutional and environmental considerations of the targeted technologies for the targeted areas. Following participatory training and capacity building on the building, operation and maintenance of the retorts and kilns, Sam1 and Casamance kilns were found to be appropriate to the target districts in view of factors such as affordability, accessibility and acceptability by local communities. As regards community involvement with woodlots, during the PPG field work exercises groups of selected farmers and leaders in selected sub-counties from the four selected districts were selected and trained in biomass estimation for natural forests and plantations. The purpose of this exercise was to test whether those skills could be retained and appropriately applied by the trained community groups. The training was done to equip participants with skills on valuation and usage of biomass resources and included tree growers, landlords, tree buyers, charcoal producers and sub-county extension staff responsible for oversight of wood fuel production and development. The findings from the trainings were then used to inform the project design as regards the role of communities in targeted activities.

The project also aims at establishing long-lasting capacities at the local level by building off existing community-based initiatives, mechanisms and structures that have proven to be effective in sustaining community ownership under other programs. **All of the chosen target districts and communities within those districts have already benefited from other support structures that will feed into project activities to ensure sustainability.** For example, the project will liaise and work closely with communities and FAO staff who have been involved in APFS field work in Nakaseke, Kiboga and Mubende over the last five years; FAO's work in this area is recognized as one of the best examples of community-based SLM work in the entire country and linkages with FAO-connected communities allows the project to benefit from established community structures rather than a greenfield approach. As noted the project will also seek to replicate and learn from relevant governance and benefit-sharing structures (at both the district and community level) in the four target districts that were previously piloted in 8 sub-counties in two other nearby districts as part of the UNDP-funded *Promotion of Sustainable Charcoal Production Project*. The lessons learned from that project as regards ensuring community ownership have been factored into the design of this project.

Moreover this project will implement participatory tools that have been shown to be highly effective in ensuring community participation and ownership in SLM activities in other parts of the country. One example (as noted in the original submission) is the application of the *Stimulating Community Initiatives for SLM (SCI-SLM) methodology*, an approach that has been adopted with great success in communities in the six districts covered under the other SLM projects.

Another tool that the project will pilot to ensure community ownership is support for development of District Environment Action Plans (DEAPs) in the four districts, which will in turn allow for district officials to develop specific planning and implementation plans for SLM activities at the community level. As noted on pg. 23 of the CEO ER: *"The project will train the relevant District Land Use Planning staff in the use of techniques that support community planning, implementation processes and land degradation assessment (including the development of District Environment Action Plans - DEAP). The DEAP process that the DDC project supported successfully developed DEAPs in the focus districts as part of the SLM mainstreaming into district action plans, which have now formed the basis for the implementation of various on-the-ground SLM initiatives."*

The project's target beneficiaries are charcoal producers, rural farmers and land owners. For the project to be successful these groups must directly experience the benefits of the project in order for them to champion the project strategy and be the primary agents of change at the local level in terms of ensuring a paradigm shift from use of earth mounds to improved kilns; from use of non-renewable biomass to adoption of sustainable forestry and land management techniques; and from non-

sustainable agricultural practices to sustainable techniques such as conservation farming. The project has dedicated substantial resources to capacity building efforts to overcome barriers to adoption of new technologies and management practices.

167. Table 9, below, shows general SFM Stakeholders in the country who are also applicable to the pilot district.

Table 9: General SFM Stakeholders in the Country Applicable to the Pilot District.

Stakeholder Category	Role or Potential Influence
a) Government	<p>These are central government stakeholders that have programs and direct administrative linkages to the project sites. They also include local government stakeholders that are based in the district. Both these categories have a role in ensuring the project is successful. It is in the interest of the project to fully engage with this important stakeholder category (fully aware that the project may have to build/strengthen their capacities) so that that they can create the enabling environment for sustainable forest management by, among other things:</p> <ul style="list-style-type: none"> a. Entrenching a culture of good governance, and promoting accountability and transparency in public life; b. Providing the appropriate policy, legislative and institutional framework; c. Coordinating national policies to exploit synergies and minimize conflicts; d. Adopting and striving for supportive macroeconomic policies; e. Implementing the project activities in line with the requirements of the National Development Plans and the district local plans as well as other sectoral plans f. Developing local guidelines and standards for charcoal certification schemes developed, adopted and publicized g. Supporting and stimulating investment in sustainable forestry management; h. Providing appropriate incentives to encourage : <ul style="list-style-type: none"> i. private sector investment in woodlot plantation development, and ii. production, processing and marketing practices that promote sustainable biomass energy and forest management; i. Investing a commensurate proportion of its budget (determined from a calculation of the productive and environmental values of forestry assets to local economic activities) in all aspects of forestry development, including management, resource assessment, human and infrastructural capacity building, knowledge generation, production, processing and marketing; j. Promoting the development of local institutions and structures and creating space for <ul style="list-style-type: none"> i. civil society action to facilitate participation of rural communities in forest management, conservation and protection, ii. principal actors in forestry to participate in policy formulation and implementation iii. certification of forest products k. Designing and enforcing a land use plan that ensures long term security and tenure of the forest estate against encroachment or conversion. l. Designing and monitoring the implementation of practices in exploitation, processing and marketing of timber/charcoal that promotes sustainable forest management; specifically for this project, creation and institutionalization of charcoal value chain activities at the district level.⁶ m. Subscribing to international conventions and relations that support sustainable forest management.
b) Organized Private Sector	<p>This category of stakeholders (for purposes of this project) includes the private actors directly involved in the forest products value chain and those private actors involved in related activities that have an effect on the sustainable management of forests. In this case we have:</p> <ul style="list-style-type: none"> a. Those who are directly involved in the production and supply of forest products (including but not limited to the licensed and non-licensed charcoal burners, saw

⁶ Arindam Basu, Courtney Blodgett, and Nicolas Müller. 2013. Nationally Appropriate Mitigation Action Study on Sustainable Charcoal in Uganda.

	<p>millers or pit sawyers).</p> <ul style="list-style-type: none"> b. Those who are act as intermediaries (usually as brokers, transporters and site based wholesalers). c. Then we have stakeholders who actually retail the products within the project areas or outside the project areas (say in urban Kampala). <p>These stakeholders can better support the project if they can</p> <ul style="list-style-type: none"> d. Develop appropriate partnerships with government and local communities. e. Be given the necessary economic incentives, to invest in plantation forest production to supplement production from natural forest. f. Apply enterprise and business skills to exploit opportunities for expanding the range of marketable products, technologies and markets. g. Participate fully (including financially) in policy formulation and inventories, and comply with exploitation, processing and marketing regulations deriving from the policies.
c) Informal sector and local communities	<p>This category of stakeholders includes members listed in the private sector category (but just that some of their actions are not registered) as well as the communities who live on, and derive livelihoods on the lands that the project targets. The project will benefit from them if these stakeholders:</p> <ul style="list-style-type: none"> h. Are made the primary beneficiaries of the project interventions using affirmative action's when necessary. i. Supported to develop and maintain suitable organizational structures for interfacing with other actors in sustainable forest management. j. Participate in policy formulation, and are persuaded to abide by regulations deriving from the policies. k. Supported to exploit opportunities for building technical and other capacities for forest management. l. Are offered, and they respond to incentives and contribute through agroforestry and social forestry practices to wood supply. m. Exploit opportunities for joint or community forest management. n. Are active participants in the planning, monitoring of the activities that are intended to lead to sustainable management of their forests. <p>It is important to note that within this stakeholder category there will be unique members who are more vulnerable, marginalized and these need to be supported to play their true roles.</p>
d) Traditional leaders, Churches and Mosques	<p>Traditional leaders, churches and mosques control public opinion and own considerable land parcels, which the project would love to transform. This group will need to be engaged and given the space to effectively participate.</p>
e) International community including donors	<p>Because they hold the finances that support the project, as well as the hinterland to source the technology and human technical capacity, this stakeholder group sways a lot of power in the sustainable forest management (SFM) equation. The project will benefit most from them by working with them to:</p> <ul style="list-style-type: none"> a. Continue supporting provision of positive incentives for SFM/REDD+. b. Step up and sustain assistance by technical and financial inputs project. c. Work on a binding international regime that will favor SFM/REDD+.
f) Organized civil society (NGOs etc.)	<p>This important category will support the project:</p> <ul style="list-style-type: none"> a. Continue to empower local communities, by awareness raising and capacity building, for effective participation in forest management; b. Continue to serve as a watch-dog against unsustainable forest management policies and practices; and c. Continue to provide technical assistance to governments for forest resources assessment, planning, management and conservation.
g) (f) Academia and Research Institutions	<p>Universities, research institutions, training colleges, schools will need to be supported to continue generating and dissemination of new knowledge.</p>

1.7.4 Sustainable Tree Management and Opportunity Costs of Charcoal Production

168. During PPG, the charcoal baseline survey demonstrated that using planted tree biomass as raw materials for charcoal production process is the most sustainable option. However, this may be an expensive option in some areas where there is a relative abundance of biomass compared to clear felling and selective cutting in which cases the biomass is available at (close to) zero opportunity costs. In areas of scarce wood biomass, availability of land to produce trees for charcoal production vis-à-vis food security is often an issue of concern by environmentalists. Fortunately most of the target area does not have food security issues. During project implementation and scale up of project in areas with food security issues, there are opportunities that could be exploited which are outlined below:
169. *Tree Regeneration and Improved Fallowing for Wood Fuel Production:* Improved fallow, which is the deliberate planting of trees or shrubs in rotation with crops have great potential for improving soil fertility. This is recommended in the target area. By providing Nitrogen to crops, tree fallows can help farmers increase their incomes and food security. They may also help in the reduction of soil degradation and curb deforestation. Forage, shrubs, trees and grasses are very important for agriculture and livestock, particularly the trees have high foliage productivity, and high leaf protein content. The woody biomass from these shrubs and trees provide a very high potential charcoal production and thus can sustainably improve incomes of subsisting communities.
170. *Use of Marginal and Fragile Lands:* In the target district as is practice in many countries in the region producing charcoal, the traditional land utilization practice will involve establishing woodlots on non-arable land, since this does not lead to any reduction of land set aside for crops and pastures. In specific instances where non-arable land is unavailable, the growth of trees may be restricted to the borders of fields, water-bodies or roadsides. This can tremendously increase available wood for charcoal production in a community.
171. *Promotion of Agro-forestry and Agro-Silvo Practices:* The other option that is sustainable with proper management is the selective cutting of trees in the agro-silvo production system. This means that certain trees that provide good quality charcoal are selected and cut for charcoal production. Preference and suitability of trees used for charcoal production may vary with size, availability and accessibility of the tree species.
172. *Establishment of Tree Plantations for Sustainable Charcoal Production:* Provision of incentives for woodlot establishment for charcoal production and investment in the improved charcoal production technologies, is critical for a sustainable production of charcoal in a liberalized economy and the project proposes the following to be pursued;
- i Identification of tree species to be planted that are suitable for charcoal and fire wood production and training of land owners in planting of tree species appropriate for charcoal.
 - ii Investment in the training of charcoal producers in modern and efficient charcoal production technologies and processes. These reduce the rate of tree harvesting through increasing the amount of charcoal obtained by as much as threefold.
 - iii Training charcoal producers in charcoal handling and packaging, and group marketing.
 - iv Provision of credit to those who need it to cushion the effects of change of land use from food/crop production to tree planting for charcoal production.
173. Improved charcoal production technologies give much higher yields of charcoal of excellent quality in addition to by-products of commercial value. This makes the practice very profitable and the actors will have the necessary motivation for investing in woodlots for charcoal production.
174. *Assumptions and Basis for Tree Planting Plans:* The plans have been determined based on the following assumptions:
- i. That there is available suitable land for woodlot establishment for selected tree species. According to the responses from tree growers, over 60% of the respondents were willing to

commit over 50 ha of land for sustainable charcoal production if supported. However this land has competing uses for agriculture production and commercial purposes. Yet tree plantations are a new farming ventures where the harvest takes time;

- ii. That the land owners will appreciate that there are more benefits for investing in woodlots for charcoal production compared to some conventional land use practices.
 - iii. That government will come up with standards for the charcoal value chain and put mechanisms in place to regulate and monitor charcoal production and marketing; and
 - iv. That the industry will provide market incentives for investment in efficient charcoal production technologies like efficient kilns and retorts as well as management practices.
 - v. Flexible financing mechanisms will be put in place for tree production for charcoal.
175. The proposed technical plans are premised on the PPG baseline study findings which showed that more than 1,100 tree growers can be included in the project by having their capacities developed for tree growing and approximately 50,000 hectares of land will be planted and well managed for sustainable charcoal production.
176. *The Implementation Plan for Tree Production:* Table 10 below gives the average cumulative acreage of the three species to be promoted per household and the targeted households in the pilot Districts. The species selected give good quality charcoal, are indigenous, termite and fire resistant and with good management fast growing. They are easy to establish and could easily be planted by direct sowing with good seed. The species are ecologically friendly with the climatic environment of the target area. Using conservative figures, both *Markhamia lutea* and *Acacia tortilis* record 19.5 metric tons after the same period with the same subsequent annual growth rate. Given the limited land holdings in the target areas, if 2,610 land owners who can progressively commit on average up to 2.27 ha of their land by the fourth year, to plant the recommended tree species; *Markhamia lutea*, *Vitexdoniana* and *Acacia tortilis* a total acreage of 5,930 ha of tree plantation will be achieved in five years. The species sprout very well which, will lead to sustainable production of the wood resource.

Table 10: Average Land Size Committed to Tree Production

Proposed average Acreage for the different Tree-Species planted per household in hectares	Year 1	Year 2	Year 3	Year 4
<i>Markhamialutea</i>	0.57	0.57	0.91	1.25
<i>Vitexdoniana</i>	0.45	0.45	0.57	0.57
<i>Acacia tortilis</i>	0.23	0.45	0.45	0.45
Average H/H Acreage	1.25	1.48	1.93	2.27
Total Area of Tree-Species planted in the target Area in hectares	Year 1	Year 2	Year 3	Year 4
<i>Markhamialutea</i>	1,485	1,485	2,370	3,260
<i>Vitexdoniana</i>	1,185	1,185	1,485	1,485
<i>Acacia tortilis</i>	595	1,185	1,185	1,185
TOTAL AREA PLANTED IN HECTARES	3,260	3,855	5,040	5,930

177. The above plantation arrangements for the corresponding tree species in the target area has taken into account several factors including among others; the ecological suitability of the locations, human settlements, household land sizes, economics of land utilization, stage of forestry

development in the District and the density of charcoal burners and more important the available land that can be converted from crop cultivation to tree planting.

178. The establishment of the above plantations shall involve investment and operation costs including land preparations, planting, costs of seeds, weeding and pruning within the initial years of the plantations establishment. Accordingly, the following cumulative wood tonnage (Table 11) is anticipated after 5 years given that the duration for establishment will be five years and harvesting will start after four years. The growth patterns are based on planted acreage per year with estimated tree coverage of 3,000 trees per hectare.

Table 11: Projected Wood Growths and Production in Metric Tonnes

Tree Specie	Average Growth Rate	Year 0	Year 1	Year 2	Year 3	Year 4	Cumulative Biomass Production
<i>Markhamialutea</i>	19.5	0	28,914.45	28,914.45	46,263.15	63,611.85	167,703.90
<i>Vitexdoniana</i>	22.5	0	26,690.30	26,690.30	33,362.85	33,362.85	120,106.30
<i>Acacia tortilis</i>	19.5	0	11,565.80	23,131.60	23,131.60	23,131.60	80,960.60
TOTAL BIOMASS PRODUCTION IN TONNES			67,170.55	78,736.35	102,757.60	120,106.30	368,770.80

179. The above wood stock has three benefits namely; public benefits (ecological impact and tax revenue) and private benefits (sales revenue of both wood and charcoal).
180. Benefits Resulting from Planting Charcoal Feedstock in terms of GHG emission reduction is demonstrated and illustrated in section 2.2.2
181. *Managing Natural Forests for Charcoal Production:* Natural forests can be managed to provide wood for charcoal production. In this case the trees for charcoal production will be selectively harvested in a manner that allows coppicing and sprouting. The coppices and sprouts can then be managed to provide sustainable wood stocks for charcoal production. Where the forests are degraded, enrichment planting will be practiced.
182. *Capacity Building for Sustainable Charcoal Production from Natural Forests:* Coppicing is a well-known method of woodland management which takes advantage of the fact that many trees make new growth (sprouts) from the stump or roots if cut down. In subsequent growth years, many new shoots will emerge, and, after a number of years the coppiced tree is ready to be harvested, and the cycle begins again. This will allow the coppiced woodland to be harvested in demarcated sections on a rotation. In this way, a crop is available each year for charcoal production. In addition, a forest maintained this way, will allow a rich variety of habitats, which is beneficial for biodiversity. Coppicing maintains trees at a juvenile stage, and a regularly coppiced tree will never die of old age.
183. All the preferred tree species (*Markhamia lutea*, *Piliostigmathonningii*, *Combretumcollinum*, *Combretummolle*, *Albiziacoriaria*, *Blighiaunijugata*, *Terminaliaglaucescens*, *Tecleanobilis*) for charcoal production in the target area have good capability for sprouting. Most of these trees take a relatively long time to grow to maturity. However the size of wood that is optimum for charcoal production using the retort technology should be less than 12 centimeters in diameter. After three to five years, most of these sprouts will have attained the required diameter and therefore ready for conversion into charcoal. This will ensure that every three to five years, the demarcated section will be ready for harvesting. Some preferred species like *Blighiaunijugata* grows rapidly. The tree is attractive, with its decoratively colored new leaves and red fruits. The seeds with their yellow aril are eaten by birds, duikers and monkeys which may be important seed dispersers. The species are indigenous and are not classified as invasive in the areas where they grow.

184. *Capacity building for tree planting:*

The project will build capacity for a total of 1,112 house- holds (potential private trees owners) in the four pilot districts through awareness creation, demonstrations, training and establishment of support structures for the provision of seedlings for enrichment planting and inputs. Table 12 below indicates the cumulative distribution of households for capacity building per year and the total accumulation of forest land in hectares to be sustainably managed for charcoal production per year.

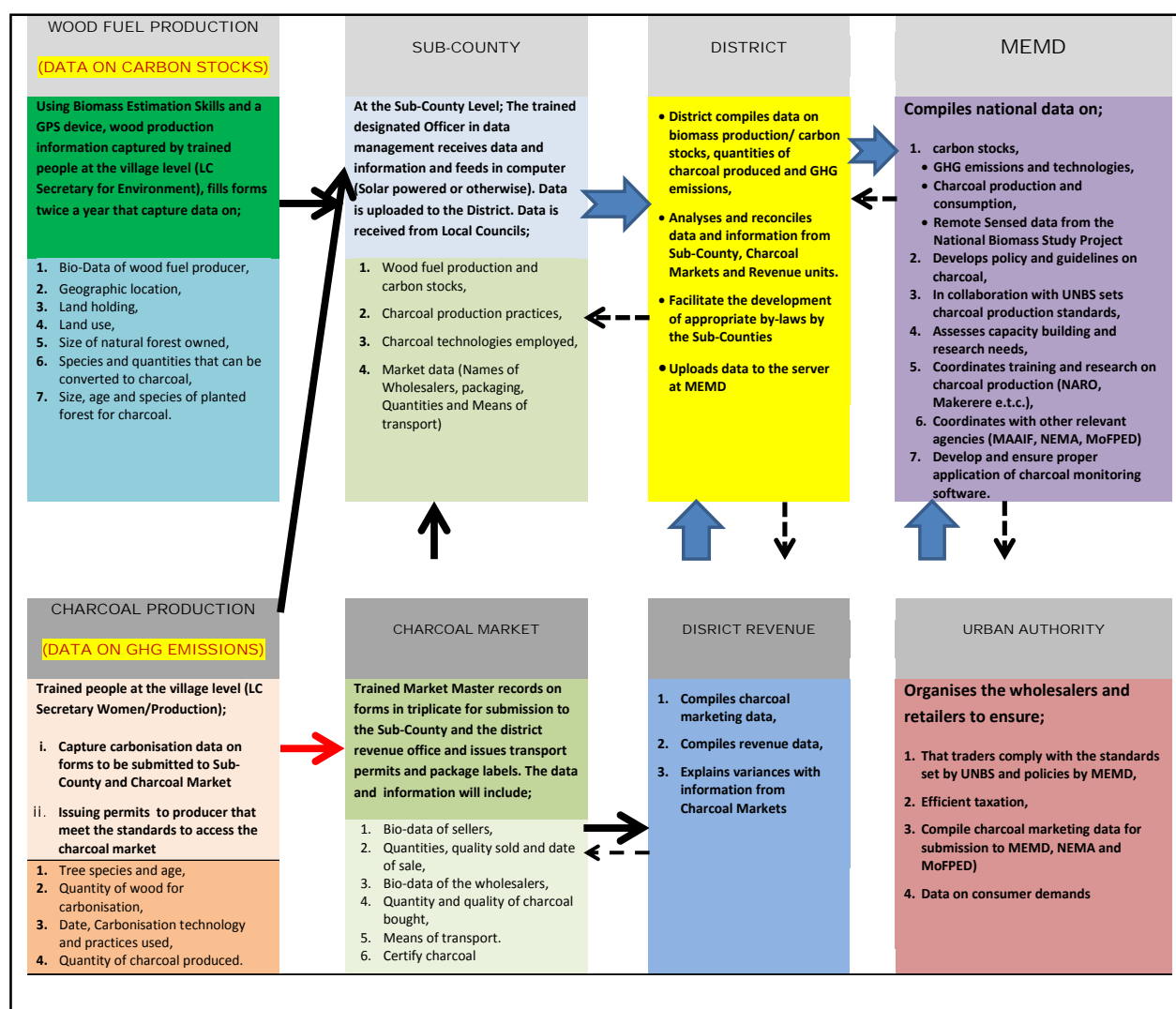
Table 12: Sustainably Managed Forests for charcoal production in hectares in the pilot Districts

Sub-County	No. of H/H	Year 1	Year 2	Year 3	Year 4
MUBENDE DISTRICT					
1. Bagezza	14	346.5	409.5	535.5	630.0
2. Bukuya	14	346.5	409.5	535.5	630.0
3. Butoloogo	15	371.3	438.8	573.8	675.0
4. Kalwaana	13	321.8	380.3	497.3	585.0
5. Kasambya	30	742.5	877.5	1,147.5	1,350.0
6. Kassanda	15	371.3	438.8	573.8	675.0
7. Kiganda	15	371.3	438.8	573.8	675.0
8. Kigando	14	346.5	409.5	535.5	630.0
9. Kitenga	30	742.5	877.5	1,147.5	1,350.0
10. Kitumbi	13	321.8	380.3	497.3	585.0
11. Kiyuuni	15	371.3	438.8	573.8	675.0
12. Maduudu	25	618.8	731.3	956.3	1,125.0
14. Mwezi	16	396.0	468.0	612.0	720.0
15. Nabingoola	23	569.3	672.8	879.8	1,035.0
TOTAL ACRAGE					11,340.0
KIBOGA DISTRICT					
1. Kibiga	30	742.5	877.5	1,147.5	1,350.0
2. Lwamata	30	742.5	877.5	1,147.5	1,350.0
3. Bukomero	25	618.8	731.3	956.3	1,125.0
4. Muwanga	30	742.5	877.5	1,147.5	1,350.0
5. Kapeke	80	1,980.0	2,340.0	3,060.0	3,600.0
6. Dwaniro	60	1,485.0	1,755.0	2,295.0	2,700.0
TOTAL ACRAGE					11,475.0

NAKASEKE DISTRICT					
1. Kapeeka	40	990.0	1,170.0	1,530.0	1,800.0
2. Ngoma	100	2,475.0	2,925.0	3,825.0	4,500.0
3. Kinyogoga	90	2,227.5	2,632.5	3,442.5	4,050.0
4. Wakyaato	40	990.0	1,170.0	1,530.0	1,800.0
5. Kaasangombe	90	2,227.5	2,632.5	3,442.5	4,050.0
6. Semuto	30	742.5	877.5	1,147.5	1,350.0
7. Kikamulo	50	1,237.5	1,462.5	1,912.5	2,250.0
TOTAL ACRAGE					19,800.0
KIRYANDONGO DISTRICT					
1. Kigumba	60	1,485.0	1,755.0	2,295.0	2,700.0

2.	MasindiPort	45	1,113.8	1,316.3	1,721.3	2,025.0
3.	Mutunda	60	1,485.0	1,755.0	2,295.0	2,700.0
TOTAL ACRAGE						7,425.0
GRAND TOTAL						50,040.0

Text Box 2: Conceptual framework of The Charcoal Production, Marketing and Monitoring Information System (CPMMS)



1.8 Baseline Analysis

185. Uganda has several programmes and projects aimed at promoting sustainable biomass and sustainable charcoal along the value chain as well as conserving forests and sustainable land management. Most of these projects have a national character but their activities are implemented at local levels and within the energy sector. An updated table showing all the baseline projects that the proposed project builds on and directly contributes towards, along with their size, target areas, and project period is provided below.

Baseline Activities (by donor)	Co-finance Budget (USD)
PREEP - The Promotion of Renewable Energy and Energy Efficiency Programme is being implemented by the Ministry of Energy and Mineral Development (MEMD) with the support of the Deutsche Gesellschaft fur Internationale Zusammenarbeit (GIZ), the German Financial Cooperation (KfW) and the Center for International Migration (CIM). The focus	\$2,607,562

<p>of PREEP is to improve access to modern energy services and promote energy efficiency in households, <u>with the primary focus on improved cook stoves</u>.</p> <p>PREEP activities include:</p> <ul style="list-style-type: none"> • Dissemination of improved stoves for households and institutions 1. Development of capacities of local organizations in the construction and repair, marketing, and monitoring of improved stoves. 2. Embedding technical advisors at district level (including in the Cattle Corridor) to assist local governments in implementing renewable energy activities including biomass 3. Implementation of awareness campaigns to promote biomass energy technologies 4. Support the development and implementation of a CDM Programme of Activities for improved cook stoves <p>Currently PREEP is implementing a three-year phase (June 2011-June 2014) and is investing 2 million Euro to “ensure that access to modern biomass energy services (improved stoves) by households, institutions and SMEs is enhanced.”</p>	<p>(2011-2014)</p>
<p>Food and Agricultural Organization (FAO) Farmer Field School (FFS) and Agro-Pastoralist Field Schools (APFS) - FAO FFS and APFS activities operate in over 3,000 sites throughout the country, including in the districts targeted in this project. FAO FFS and APFS activities include:</p> <ul style="list-style-type: none"> • Farmer group formation and livelihood management • Strengthening and equipping farming communities, farmers and service providers (extensionists, facilitators and NGOs) with better rain-fed land management skills, and decision-making capacity to overcome soil productivity limitations, and to enhance sustainable and economically viable land management practices. • Piloting Conservation Agriculture for improved land management and livelihoods of smallholder farmers. • Integrated nutrient management to attain sustainable productivity increases. • Land use planning using application of the FAO-LADA-WOCAT tool • Trainings on rural energy (energy saving stoves), forestry (tree nurseries and SFM principles) and SLM for FFS and APFS groups. <p>More recently as part of separate initiative FAO Uganda has introduced new mapping technologies in Uganda that will help the country generate more useful and detailed forestry statistics and land cover maps. The new tools and information will help the government monitor national forest resources and make informed decisions regarding long-term forestry and investment policies, as well as avoid unintended forest conversion and the degradation of the productive and protective functions of forests (this funding came after preparation of the GEF submission and so is not counted as co-finance but is nonetheless factored into the design of the project).</p>	<p>\$1,600,000</p> <p>(2013-2017)</p>
<p>Government of Uganda - Ministry of Energy and Mineral Development (MEMD)</p> <p>MEMD is implementing the Biomass Energy for Rural Development Project – this government project supports a wide variety of technologies in the biomass energy sector (biogas digestors, charcoal briquetting, gasifiers, improved charcoal production techniques). It is one of the key platforms supported by MEMD to achieve the goals of the Energy Policy and more specifically the Renewable Energy Policy for Uganda (2007) whose policy goal is to increase the use of modern and sustainable renewable energy to 61% of the total energy consumption by the year 2017. MEMD is also supporting BEST.</p>	<p>\$ 1,156,069</p> <p>(2013-2017)</p>
<p>Government of Uganda – National Forestry Authority (NFA)</p> <p>Various activities supporting SFM across all target districts.</p>	<p>\$1,233,141</p> <p>(2013-2017)</p>

<p>Government of Uganda – Minister of Water and Environment (MWE)</p> <p>Uganda's REDD+ Readiness Preparation Plan (R-PP) was approved in funding from the Forest Carbon Partnership Facility in April 2012. The R-PP Support Project will be implemented by the MWE through the REDD-Plus Focal Point. The MWE is responsible for all technical and managerial aspects of the project. An initial assessment of Uganda's land use, forest policies and governance to inform REDD-Plus strategy development was undertaken and elaborated in the R-PP. The R-PP has identified the following as D&D drivers: i) agricultural encroachment; ii) charcoal production; iii) firewood harvesting; iv) timber harvesting; and v) livestock grazing.</p> <p>The R-PP is part and parcel of the MWE's Joint Water and Environment Sector Support Program (JWESSP). During implementation of the R-PP the MWE shall be supported by the Climate Change Policy Committee (CCPC) which will serve as a Steering Committee for the project and an official platform for policy level stakeholder participation. During the implementation of the R-PP, Uganda has committed to:</p> <ul style="list-style-type: none"> • Undertake a comprehensive and complete assessment of the potential strategic options proposed in the R-PP as a basis for prioritizing the Strategy Options for addressing the drivers of deforestation and forest degradation, maintenance of carbon stocks, enhancing conservation of forest biodiversity and, for ensuring sustainable forest management in Uganda; and • Assess prioritized REDD-Plus strategic options for their feasibility taking into account: (i) socio-economic, political and institutional perspectives; (ii) costs and benefits in relation to people's livelihoods and biodiversity conservation; (iii) forestry governance; (iv) national development policies and strategies; and, (v) risks associated with the specific strategy options and ways to manage and mitigate them; and then; • Prepare Draft REDD+ Strategy consolidating findings of SESA and analysis of REDD+ Strategy Options 	<p>4,450,000</p> <p>(2013-2017)</p>
<p>Government of Uganda – Ministry of Local Government (MoLG)</p> <p>To support this project the MoLG has committed a contribution of local government staff time (salaries) plus field allowances for quarterly M&E visits – contributions includes contributions of Forest Officers, Environment Officers and Community Development Officers in the target areas.</p>	<p>\$101,734</p> <p>(2013-2017 – annualized contribution)</p>
<p>Government of Uganda – Mubende District Local Government</p> <p>This contribution (from one of the four targeted districts for this project) represents 10% of the 5 year district natural resources budget and council budget costs that will be allocated to hold six (6) charcoal production marketing and natural resource committee meetings in connection with the development of a charcoal ordinance and certification scheme for the district (supported under the project).</p>	<p>\$63,602</p> <p>(2013-2017)</p>
<p>Belgium Technical Cooperation (BTC) - Capacity Development Project</p> <p>BTC's Capacity Development Project is implemented by the Climate Change Unit of the Ministry of Water and Environment (MWE). This project, started in 2012, seeks to strengthen the capacity of individuals and institutions of both state and non-state actors in the successful development and implementation of carbon finance projects in Uganda and will assist with supporting the carbon finance activities under the project.</p> <p>This Euro 2 million project will be implemented over a 3.5 year period starting in October 2011. Of that amount approximately \$290K will be used as in-kind support to this project as regards carbon finance activities.</p>	<p>\$290,000</p> <p>(2011-2014)</p>
<p>UNCDF CleanStart Programme</p> <p><i>CleanStart</i> – an innovative partnership between UNCDF and UNDP – aims to expand access to clean energy for low-income people through microfinance and Uganda is the first</p>	<p>\$1,300,000</p> <p>(2013-2017)</p>

<p><i>CleanStart</i> pilot country in Africa. <i>CleanStart</i> will invest approximately US\$1,299,620⁷ over a period of four years (2013-2017) to develop replicable business models for scaling up microfinance for cleaner and more efficient forms of energy for poor people, as well as plan to source an additional US\$ 534,500 which is currently unfunded. By end of programme, more than 48,000 low-income households and micro-entrepreneurs (or 240,000 beneficiaries) will have access to modern energy.</p> <p>The <i>CleanStart</i> Business Plan for Uganda has four main program outputs:</p> <ol style="list-style-type: none"> 1. Finance for Clean Energy to strengthen capabilities of up to three (3) financial service providers (FSPs) in Uganda to provide microfinance for clean energy to low-income households and micro-entrepreneurs. The three FSPs will be selected via an RFP. 2. Technical Assistance for Clean Energy to remove barriers to the sustainable deployment of those technologies and services for which the selected FSPs will provide microfinance. Based on the business plan, four (4) specific clean energy technologies were shortlisted for commercialization, including (of direct relevance to this project) briquetting machines. 3. Knowledge and Learning to promote awareness and understanding of the potential for microfinance to stimulate adoption of clean energy, and to develop skills in clean energy microfinance 4. Advocacy and Partnership to create an enabling policy and business environment to expand microfinance for clean energy. <p>The <i>CleanStart</i> Business Plan for Uganda is currently under final review by MEMED and is expected to be formally approved at any moment and implementation started shortly thereafter.</p>	
<p>UNDP Uganda - “Strengthening Sustainable Environment and Natural Resource Management, Climate Change Adaptation and Mitigation”</p> <p>The UNDP CPAP (2010-2014) for Uganda includes a major focus on “Strengthening Sustainable Environment and Natural Resource Management, Climate Change Adaptation and Mitigation.” The CPAP project focuses on strengthening the efforts and capacities of local governments, CSOs and communities to sustainably manage and utilize natural resources, integrate climate change adaptation and mitigation in their activities and build climate change resilient societies. The UNDP CPAP has committed a total amount of US\$ 6.7 million in UNDP core resources, including US\$ 1.85 million for the sub-components on energy, SLM and GHG emissions which will serve as co-financing for this project. This includes financing for BEST.</p>	<p>\$1,860,000</p> <p>(2010-2014)</p>
<p>Total</p>	<p>\$14,662, 108</p>

As mentioned in the PIF, much of the donor-driven work on biomass energy continues to focus around demand-side interventions, particularly around support for production of improved cook stoves. For example GIZ’s PREEEP program in Uganda continues to focus on dissemination of improved cook stoves (both charcoal and wood fuel). The largest single component of PREEEP is dissemination of improved stoves (Rocket Lorena, Shielded Fire, Metal Rocket and Improved Charcoal stoves) for households, social institutions and SMEs. Other important agencies involved in promotion of cook stove production include Ugastove, FOWE, MotoStove, BM Stove and SSESSA, all of whom are coordinated by the Global Alliance of Cookstoves (GACC), which has Uganda as one of its priority countries (this project is not counted as co-finance but as a related initiative). Other support institutions in this area include private sector institutions providing research and development and standardization for stoves e.g. CREEC and UNBS, wholesaling funders, microfinance organizations and private donors.

⁷ CleanStart will explore the possibility of mobilising additional funding for the Uganda Business Plan based on outcomes of the mid-term evaluation tentatively scheduled for 2015

While improved stoves are no doubt an important intervention, the situation remains that described in the PIF whereby insufficient attention is being paid to supply-side interventions in the charcoal value chain. In areas where charcoal is a primary driver of deforestation the introduction of improved kilns – in combination with improved stoves and fuel switch – has been demonstrated to be the most powerful tool in both reducing emissions and increasing forest cover (World Bank). The relatively larger impact of improved kiln technology on forest protection – compared to interventions on the consumption side such as improved stoves – can be explained by the fact that production-side measures are not offset by population growth and, thus, have a more profound impact. Combining production side interventions with policy reform and consumption-side technologies remains the most effective approach and this is true now more than ever in the Ugandan context.

2 PART 2: PROJECT STRATEGY

2.1 Overall Project Strategy

186. This project will remove the barriers to biomass technology development through national and district level approaches described in the previous sections that involve mobilizing investment (from financial institutions and carbon markets), capacity building and technology dissemination; promoting conservation of carbon stocks; and addressing the management of competing land uses and resulting changes in land-ecosystem dynamics. At the district level the project will strengthen SFM & SLM. This will be done through the enhancement of the charcoal producers' capacity in tree planting and agroforestry, promotion of efficient harvesting techniques, dissemination of and capacity building in the use of efficient carbonization technology and charcoal packaging through the formation of charcoal producers associations. Through the use of participatory planning and awareness creation approaches, the project will also enhance the local producers in carbon stock-taking through the development of knowledge management systems that allow sharing of lessons learned across the districts. . At the national level the project will enhance the charcoal supply value chain by linking charcoal producers to vendors through establishment of a dialogue system between the various agencies (governmental and non-governmental) responsible for sustainable charcoal development.

2.1.1 Conformity with GEF Policy

187. This project conforms to GEF's overall strategic vision under GEF V of helping countries meet their sustainable development needs and achieve multiple environmental benefits through an integrated approach. The project is consistent with GEF-2& 5 CCM and LD strategies of assisting countries in the deployment and diffusion of low-carbon, energy efficiency technologies through investment, capacity building and technology cooperation; promoting conservation of carbon stocks; and addressing management of competing land uses and resulting changes in land-ecosystem dynamics. The project advances the potential of sustainable land and forest management (and reduced GHG emissions) within a targeted landscape, while developing options and incentives to address the fundamental drivers of deforestation, unsustainable energy use and natural resource degradation prevalent in the pilot districts.

188. Current trends in charcoal production and the possibilities presented by promoting sustainable charcoal production align well with GEF strategies since the need for wood fuel – both for rural and urban markets – is the quintessential form of competing land use. Traditional demands for biomass such as fuel wood and charcoal are predicted to remain high in Uganda, where more than 90% of the total energy consumption is still supplied by firewood and charcoal according to the Ugandan National Energy Balance. Availability of such biomass, as well as preservation of carbon stocks, can be greatly improved through afforestation, restocking, more efficient harvesting, and production and stove technologies, many of which are now commercially available. GEF-5's CCM FA Strategic objective # 3 aims to promote investment in renewable energy technologies. As stated in the Project Identification Form(PIF), this project will respond to that SO (Sulphur Oxide?) by disseminating 600 improved charcoal kilns in targeted areas.

Emission reductions will include both CO₂ emissions and pyrolysis related emissions (CH₄) as their shares in the overall emission reductions are around 60-70% and 30-40% respectively.

2.1.2 Linkage with UNDP Country Programme

189. The existing UNDP Country Programme (2010-2014) seeks to support the attainment of Millennium Development Goals (MDGs) through the following programme components: Democratic Governance; Poverty Reduction; Crisis Prevention & Recovery; Environment and Energy; HIV/AIDS, and Gender. The UNDP Country Office has a fully established Energy and Environment Unit and cluster of projects with three fixed term full-time professional staff dedicated to the environment portfolio. The Team Leader holds a Masters in Business Administration and Master of Science in Environment and Natural Resources Management a Programme Analyst, a Programme Officer, a Programme Associate as well as two dedicated UNDP-GEF/Small Grants Programme staff and additional project level coordinators. This team is supported by UNDP/GEF Regional Coordination Unit Technical Advisors for Energy and Climate Change. and support staff assisting with M&E and delivery oversight, among other tasks. with an MBA and MSc,
190. This project is line with and directly supports the UN Development Assistance Framework (UNDAF) for 2012-2014 in particular **Outcome 2:** Vulnerable segments of the population increasingly benefit from sustainable livelihoods and in particular improved agricultural systems and employment opportunities to cope with the population dynamics, increasing economic disparities, economic impact of HIV&AIDS, environment shocks and recovery challenges by 2014. Notably: **Outcome 2.2** *Vulnerable communities, Government, civil society and the private sector are sustainably managing and using the environment and natural resources for improved livelihoods and to cope with the impact of climate change.*
191. UNDP's Programme in Uganda is articulated in the current [Country Programme Action Plan \(CPAP 2010 - 2014\)](#). The five-year framework born out of mutual cooperation between the Ugandan Government and UNDP. Government ownership and responsibility over Programme activities is an essential factor to UNDP.
192. The project fits within the GoU/UNDP CPAP Outcome 2.3: Capacity of Selected Institutions Strengthened for Sustainable Environment and Natural Resources Management (ENRM) as well as Climate Change (CC) Adaptation/ Mitigation and Disaster Risk Management which aims at addressing challenges of environment and natural resources degradation which are negatively impinging on efforts to promote growth, create wealth and reduce poverty. The project will contribute to meeting the objectives as set out in the CPAP and is consistent with the agreed terms in the UNDP key actions. The strategies to be adopted under the project are consistent with UNDP's mandates in the development arena, and will complement UNDP's work on strengthening governance, in particular improving institutional effectiveness in public and community level institutions .
193. Also at the national level, the UN Uganda Country Team has developed a UNDAF Action Plan 2013-2014 which prioritise access to renewable energy and climate change management in attaining sustainable development.
194. The project is also in line with other international activities and regional programmes. It is in line with the Millennium Development Goals (MDGs) adopted by Uganda, especially MDG-7 on "Environmental Sustainability", the indicators for which include Integrate the principles of sustainable development into country policies and programmes; reverse loss of environmental resources; and Rio+20 outcomes on green growth.
195. The programme will be guided by the five inter-related principles of the UN Development Group (UNDG):

- Human-rights-based approach to programming, with particular reference to the [UNDG Guidelines on Indigenous Peoples' Issues](#);
- Gender equality;
- Environmental sustainability;
- Results-based management;
- Capacity development.

196. In addition, the project will: Facilitate partnerships, drawing on expertise from a range of national and international organisations acting as executing agencies to ensure well coordinated and timely action; and actively contribute to coordination and mainstreaming in-country, while avoiding duplication of effort with other initiatives.

2.2 Project Objectives, Outcomes and Activities (Outputs)

197. The overall goal of this project is “*Improved charcoal production technologies and sustainable land management practices through an integrated approach in Uganda.*” The objective of the project is to secure multiple environmental benefits by addressing the twin challenges of unsustainable utilization of fuel wood (including charcoal) and poor land management practices common in Uganda’s woodland through technology transfer, enhancement of the national policy framework and promotion of SLM and SFM practices. The project is being developed within the context of the NDP (to promote a low carbon emission development path), the National Forestry Policy (2001) (which seeks to promote the rehabilitation and conservation of forests, soil and water resources), the National Action Plan (NAP) (to combat desertification under the (UNCCD)) and other relevant national policy and legal frameworks. The project has involved piloting low carbon emission sustainable charcoal technologies and broader sustainable land and forest management practices in four districts: Mubende, Kiboga, Nakaseke and Kiryandongo.

198. The main barriers to transforming the current charcoal production practices into sustainable businesses will be overcome through **three main components**:

- Component 1: Data collection and improved coordination and enforcement of regulations governing the biomass energy sector, in particular those related to sustainable charcoal
- Component 2: Dissemination of appropriate technologies for sustainable charcoal production in selected (4) charcoal-producing districts (Mubende, Kiboga, Nakaseke and Kiryandongo)
- Component 3: Strengthening the capacity of key stakeholders in SFM and SLM best practices and establishment of sustainable woodlots

199. Description of Components

Component 1: Data collection and improved coordination and enforcement of regulations governing the biomass energy sector, in particular those related to sustainable charcoal – BEST has made clear that Biomass energy should not be viewed as an isolated sub-sector but as an integral part of the development process in Uganda. It prioritizes the creation of an interlinked biomass resource database and information centre with representatives from key line Government agencies and more harmonized coordination platforms. Additionally one of the key outputs (1.3) of the GEF-funded project *Enabling Environment for SLM to overcome land degradation in the cattle corridor of Uganda* is a “National policy for regulating sustainable production, processing and marketing of charcoal in place.” Under that project there is now a published draft policy brief developed (see Section A.7 and Annex K) with detailed recommendations for the establishment of national policies and laws to govern sustainable charcoal production and establish national standards for the production, processing, certification and marketing of such products.

In direct response to BEST recommendations this component will support data collection platforms and improved coordination and enforcement of current regulations governing the biomass energy sector, as well put in place frameworks for institutional coordination at the district level. The component will fund a national charcoal survey and updated standardized baseline report, building on

biomass data collection already being supported by GIZ and the current standardized baseline (SBL) developed by Perspectives GmbH and the Ugandan DNA in 2012. It will create a new framework for coordination among national and district actors and ensure that a functional biomass database is established and hosted at MEMD and published in Uganda Bureau of Standards reports⁸ and that such a database is used as a baseline in the development of a possible future sustainable charcoal NAMA.

At the district level, the project will seek to replicate relevant localized governance and enforcement structures, certification schemes, community-based learning platforms and policy-making initiatives in the four target districts that were previously successfully piloted in 8 sub-counties in two other districts as part of the UNDP-funded *Promotion of Sustainable Charcoal Production* Project; this will include adoption of improved charcoal and biomass guidelines and ordinances at the district level in Mubende, Nakaseke, Kiboga and Kiryandongo. Under the above-mentioned project district ordinances and by-laws on charcoal production were successfully adopted in Luwero and Nakasongola Districts (neighboring areas to the target districts in this project) and handed over to the relevant District Councils for enactment and further management of the process up to gazettment – a description of these activities can be found in Annex L. The relevant District Environment Offices together with the District Forest Offices took the lead in completing the process of enactment and later in operationalizing and enforcing the ordinance on behalf of the District Council. As planned, charcoal producer organizations were formed and formally registered with the respective District Director of Community Services and a good number of these associations have since become vibrant and self-sustaining and are now certified and regulated by the relevant district authorities. When the national standards on sustainable charcoal certification are finally adopted under the *GEF-funded project Enabling Environment for SLM* project (expected in the next 6-12 months), the project will utilize those in the four targeted districts; in the meantime and in the case of delays in the adoption of national standards the project will replicate the current standards developed and piloted in Luwero and Nakasongola Districts.

This component will also fund awareness and educational programs in all four target districts and update guidelines for measuring biomass (CAI & MAI) and the biomass study technical manual. All of these activities will be integrated into any new national-level charcoal policies when they are established; they will also be harmonized with into the MRV framework for a possible future NAMA for the charcoal sector, a possibility that is being considered under the UNDP-supported Low Emissions Capacity Building (LECB) Project. Utilizing the CAI and MAI guidelines the project will also establish Annual Allowable Cut (AAC) targets for each district. AAC or harvestable biomass is the amount of wood permitted to be harvested in a given area within a one year period without degrading the forest's (or any woody formation's) ability to maintain its sustainability and productivity. Determining AAC is very comprehensive and the principle behind AAC is that what is harvested in a year should not exceed what the given vegetation type is able to replenish by itself through annual increment and ingrowth i.e., CAI or MAI in forest plantations with a known rotation age.

Component 2: Dissemination of appropriate technologies for sustainable charcoal production in selected (4) charcoal-producing districts (Mubende, Kiboga, Nakaseke and Kiryandongo) — BEST draft recommendations state categorically the need to “demonstrate benefits of improved wood to charcoal transformation technologies and provide seed money to attract investment into green charcoal production” and establishes a national target of “Maintaining wood demand for charcoal at the 2013 level by increasing per cent of charcoal made in improved technologies to 75% and above 2015.”

This component responds to that directive and specifically provides for GEF seed funding for the roll-out of appropriate technologies (i.e. improved kilns and promotion of briquetting technologies) for sustainable charcoal production in four charcoal-producing districts. First, working in close collaboration with the relevant district governments and FAO FFS and APFS structures already in

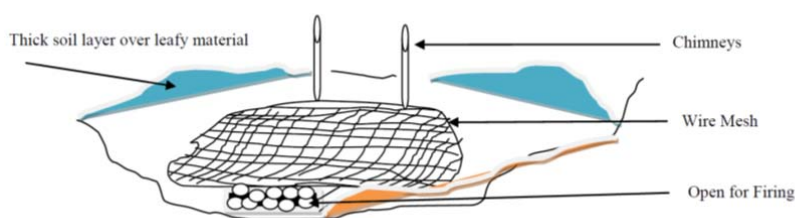
⁸ The database will be harmonized with the NFA biomass resource assessment

place, some 60 sustainable charcoal cooperatives will be identified or organized comprised of a total of at least 2,400 sustainable charcoal champions. Initial activities under this output will involve developing ranking criteria for categorizing charcoal producers or entrepreneurs and conducting surveys to rank different actors into pre-determined categories based on capacity needs and which kiln is most appropriate for their use. The formation and identification of the groups will include special attention to gender roles and responsibilities at the community and household levels, which determine the division of labour thus impacting on men's and women's relationship to natural resources, e.g. access to labour for tree growing, charcoal production and marketing.

Following charcoal producer group formation or categorization, the project will train all groups on the relevant district ordinances and standards for sustainable charcoal certification schemes developed under Component #1. Sensitization workshops will be held at the community, sub-county and district levels. Thereafter GEF funds will be used to purchase and disseminate the equipment for four hundred (400) Casamance kilns to the relevant producer groups and groups will be trained in their use. In addition, two hundred (200) retort kilns will be distributed to producer groups who have agreed to operate the kilns in areas adjacent to the woodlots established under Component #3 and who are willing to plant more trees to ensure sustainability. Criteria will be established for the expected in-kind contributions of chosen producer groups who receive the technologies. Customized trainings will be done on proper utilization and maintenance of the retort kilns.

The Casamance kiln has a chimney at the back or side and air-lets or channels at the side. The wood is typically cut into pieces measuring 0.5 metres long which are then arranged in an elaborate pattern of laying wood pieces putting the larger ones at the center, standing the wood upright and allowing for air flow within the lower levels of the stack. The wood is then covered fully with leaves, wire mesh and finally soil. Air inlets and a chimney are placed at different locations around the kiln.

Typical Cross-sectional View of a Casamance Kiln



Source: Available Charcoal Production technologies in Kenya (UNDP and Kenya Forest Service, 2012)

The retort kiln selected to be disseminated under the project (based on an assessment of various types at PPG stage) is a modified version of the Adam Retort called the Sam1 Brick Retort. It operates in a manner similar to the Adam Retort with the major difference being that the fire box is within the retort as opposed to an external fire box that is used in the Adam Retort. The heat losses to the walls of the fire box are minimized. The result is that it takes a shorter time and less firewood to be fired than the Adam Retort. However because the fire box is directly under the retort, the retort is slightly higher than the Adam retort while having the same capacity.

MRV, tracking and licensing system will be established for all improved kilns piloted to ensure they are replacing inefficient practices and to track their emission reduction impacts. It is expected that the profit margin per output unit of charcoal produced by the groups with the new more efficient technologies will increase by at least 20% per group (with new kilns) as compared to baseline scenario for all participating charcoal cooperatives (this will be verified). Financial statements and records of sale will be kept for all groups and monthly aggregate charcoal production and sales by all groups within a district will be recorded.

Given that PREEP already has experience with dissemination of improved stoves and capacity building of local organizations on construction, repair, marketing and monitoring of Improved Charcoal Stoves (ICS), the project will seek to draw on their expertise as regards improved kiln technology transfer. Some of PREEP's technical advisors are situated at the district level with mandates to work with local governments and NGOs in implementing renewable energy activities including carrying out awareness campaigns to promote ICS technologies and promote the primary school curriculum on energy. Wherever possible activities under Component #2 will be done in close cooperation with GIZ PREEP and its associated local partners in the four districts.

This component will also support the development of a model scheme to support consumer financing schemes for charcoal producing groups (with local financial institutions) to purchase improved kiln technologies post-project. At present improved kiln technologies are not commercially mature enough to attract asset-backed financing but the hope is that following the dissemination of the technologies in the target areas their viability will be proven and local banks will begin to view them as productive assets that are eligible for commercial financing. The model financing scheme will allow for the increased uptake and dissemination of these technologies on a broader commercial scale when the project is finished.

Under this component training and technical assistance will also be provided to those briquetting businesses that are receiving loans from participating Micro-Finance Institutions (FSPs) that are working in conjunction with *CleanStart* (See detailed *CleanStart* Business Plan for Uganda provided under separate cover).

As part of the *CleanStart* scoping study a baseline energy matrix was developed for a full range of clean energy technologies in Uganda – including biomass energy applications – and that information (as it applies to biomass technologies) is summarized in the table below for reference with the accompanying indicators. The findings demonstrate the relative commercial immaturity of supply-side biomass technologies such as briquetting systems and kilns relative to demand-side technologies (improved stoves) and thus underscore the timeliness and relevance of efforts to bring these types of technologies to a more viable level of maturity.

Biomass Energy Technology Selection Matrix for Uganda

Technology	Typical Unit Price (\$)	Relative Level of Maturity of Energy Technology	Number of Companies Currently Operating in Uganda	Specific Energy Loans Developed
Improved Household Cook Stoves	8-15 (charcoal stoves); 13 (wood stove)	Fairly mature	More than 7	Currently under trial
Improved Institutional Cook Stoves	930 for 200 liter stove (for 400 meals)	Developing market	More than 5	Only just being developed

Biomass Briquetting Systems	370 for a 1-tonne/day capacity machine	Fairly immature	More than 5	Not yet developed although some interest is being shown
Efficient Charcoal Production (kilns)	N/A	Immature and informal	Many informal producers	Not yet developed

Source: CleanStart Detailed Business Plan – Uganda (prepared by Practical Action - 2013)

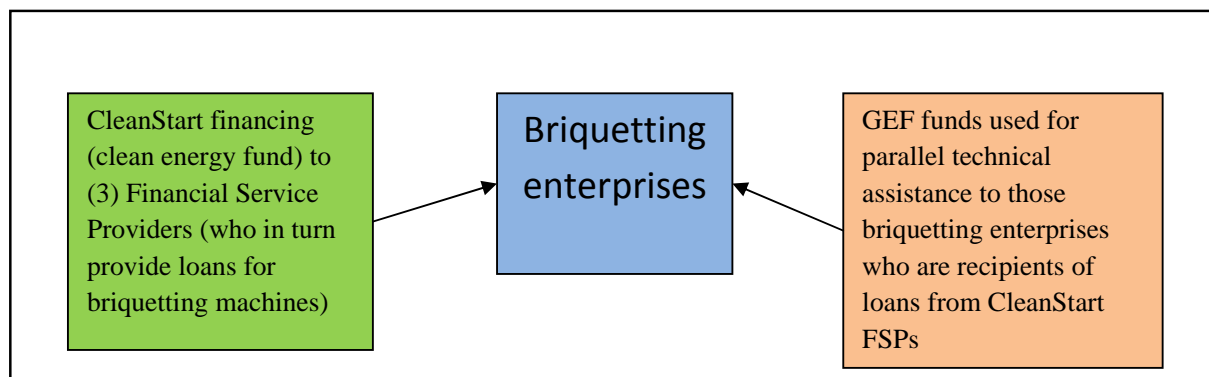
Briquetting systems have now been included as an additional technology for support under the project because they are more commercially developed than kilns and with a minor amount of GEF support can offer strong synergies with and complement support for the piloting of charcoal production (source) technologies. As regards briquetting, the *CleanStart* scoping study as well as the UNDP NAMA study confirmed that a great deal of charcoal dust is lost during transportation and improper storage. The significance of these losses can be gauged by the fact that manufacturers around Kampala buy out the residual charcoal dust and combine it with a binding agent like cassava to form charcoal briquettes. The *CleanStart* assessment indicated that the number of briquette producers and daily production can easily be raised from 17 briquette producers to 50 producers and from 8 tons to 50 tons per day. Currently, the size of the briquetting market is not known, as the total amount of materials suitable for briquetting production has not been adequately estimated (although it is believed to be substantial). Using the baseline of the usage of charcoal among Ugandan households (22% of households in 2009/10), it can be estimated that several hundred thousand Uganda households could start using briquettes as an alternative to charcoal with the appropriate development of the sector. Briquette making machinery generally costs upwards of US\$ 376, and can produce up to 1 ton of briquettes per day at full capacity. Most briquette producers manage to produce about 800-1,000 kg of briquettes per day with high quality machines and could increase capacity to scale up to 4 to 5 tons/day in the immediate future. Therefore there is great potential to jumpstart this market with support from this project.

As part of Output #1 of the *CleanStart* Program in Uganda, UNCDF (the only UN agency with a lending mandate) will create a fund and provide appropriate financing through a chosen institutional host – likely to be the Uganda Energy Credit Capitalisation Company or Microfinance Support Centre – to a selected number of FSPs in the country. The CleanStart Energy Fund will operate through the following instruments:

- Pre-investment technical assistance to build awareness and confidence based on existing international experience and to develop outline business plans for the 4 main clean energy technologies.
- Risk capital grants to a select number of high-performing FSPs (up to 3) to cover the up-front cost of introducing a range of specific new energy loan product lines.
- Wholesale fund (Value Chain Fund) to advance operations of the less well developed clean energy value chains of institutional ICS, biogas and briquette production.
- Guarantee funds to mitigate risks of FSPs lending to poor households

As already noted the C/S fund is envisioned to support financing in four energy value chains: Solar, Briquettes, Biogas and Improved Institutional Cook Stoves. GEF funds (TA) will incrementally complement CleanStart Energy Fund financing by supporting C/S Output #2 - Technical Assistance for Clean Energy to remove barriers to the sustainable deployment of those technologies and services for which the selected FSPs will provide microfinance. See the schematic on the next page for what GEF funds will support in parallel to C/S.

Schematic of GEF and CleanStart Support for Biomass Briquetting Enterprises



Finally the project will support the development⁹ and submission of a carbon finance project (Program of Activities - PoA) for registration to an appropriate Voluntary Carbon Standard authority (funding for the actual carbon finance transaction costs will be provided by the Belgian Technical Agency project) or alternatively a Sustainable Charcoal NAMA Design Document (to be decided during the first year). It is likely that the PoA developed will be under SSC methodology, AMS-III.BG: *Emission reduction through sustainable charcoal production and consumption* although it will be registered under the VCS¹⁰. More information on this outcome can be found under Section 1.5 of the Prodoc – *Developing a Carbon Finance Project for Sustainable Charcoal*.

Compliance methodologies are widely employed in the Voluntary Standards creating VER (Voluntary Emission Reduction Units) Carbon Credits. These projects use the same methodology, but do not have their projects approved and registered via the UNFCCC registration body; instead they have them approved and registered under appropriate voluntary certifying bodies including the Verified Carbon Standard (VCS), Gold Standard GS, and CarbonFix Standard (see Table 13 below).

Table 13: Applicability of Methodologies in select Voluntary Carbon Standards

Carbon Standard	Description	Comment on applicability of CDM/UNFCCC-Approved Methodologies
Verified Carbon Standard (VCS0)	The Verified Carbon Standard is a voluntary GHG program founded by a collection of business and environmental leaders who saw a need for greater quality assurance in voluntary carbon markets. In 2009, VCS incorporated in Washington D.C as a non-profit NGO.	<u>Any</u> methodology developed under the United Nations Clean Development Mechanism can be used for projects and programs registering with VCS. VCS projects must comply with the grace periods and rules set out by the relevant GHG program. For example, if a CDM methodology is withdrawn, a VCS project using that methodology must issue the project validation report by the CDM deadline for requesting project registration. http://www.v-c-s.org/methodologies/what-methodology
Gold Standard (GS)	The Gold Standard is an award-winning certification standard for carbon mitigation projects and is recognized internationally as the benchmark for quality and rigor in both the compliance and voluntary	The Gold Standard accepts <u>all</u> methodologies approved by the CDM Executive Board that meet the scope and specific eligibility criteria of the GS.

⁹ No direct transaction costs will be funded by GEF

¹⁰ VCS accepts all CDM and CAR methodologies (except the forestry one).

	carbon markets. The GS certifies renewable energy, energy efficiency, waste management and land use & forest carbon offset projects.	http://www.cdmgoldstandard.org/project-certification/gs-methodologies
CarbonFix Standard (CFS)	<p>The CarbonFix Standard sets a quality benchmark for worldwide LULUCF projects. It was developed in 2007 with experts in the fields of forestry, climate change and development aid sectors.</p> <p>The standard combines criteria on sustainable forest management and CO₂-fixation.</p>	<p>The CFS methodology is based on the research of the 2006 IPCC Guidelines and approved A/R CDM methodologies. The ‘2006 IPCC Guidelines’ represent the scientific basis of the UN to determine the carbon storage in different land-use systems.</p> <p>http://www.carbonfix.info/chameleon/outbox/public/216/CFS-Methodology.pdf</p>

In conclusion the CDM methodology AMS-III.BG can be used to obtain certification under any of the voluntary standards above. The ex-ante estimation of CO₂e avoided provided in the in the CCM Tracking Tool for this project are loosely in line with the requirements of the methodology; a detailed application of all the tools prescribed by the methodology will be done once this project starts.

The AMS-III.BG contains the following elements which make it most suitable for accessing carbon finance in the proposed project:

- Envisages small-scale charcoal production
- Involves shifting from non-renewable to renewable biomass feedstock
- Allows a range of charcoal kilns and promotes formation of charcoal associations for easier contracting and methane capture may or may not be undertaken as a project activity

This methodology is applicable to project activities that displace the use of non-renewable biomass in the production of charcoal supplied to identify consumers included in the project boundary. The methodology requires that the project activity proposed for carbon financing shall introduce efficient charcoal production technologies using renewable biomass feedstock such as biomass residues to displace the production of charcoal in unimproved traditional kilns by the informal sector thereby leading to emission reductions. The relevant conditions of the GEF project that make it suitable under this methodology are:

- It is small scale and the end users of charcoal shall be: (i) households; or (ii) small and medium enterprises (SME); or (iii) a group of households served by a charcoal market.
- The end users (of the charcoal) do not include large scale industries.
- The project promotes formation of charcoal associations
- The proposed technologies for piloting include but are not limited to Retorts, Casamance, Improved Earth Kilns, etc. and methane capture may or may not be included as a project activity.

Component 3: Strengthening the capacity of key stakeholders in SFM and SLM best practices and establishment of sustainable woodlots – Under this component it is targeted that some 50,000 ha of woodlands across the four pilot districts will come under improved land use management and approximately 5,900 ha of community woodlots of indigenous fast-growing trees will be established on under-productive agricultural lands or degraded forests to supply the improved kilns (deployed under Component 2) with renewable biomass. As regards the latter target, during the PPG the charcoal baseline survey demonstrated that using planted tree biomass as raw materials for charcoal production process is the most sustainable option in the districts chosen.¹¹ It was further confirmed that there is available suitable land for woodlot establishment for the selected tree species in all four districts. According to the responses from various landowners surveyed during the PPG phase, over 60% of the respondents surveyed (more than 1,100 landowners) were willing to commit land

¹¹ It is noted that this may be an expensive option in some areas where there is a relative abundance of biomass compared to clear felling and selective cutting in which cases the biomass is available at (close to) zero opportunity costs. In areas of scarce wood biomass, availability of land to produce trees for charcoal production vis-à-vis food security is often an issue of concern. Fortunately the target areas of this project do not have food security issues.

(between 1-50 ha) for cultivation of indigenous species as biomass fuel stock provided they received technical assistance. Land tenure arrangements in the chosen districts are supportive of such activities.

Table 4 below gives the average cumulative acreage of the three indigenous species to be promoted per household across the four pilot districts (obviously the acreage across households will vary – this is for illustrative purposes). The three indigenous species selected for piloting were chosen based on the following characteristics of tree species which are suitable for wood fuel production:

- Grow quickly, yield a high volume of wood quickly, and require minimum management time.
- Water extraction rates that are suitable for local agronomic conditions.
- Coppice or sprout well from shoots.
- Have dense wood with low moisture content.
- Produce little and non-toxic smoke.
- Produce wood that splits easily and can easily be transported.
- Yield other products or services for the household.
- Produce wood that does not spit or spark when burning.

The species selected are easy to establish and could easily be planted by direct sowing with good seed. The species are ecologically friendly within the climatic environment of the target area. Using conservative figures and as noted in Table 14, both *Markhamia lutea* and *Acacia tortilis* record an annual average growth rate of 19.5 metric tons the growth rate for *Vitex doniana* is even higher. Given the limited land holdings in some of the target areas, if 2,610 land owners can progressively commit on average up to 2.27 ha of their land to establishment of woodlots, by the fourth year (end of project) a total acreage of 5,930 ha of tree plantations under cultivation (conservative estimate) will be achieved producing a cumulative biomass stock of 368,771 MT of wood.

Table 14: Average Land Size Committed to Tree Production

Proposed average acreage for the different tree-species planted per household in hectares	Year 1	Year 2	Year 3	Year 4
<i>Markhamia lutea</i>	0.57	0.57	0.91	1.25
<i>Vitex doniana</i>	0.45	0.45	0.57	0.57
<i>Acacia tortilis</i>	0.23	0.45	0.45	0.45
Average H/H Acreage	1.25	1.48	1.93	2.27
Total Area of Tree-Species planted in the target Area in hectares	Year 1	Year 2	Year 3	Year 4
<i>Markhamia lutea</i>	1,485	1,485	2,370	3,260
<i>Vitex doniana</i>	1,185	1,185	1,485	1,485
<i>Acacia tortilis</i>	595	1,185	1,185	1,185
TOTAL AREA PLANTED IN HECTARES	3,260	3,855	5,040	5,930

Table 15: Projected Wood Growths and Production in Metric Tonnes across 4 Districts

Tree Species	Average Annual Growth Rate (mt)	Year 0	Year 1	Year 2	Year 3	Year 4	Cumulative Biomass Production (MT)
<i>Markhamia lutea</i>	19.5	0	28,914.45	28,914.45	46,263.15	63,611.85	167,703.95
<i>Vitex doniana</i>	22.5	0	26,690.30	26,690.30	33,362.85	33,362.85	120,106.30
<i>Acacia tortilis</i>	19.5	0	11,565.80	23,131.60	23,131.60	23,131.60	80,960.55
TOTAL BIOMASS PRODUCTION IN METRIC TONNES			67,170.55	78,736.35	102,757.60	120,106.30	368,770.75

As such under outcome 3.1 the project will identify and train a total of 1,100 households (potential private land owners) in the four pilot districts for woodlot establishment (minimum 5,900 hectares set-aside). Activities under this output will involve: 1) Training all communities/woodlot managers on new charcoal regulations and SFM best practices, including use of specified tree species and optimal ecological yield from such species; 2) Technical support provided to all woodlot owners on tree nursery management as an entrepreneurial activity with target to plant over 17.4 million seedlings; 3) Dissemination of over 17.4 million tree seedlings to woodlot owners; 4) Establishment of land use and forest management plans (including zoning and mapping of forest areas) for all targeted woodlot areas; and 5) Contracts signed between woodlots owners and charcoal producer groups for feedstock supply.

The above-mentioned plantation arrangements for the corresponding tree species in the target areas have taken into account several factors including the ecological suitability of the locations; human settlements; household land sizes and security of tenure; economics of land utilization; status of forestry development in the district; and the most importantly the available land that can be converted to tree planting. The establishment of the above-mentioned plantations shall involve GEF technical assistance and investment in hardware and operation costs including land preparations, planting, costs of certified seeds¹², weeding, pest and disease management¹³ and pruning regimes within the initial years of the plantations' establishment. Generally, trees require minimum inputs after planting compared to agricultural crops. However, weeding and protection against grazing, trampling and browsing by animals and trespass or destruction by humans is important for optimum yields. For *Acacia tortilis* the prescribed establishment and management practices will be adopted on the guidelines of the *Tree Farming and Management Practices – Acacia Pocketbook*¹⁴. The growth patterns of the chosen species are based on planted acreage per year with estimated tree coverage of 3,000 trees per hectare at spacing of 1.5 metres by 1.5 metres¹⁵. The retort kilns piloted under Component #2 will be located in the vicinity of the woodlots.

While most of these trees chosen take a relatively long time to grow to full maturity, the size of wood that is optimum for charcoal production using the retort technology should be less than 12 centimeters in diameter. As such after three to five years, it is expected that most of these sprouts will have attained the required diameter and therefore will be ready for harvest and conversion into charcoal. This will ensure that every three to five years, the demarcated section will be ready for harvesting. As noted in Table 4, the project assumes biomass stocks of 368,771 metric tons of wood are available for utilization by the end of the project (which would otherwise come from deforestation of woodlands under a BAU scenario).

¹² Certified tree seeds are recommended for best germination results

¹³ Some of the insect pests affecting trees in arid and semi-arid regions include termites, defoliators, sap suckers, seed and wood borer.

¹⁴ Prepared for PISCES by Practical Action Consulting East Africa, June 2012

¹⁵ Spacing is the most important aspect in the establishment of forest plantations because it correlates to the success of the forest plantation in terms of maintenance, stand stability, quality of wood and investment.

The second outcome of this component focuses on the broader promotion and replication of SLM/SFM knowledge and best practices from other ongoing SLM/SFM projects in neighbouring districts to the four target districts for this project. As noted in the PIF, the GEF-funded *Enabling Environment for SLM to overcome land degradation in the cattle corridor of Uganda* project and the UNDP DDC (Drylands Development Center) project are part of a broader platform that forms one component of the Uganda SLM Investment Framework which seeks to integrate all country SLM initiatives under a harmonized platform to improve coordination among the different SLM stakeholders in Government, Development Partners, NGOs and Civil Society. During the PPG phase the following relevant tools or practices were identified from those projects (as well as other partners such as FAO) for replication in the targeted districts under this project:

- Community's indigenous knowledge stimulated using the "Stimulating Community Innovations (SCI-SLM) approach" to generate local solutions to land degradation such as soil erosion and nutrient depletion as well as social issues such as improved livelihood from farm income. The Stimulating Community Initiatives for SLM (SCI-SLM) methodology/approach has been successfully adopted for piloting SLM initiatives in the six districts covered under the other SLM projects. Emphasis is put on encouraging social and technical innovations, mutual learning through exchange visits (farmer to farmer) and linking research and traditional knowledge through joint experimentation. It will be applied in the four districts under this project.
- Promotion of Conservation Agriculture (CA) as a key SLM and climate adaptation approach/technology in agriculture dominated landscapes has been prioritized. The focus is direct engagement at farm level working closely with private sector firms promoting CA. As part of the UNDP DDC project, CA was promoted in six of the cattle corridor districts, namely Nakaseke, Nakasongola, Kamuli, Kaliro, Lyantonde and Sembabule. The districts' climates are all characteristic of the cattle corridor mean annual rainfall patterns save for Nakaseke which has slightly higher average annual rainfall than the rest. Data from 246 farmers involved in the CA pilot under that project revealed that yields when using CA practices more than doubled compared to using conventional practices. Further, farmers in Lyantonde and Sembabule, where the rainfall was minimal and very unreliable reported some harvest under CA but total crop failure under conventional agriculture. The findings re-affirm the scientific underpinning of CA being an excellent local strategy for responding to climate change mitigation and adaptation, as well as food security. Results from Kamuli district where rains continued for some time after planting were even more positive as the percentage yield increase when using CA was up to 600% compared to conventional sources.¹⁶ In light of these results under this project CA practices will be introduced to 400 farming households (50 in each district) over at least 400 ha.
- The project will support land use planning (in each target district) using FAO-LADA-WOCAT tool. FAO experiences with this tool in other parts of Uganda have proved highly effective and they will provide technical support in its application.
- The project will train the relevant District Land Use Planning staff in the use of techniques that support community planning, implementation processes and land degradation assessment (including the development of District Environment Action Plans - DEAP). The DEAP process that the DDC project supported successfully developed DEAPs in the focus districts as part of the SLM mainstreaming into district action plans, which have now formed the basis for the implementation of various on-the-ground SLM initiatives and ensure community ownership of all activities.
- Finally the project will ensure that a mapping is completed of all targeted areas under sustainable forestry management as well as agricultural lands under SLM in collaboration with FAO and National Forestry Authority's new GIS/mapping platform. The Ugandan

¹⁶ CONSERVATION AGRICULTURE (CA) AS A SUSTAINABLE LAND MANAGEMENT (SLM) STRATEGY AND CLIMATE CHANGE ADAPTATION, REPORT FOR THE FIRST CROPPING SEASON, APRIL- JULY, 2012], UNDP DDC Project 2012

National Forest Authority (NFA) carries out various types of inventories and mapping exercises as regards the country's biomass stocks and has a dedicated Geographic Information System/Mapping Unit. More recently FAO has introduced new mapping technologies in Uganda¹⁷ that will help the country generate more useful and detailed forestry statistics and land cover maps. The new tools and information – presented at a workshop in August 2013 – will help the government monitor national forest resources and make informed decisions regarding long-term forestry and investment policies, as well as avoid unintended forest conversion and the degradation of the productive and protective functions of forests.

To update Uganda's land cover map, FAO and NFA are now working together (with funding from Finland) to classify the most recent satellite imagery and produce statistics using an open-source image processing tools. The new land cover map and statistics will help Uganda improve its forest monitoring capabilities, and the figures will be included in new national statistics and also be included in the upcoming FAO Global Forest Resources Assessment 2015. This project will work with NFA and FAO to make sure that as accurate data as possible on above-ground biomass stocks and land use change in the targeted districts is mapped under these platforms so as to monitor whether the proposed global environmental benefits are being successfully attained.

2.2.1 Log Frame, Outcomes, Indicators and Incremental Reasoning

200. A detailed logical framework matrix is Annexed (Annex 1) showing outcome key performance indicators (KPI), baseline, target, means of verification and assumptions.
201. Incremental Reasoning and Linkages with the Baseline - The table below describes in detail the incremental benefits of the different components relative to the BAU scenario and the baseline co-finance investments

Table16: Project Activities and Incremental Reasoning

BAU practices – Component #1	Alternative to be put in place by the project	Linkages to Baseline Co-finance
<ul style="list-style-type: none"> - Current biomass database is uncoordinated, inadequate, outdated and unreliable - Standardized baseline not based on updated district level information - Multiple taxation, tax evasion rampant - Lack of coordination amongst the MEMD, MWE and Local Government on harvesting, licensing and technology transfer for charcoal - Biomass energy mandate is distributed across many government agency with no focal point - License fees not standardized - No charcoal ordinances or certification schemes in targeted districts - Inadequate and uncoordinated individual /NGO driven and project based programs in biomass energy - Biomass measurement guidelines and technical manual are not in use. The technical manual is outdated. - No CCA targets established for targeted districts - Awareness of BEST very low at the district level 	<ul style="list-style-type: none"> - National charcoal survey and updated standardized baseline reports completed - Framework for institutional coordination and resource mobilization developed between MEMD, local government authorities and the National Forest Authority to manage charcoal trade at district level - Baseline report and functional biomass database established and hosted at MEMD and published in Uganda Bureau of Standards reports - Local ordinances and standards for sustainable charcoal certification schemes developed, adopted and publicized in targeted pilot 	<p>Activities under Component #1 will be incremental to all MEMD, MWE, PREEP, MoLG, Mubende district government and UNDP baseline co-finance.</p> <p>All components are directly supportive of the BEST draft recommendations</p> <p>While not baseline activities, the project builds on the SLM enabling environment project and when the national standards on sustainable charcoal certification are finally adopted under that project they will be adopted in the four targeted districts.</p>

¹⁷ For more see <http://www.fao.org/news/story/en/item/193725/icode/>

	<p>districts</p> <ul style="list-style-type: none"> - Awareness and educational program on local ordinances and standards for sustainable charcoal completed in all targeted pilot districts¹⁸ - Updated guidelines for measuring biomass using the biomass study technical manual. Annual Allowable Cut (AAC) targets established for all districts by year 2 	
BAU practices – Component #2	Alternative to be put in place by the project	Linkages to Baseline Co-finance
<ul style="list-style-type: none"> - Despite the high demand for biomass, investment in improved production technologies both on the demand side and energy transformation levels has remained exceptionally low; most focus is on ICS - BAU Carbonization Technologies = Earthmound Kilns @ 10% efficiency conversion - BAU biomass Sources = non-renewable - No widespread use of improved kiln technologies and those that are in use are not licensed or monitored; no financing mechanism for improved kilns - Charcoal producers in target districts are not formally organized and do not have access to improved carbonization technologies - No carbon finance projects in Uganda dealing with sustainable charcoal have been registered with a carbon authority; no NAMA DD for sustainable charcoal - Low average income of a typical itinerant charcoal producer in target districts - Estimated 17 formal briquette makers in Uganda, receiving limited training and financial assistance; no dedicated loans for briquetting machines 	<ul style="list-style-type: none"> - 60 sustainable charcoal producer groups organized, trained and operational comprised of a minimum 2,400 charcoal champions spread across pilot districts. - Demonstration of Casamance kiln operation and viability to target groups (total of 400 Casamance kilns disseminated) - Demonstration of retort kiln operation and viability to target groups (total of 200 retort kilns disseminated) - MRV, tracking and licensing system established for all improved kilns piloted - All groups in compliance with certification standards - Model scheme to support consumer financing schemes for charcoal producing groups (with local financial institutions) proposed by end of project. - Basic Program of Activities (PoA) project submitted for registration to appropriate authority or alternatively a Sustainable Charcoal NAMA Design Document developed - Training and technical assistance provided to all briquetting businesses that are receiving loans for briquetting 	<p>Activities under Component #2 will be incremental to MEMD, MWE, PREEP, FAO, MoLG, UNCDF, BTC and UNDP baseline co-finance</p> <p>All operational linkages between the C/S financing schemes for briquetting and this project will be done once both projects start implementation</p>

¹⁸ As noted in section B.2 the educational materials will include awareness raising and information sharing on the need for gender equity as a vital component of sustainable charcoal production and tree management

	machines from CleanStart	
BAU practices – Component #3	Alternative to be put in place by the project	Linkages to Baseline Co-finance
<ul style="list-style-type: none"> - Limited amount of land in targeted districts under SFM regimes or benefiting from SFM practices - Apart from activities in gazetted area, currently no management plan exists for the wood resource on private land - 4,800 ha of land across four districts deforested each year for charcoal production - all biomass used in charcoal production is non-renewable - Conservation farming not widely practiced across target districts - Communities in targeted districts have not had exposure to the SCI–SLM approach or LADA tool - District Land Use Planning staff have little knowledge of techniques that support community planning, implementation processes and land degradation assessment - No detailed mapping of biomass stocks (both forestry and agricultural areas) done in targeted districts - No method in place to accurately measure and monitor land use change and deforestation in targeted districts - Land use / cover maps outdated at district level 	<ul style="list-style-type: none"> - At least 1,100 private woodlot owners in the four pilot districts identified, trained and contracted to make land available for woodlot establishment (minimum 5,900 hectares set-aside). Activities under this output will involve: - Sustainable woodlots (out-grower schemes) successfully established to supply improved kilns with renewable biomass established (5,900 ha). - Targeted communities indigenous knowledge of SLM enhanced using the “Stimulating Community Innovations (SCI–SLM) approach ” to generate local solutions to land degradation - Conservation Agriculture (CA) practices introduced to 400 farming households (50 in each district) over 400 ha - Land use planning done in each target district using FAO-LADA-WOCAT outcomes. - District Forestry and Land Use Planning staff trained in the use of techniques that support community planning, implementation processes and land degradation assessment. - Mapping completed of all targeted areas under sustainable forestry management as well as agricultural lands under SLM in collaboration with FAO and National Forestry Authority’s new GIS/mapping platform 	<p>Activities under Component #3 will be incremental to MEMD, MWE, NFA, FAO, MoLG and UNDP baseline co-finance</p>

2.2.2 Project's Global, National and Local Benefit

Local Benefits: The adoption of retort technology is expected to have a major beneficial impact on local incomes from sustainable charcoal, as reflected in Output 2.4.1 whereby the profit margin per output unit of charcoal produced with new technologies is targeted to increase by at least 20% per group (with new kilns) as compared to baseline scenario for all participating charcoal cooperatives. In retort carbonization, there is no direct contact of the biomass feed with atmospheric oxygen. In this manner the entire biomass feed is available for the conversion into charcoal, significantly increasing charcoal yields per unit of biomass fed into the retort and thus leading to higher incomes for the charcoal producers. The Sam1 retort was specifically selected for dissemination based on its commercial viability in a Ugandan context. Table 8 (see below) compares the key attributes of the Adam Retort and Sam 1 Brick Retort. As regards carbonization efficiencies the two retorts are quite similar but the Adam retort is more costly as it requires a proprietary license fee of US \$ 2,000 per year and US\$ 40.00 per additional kiln in addition to the capital cost of US \$ 1,200 for the actual retort; meanwhile the Sam1 retort costs only US \$ 1,000 and it does not require a license fee or any other payment. The maintenance costs of the Sam1 Brick retort are slightly less.

Table 17 – Comparison of Retort Attributes of Adam Retort and Sam1 Brick Retort

RETORT ATTRIBUTES	ADAM RETORT	SAMI BRICK RETORT
1. Retort Volume (Wood Chamber)	4.32 m ³	4.32 m ³
2. Capacity of wood charge per loading in kg (Depending on type of wood)	1900kg – 2600kg	1900kg – 2600kg
3. Yield (Skill of operator and wood preparation/quality)	35-40%	35-40%
4. Capacity of charcoal production a year (At a rate of 7 runs a month and 70 runs a year)	60 tones	60 tones
5. Labour costs per retort run (loading and unloading)	U\$60	U\$60
6. Cost Of Retort	U\$1,200+ (license cost of U\$2,000 + \$40 per additional kiln)	U\$1,000
7. Maintenance costs per year	U\$120	U\$100
8. Cost of wood per Retort run	U\$32	U\$32
9. Firebox position	Outside therefore requires more wood for ignition	Inside thus requires less wood for ignition

Similarly project support for biomass briquetting enterprises who are receiving energy loans from FSPs working in partnership with *CleanStart* is expected to generate increased incomes for those same enterprises since they will need to repay the loans facilitated under *CleanStart* to purchase those assets. As noted in Table 18, the *CleanStart* business plan assessed the market demand for loans for biomass briquetting at more than \$800K USD with the potential for loans from FSPs to over 2,000 entrepreneurs.

Table 18 – Market Potential for Biomass Briquetting Machines (CleanStart Assessment)

Technology	Loan Size	Value of Loans (US\$)	Target FSP Institutions for CleanStart engagement
Briquetting Machines Loans to 2,000 entrepreneurs (no established market size)	Average loan size UGX1million or US\$400	800,000	Finca and Opportunity Bank

Finally the introduction of the various SFM and SLM interventions are expected to generate a variety of local benefits. To cite one example, the UNDP DDC SLM Project report on results from the piloting of conservation agriculture in selected districts noted the important local benefits that resulted from those activities, namely:¹⁹

- a) Farmers can plant a larger area because they are not moving or turning over soil for each part before they plant. This saves money and time e.g. it has been estimated that ploughing 1 acre of land to 10 cm depth involves turning over 400 tons of soil, which has associated cash or in-kind labor costs (whether manual or mechanical).
- b) Farmers can prepare their land as soon as they have harvested. This allows for early planting at the onset of the rains which is critical for success. Early planting permits timely weeding.
- c) Labor requirement for land preparation for planting is spread over several months rather than being done at once.
- d) Retaining residues reduces soil and water loss, improves infiltration, reduces soil temperatures and in time improves soil fertility.
- e) Conservation Agriculture leads to increased yields. There is cost-effectiveness in CA as it leads to reduced costs per unit production of maize and beans mainly because of the improved returns on labor and purchased inputs. The improved performance in dry, wet and normal seasons makes effective use of the whole year for crop production.

That same report goes on to mention that: *“It is therefore recommended that communities in the cattle corridor districts should be encouraged to implement CA in order to ensure food security as well as protect the environment.”*

More broadly unsustainable land use and the resultant land degradation have serious socio-economic consequences for farmers and pastoralists. This project emphasizes participatory involvement of the target groups because it recognizes that implementing SLM starts with the land users themselves, who must also benefit economically if they are to adopt SLM practices. SLM incorporating tree planting and improved management has concrete benefits beyond the farm in terms of biodiversity. On-farm biodiversity consists of crop genetic diversity as well as a wide range of soil biota and animals. The on-farm benefit of crop genetic diversity is soil health, through interrelationships between plant diversity, soil microbial diversity and organic matter content. The global value of plant and animal genetic resources for food and agricultural production in the targeted areas is therefore huge.

National Benefits: Realization of the project objective will also generate national benefits through increased stakeholder awareness about unsustainable land use and charcoal production; demonstration of improved charcoal carbonization technologies; contribution to a more streamlined and coordinated charcoal sub-sector; advocacy of the need to increase women’s access to and control over tree and

¹⁹ See footnote 25

charcoal production resources; and enhanced stakeholder involvement supported by local sustainable financing mechanisms. Indirect national benefits include the following:

- Cross-sectoral integration of sustainable land management into national development plans, policies, strategies, programs, funding mechanisms and multi-sector stakeholder groups;
- SLM contributes to the health of natural ecosystems that are in turn critical for the tourism and agriculture industries;
- Greater empowerment and self-sufficiency of natural resource users and stakeholders to participate directly in the conception, monitoring and adaptive management of lands and resources; and
- Reduced environmental risks and increased resilience to climate and environmental disasters.

Gender benefits: The project is cognizant of the fact that women in most Sub-Saharan African countries often are the ones who participate in village woodlots and are also involved in charcoal production. They have knowledge on the art of making charcoal and can often identify the properties of materials suitable for fuel wood and NTFPs both for commercial and domestic purposes (Texon, 1998). Cultural considerations in the choice of a charcoal production system and/or technology is important because fuel wood gathering for domestic and commercial purposes requires the utilization of human energy of which women contribute a disproportionate share. Tree growing for charcoal production at the farm / community level involves both men and women in different roles and responsibilities and with different levels of access to and control over production resources including land, water, labor and financial inputs. Men and women also have different levels of access and control over benefits derived from charcoal production. This necessitates awareness creation and information sharing on the need for gender equity as a vital component of promoting sustainable charcoal production.

In Uganda, agriculture is the main occupation of women. Nationwide, agriculture employs 72% of all employed women while 90% of all rural women work in agriculture; in comparison only 53% of rural men work in the sector (FOWODE, 2012). The project includes specific targets for adequate gender representation in the participating producer groups and the promotion of measures to heighten advocacy on SFM and charcoal production particularly as it applies to encouraging equitable participation of men and women in the charcoal value chain so that there is equal sharing of benefits accrued from the charcoal production and woodlots. This will be done through a gender-balanced training program that covers biomass estimation, forest/plantation management, improved charcoal conversion technologies and business skills. The education and awareness campaigns done under Output 1.5..1 will lobby and advocate at the community level as to the importance of increasing women's access to and control over tree and charcoal production resources.

Global Benefits:

The associated global benefits from the various interventions in the project are summarized in Table 7. As regards the CO₂ emission reduction benefits the project includes two interrelated emission reduction targets – those from discrete activities related to the kilns and woodlots and those from promotion of improved SFM practices across a broader targeted landscape.

As regards the improved kilns to be introduced, the emission reduction targets are based on wood savings (converted to energy savings) and methane capture (as regards the retort kilns) calculated over the lifetime of the assets and compared to a Business-As-Usual (BAU) wood use scenario during the same period. Under a BAU scenario with the current inefficient technologies the wood requirements for charcoal production in the four districts over 15 years (based on current production rates) would be approximately 40,097,990 MT whereas with the improved kilns the wood usage is reduced by 723,000 MT over that same period for a net lifetime reduction of 1,576,501 tCO₂. It should be noted that the energy savings for the kilns are calculated for the carbonization process only. To avoid double counting there is need to account

for the fact that not all the GHGs removed from the biomass as part of the charcoal production process is released immediately; some of the carbon is retained in the form of charcoal to be combusted and accounted for at the end user level which is outside the scope of this project.

The woodlots are designed to complement the kilns by further reducing pressure on the natural forests in the targeted four districts. The annual BAU wood requirements for forecasted charcoal production in the four districts over 20 years is estimated at 53,463,987 MT of woody biomass needed based on a deforestation rate of 4,811 ha per year for charcoal production in the four districts (see Table 1). Under the project-based woodlot scenario (assuming biomass accumulation rates provided under Table 5 and sustainable replanting and harvesting schedule) the total renewable biomass produced under the woodlots over that same period would be 1,475,083 MT. This would result in a further net lifetime reduction of 2,699,402 tCO₂ of avoided deforestation compared to the BAU scenario to add to those emissions already reduced from the improved kilns.

Finally the other activities under Component #3 designed to strengthening the capacity of key stakeholders in SFM and SLM best practices will lead to a variety of carbon sequestration and/or avoided deforestation emission reduction benefits across a much broader landscape albeit in less direct way than the support for the kilns and woodlots. The project will bring 50,000 ha of forestlands across the four pilot districts under improved multifunctional forest management and will pilot a variety of land use planning tools and activities (i.e. conservation farming) in that target area (which is in addition to the 5,900 ha under woodlot management). The estimated enhanced carbon sequestration from these activities is 2,100,000 tCO₂ over the LULUCF lifetime length of 20 years. This figure is based on data from other schemes in Uganda and studies by Camco (2011) in South Western Kenya which show that with improved management of Miombo woodlands allowing for natural regeneration can result in above-ground carbon accumulation of 21tCO₂/ha/yr. Using a very conservative causality factor of 10% applied to potential improvement in carbon sequestration from GEF-funded activities compared to this full growth rate results in an emission reduction target of 2,100,000 tCO₂eq over twenty years for the 50,000 ha target.

A detailed assessment of the global benefits from the various interventions in the project are summarized in Table 7:

Table 19 – Summary of Global Environment Benefits²⁰

Focal Area	Global Environmental Benefits
CCM 2: Promote investment in energy efficiency technologies	<p>The introduction of improved and more energy efficient carbonization technologies will lead to the following GEBs:</p> <ul style="list-style-type: none"> - Wood usage is reduced by 723,000 MT over the asset lifetimes (15 years) from use of improved kilns compared to BAU scenario (under a BAU scenario with the current inefficient technologies the wood requirements for charcoal production in the four districts over 15 years - based on current production rates - would be approximately 40,097,990 MT) Lifetime energy savings of : <ul style="list-style-type: none"> - 1,843,200,000 MJ for Casamance kilns (avoided emissions of 210,816 tCO₂eq) ; and - 9,737,142,857 MJ for retort kilns (avoided emissions of 1,113,686 tCO₂eq) - additional lifetime avoided methane emissions for all retort kilns introduced of 252,000 tCO₂ eq

²⁰ Refer to Annex F for more details as regards the CCM2 Calculations

	<p>Total direct lifetime emissions avoided of 1,576,502 tCO₂eq</p> <p>Note: These emission reductions are only for wood savings in the carbonization process and do not account for all net emissions in the charcoal chain or end use combustion. Moreover the ERs resulting from support to the biomass briquetting technologies commercialized under <i>CleanStart</i> will be determined during Year 1 after <i>CleanStart</i> becomes operational and will then be included in the CCM Tracking Tool</p>
CCM 5: Promote conservation and enhancement of carbon stocks through sustainable management of land use, land-use change, and forestry	<p>The establishment of community woodlots (out-grower schemes) to supply improved kilns with renewable biomass (5,930 ha) will lead to the following GEBs:</p> <ul style="list-style-type: none"> - Yields of 368,770 MT of renewable biomass produced over 5,900 hectares under woodlot management by end of project (year 4) and 1,475,083 MT of biomass accumulation by year 20. - The annual BAU wood requirements for forecast charcoal production in the four districts over 20 years is estimated at 53,463,987 MT of woody biomass removed based on a deforestation rate of 4,811 ha per year for charcoal production in the four districts (see Table 1). Under the project-based woodlot scenario (assuming biomass accumulation rates provided above) the project targets a further net lifetime reduction of 2,699,402 tCO₂ of avoided deforestation compared to the BAU scenario to add to those emissions already reduced from the improved kilns. <p><u>Assumptions:</u></p> <ul style="list-style-type: none"> - 1 tonne of charcoal is produced from 0.02 ha - At 10% efficiency this means 10 tonnes of wood are extracted from 0.02 ha of woodland for charcoal production. This excludes small twigs and foliage which is part of the above-ground biomass on site. To estimate the total above-ground biomass on the site, we use a Biomass Expansion Factors (BEF) from the 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4: Agriculture, Forestry and Other Land Use - BEF = 1.25 i.e. total AGB on site = 1.25 x 10 tonnes = 12.5 tonnes of dry wood biomass <p>Assuming 50% of the wood biomass (per MT) is carbon therefore for each tonne of charcoal produced, 0.5 x 12.5 tonnes of biomass = 6.25 tonnes of carbon removed</p> <p>Molecular Ratio of CO₂/C = 44/12 = 3.66</p> <ul style="list-style-type: none"> - Thus 368,770 MT of renewable biomass produced and harvested in one five year cycle results in avoided emissions of 368,770 X 0.5 X 3.66=avoided 674,850 tCO₂eq which is 2,699,402 over a 20 year lifetime - Meanwhile the estimated total hectares lost annually due to deforestation from charcoal production in the target districts is 4,812 ha per year which results in total net emissions of

	5,399,863 tCo2 per year in a BAU scenario
SFM / REDD+ 1: Reduce pressures on forest resources and generate sustainable flows of forest ecosystem services	<p>Improved SFM practices advocated under the project will lead to the following GEBs:</p> <ul style="list-style-type: none"> - 50,000 ha of forestlands across four pilot districts brought under improved multifunctional forest management leading to enhanced carbon sequestration of 2,100,000 tCO2eq over lifetime. This figure is based on data from other schemes in Uganda and studies by Camco (2011) in Chyulu Hills National Park, Imbirikani Group Ranch and Eselenkei Group Ranch in South Western Kenya which show that with improved management of woodlands allowing for natural regeneration can result in above-ground carbon accumulation of 21tCO2/ha/yr. Using a very conservative factor of 10% improvement in carbon sequestration compared to this full growth rate results in a figure of 2,100,000 tCO2eq over twenty years for a 50,000 ha target.
LD-2: Forest Landscapes: Generate sustainable flows of forest ecosystem services in drylands, including sustaining livelihoods of forest dependant people	<p>Improved SLM practices and knowledge transfer advocated under the project will lead to the following GEBs:</p> <ul style="list-style-type: none"> - A least half of the land under improved SFM registers reduction in land degradation by at least 20% as measured by reduction in soil erosion and improvement in soil organic matter , in addition to carbon sequestration targets - Conservation farming practices leading to improved soil organic matter and field intensification across 400 hectares and increased yields of at least 20% compared to baseline scenario - Relevant tracking of LD indicators used under the LADA WOCAT tool (to be determined during the first year of the project) and NFA mapping

Quantification and Presentation of Global Benefits: With regards to the incremental value of GEF-funded CC mitigation activities, the proposed additional GHG emission reductions from low-carbon technologies and SFM practices (switch to renewable biomass) compared to the business-as-usual case are based on the following field findings in the four pilot districts:

1)	Baseline survey in the four districts revealed that over 95% of producers were using different form of inefficient conversion technology (earth kiln or other) – not even one retort kiln was found in the pilot districts.
2)	Using inefficient methods produces charcoal yield of between 80 kg to 150 kg from 1,000 kg wood giving efficiency of between 8% to 15%. A conservative average efficiency of 10% for earthmound kilns has been used on all the calculations
3)	In the targeted areas with the support of GEF funds traditional charcoal-making facilities are replaced by 1) 200 high-yield, low-emission Sam1 retorts (modified form of Adams retort), each with an average yield of 350 to 400 kg of charcoal from 1000kg of wood (dry basis), this is equivalent to 35 – 40 % efficiency 2) 400 casamance kilns, each with an average yield of 200kg to 250 kg of charcoal from 1000kg of wood giving an efficiency of 20% to 25%. All calculations have been based on 35% efficiency for the retort and 25% for the casamnce.
4)	Based on field studies, each Sam1 retort is capable of producing 350 kg to 400 kg of charcoal in each batch

	process with a 30-hour batch duration. Each retort therefore has an average annual production of 24 tons of charcoal; for Casamance it is about 10 (9.6) tons of charcoal.
5)	Optimized charcoal production from use of retorts can entirely avoid the emissions of CH ₄ from pyrolytic gases resulting from traditional processes. Avoiding CH ₄ emissions through such a technology represents an emission reduction of roughly 3.5 tCO ₂ e per tons of charcoal of produced (Pronatura 2009). Methane capture will result in the avoided emission of 252,000tCO ₂ eq
6)	The capital cost of Sam1 retort is USD 1000.00 (includes cost of transport and installation). GEF funding will cover these costs. Sam1 retorts like Adams retort have an average lifetime of 15 years but can stay longer as they are made of fired bricks and as long as metal plates are replaced; casamance kilns have an average lifetime of 5 years. Depending on the market or farm gate price plus the frequency of carbonization, based the pilots, theoretically the return on investment (ROI) will take at most 60 days of operation for the Sam1Brick Retort.
7)	For each retort, total losses (i.e., production facility, charcoal transport, and distribution to consumers) do not exceed 5 percent.
8)	The amount of hectares of land to be set-aside for the establishment of woodlots for cultivation of a sustainable biomass source for the kilns mentioned above is 5,930 ha. The species selected, using conservative figures, both <i>Markhamia lutea</i> and <i>Acacia tortilis</i> record 19.5 metric tons after the same period with the same subsequent annual growth rate. The species sprout very well and also give good quality charcoal, are indigenous, termite and fire resistant and with good management fast growing. They are easy to establish and could easily be planted by direct sowing with good seed. The species are ecologically friendly with the climatic environment of the target area. Based on the PPG baseline study, the project will build capacity for a total of 1,112 forest owners in the four pilot districts through awareness creation, demonstrations, training and establishment of support structures for the provision of seedlings for enrichment planting and inputs. Table 12 in section 1.7.4 has indicated the cumulative distribution of households for capacity building per year and the total accumulation of forest land in hectares which is 50,040 ha to be sustainably managed for charcoal production per year. The project will adopt planting patterns similar to the one practiced in Bondo district, Kenya. During year 1, 1186ha (5930ha/5) will be harvested for charcoal and the same size of land planted with short rotation crops on plot number 1. The following year the same number of trees on another 1,186 ha will be planted on plot number 2. This will be repeated up to year five, where plot number 5 will be planted. By year 5, tree crops in the first plot will be ready for harvesting. This can modelled in different parts of the country on smaller or larger scales depending on availability of land. In year 6, plot number 2 will be harvested and replanted. The rotation system will follow this pattern. Field trials in Bondo District of Kenya show that <i>Acacia polyacantha</i> can be harvested for charcoal at year 5 (Mugo and Ong, 2006) using a similar model. 5,900 ha of <i>Acacia polyacantha</i> matches the woodfuel requirements of 200 retorts and 400 casamance kilns over 5 years. Based on PPG trials in the pilot district, the same number of retort kilns and Casamance will be needed

Summary: The project promotes a variety of best practices and customized technology options to address the twin challenges of unsustainable utilization of biomass for charcoal and poor land management practices common in Uganda's Woodlands. The project will spend \$3,480,000 to address multiple issues across 50,000 ha in four districts inhabited by people 1.7 million people. The project will be implemented in districts which cover some of the most naturally wooded areas outside protected areas in the country according to the Forestry Department. As regards the cost-effectiveness of CCM funds – the main source of GEF funding for the project – **the combined direct lifetime GHG emission reductions from the deployment of improved carbonization technologies combined with the establishment of dedicated woodlots totals 4.275 million tons CO₂eq (1,576,502+2,699,402 tCO₂) of avoided deforestation in the project area. If we include carbon sequestration benefits from improved SFM practices piloted over a broader area, the combined GHG emission reductions from project activities increases to 6.376 million tons CO₂eq.** Based on the GEF grant the cost of avoided CO₂ emissions from the various CCM activities in the project is USD \$1.23 cents per ton CO₂ avoided or reduced. If one includes the enhanced carbon sequestration benefits, the project has a cost abatement ratio of USD \$0.55 cents per \$ of GEF contribution.

2.2.3 Assessment of Project's Sustainability and Replicability

202. Institutional Sustainability: The project emphasizes building institutional capacities within MEMD to manage biomass energy and making vertical linkages with DFS, District Local Governments and Forestry Sector Support Department (FSSD) in the MWE, which offers supportive back-up to the NFA and District Forest Services, as well as Charcoal Producers Association. This is because MEMD is thin on the ground, and can only manage the charcoal value chain, especially the production side, if they are represented on the ground. Such linkages can be done through legal agreements such as an MOU with related agencies such as MWE, NFA and Local Governments to manage the feedstock production. In addition and for sustainability MEMD will work more closely with NGOs, CBOs and community/village level resource management institutions to establish and maintain sustainable charcoal initiatives for the production of mutually agreed benefits as well as establishing a foundation for continuing collaboration in the future. MEMD in close collaboration with DFS and local governments shall ensure the strengthening of capacity for local institutions to enforce implementation of bye laws. In addition, raising awareness on the existence and importance of bye laws on sustainable charcoal production will go a long way in ensuring sustainability of project initiatives.

The project will also invest in developing skills of local community leaders and other key stakeholders to mobilize community members for participatory planning, implementation and monitoring of the project progress. Local community leaders are particularly essential in ensuring the success of SFM and SLM practices and also in mobilizing local people to form charcoal producer cooperatives/associations. Such cooperatives will make it relatively easy to engage with financial institutions as well as access to inputs. The project will develop a body of knowledge and experience with participatory management practices among local and national government authorities.

This project will be sustainable if there is strong institutional support since there are many agencies involved in SFM, SLM and sustainable charcoal production, trade and marketing. It is important that there is coordination and collaboration among these institutions. For instance, in Mexico a law was passed in 2008 for the Promotion and Development of Biofuels, which explicitly includes fuels derived from forestry activities in its definition of biofuels, and mandates coordination through the creation of a new institution. The "*Commission Intersecretarial para el Desarrollo de los Bioenergéticos*," is made up of five ministries: Energy; Environment and Natural Resources; Agriculture, Livestock, Rural Development, Fisheries and Food; Economy; and Finance and Administration (Government of Mexico, 2008). A similar law is needed in Uganda because there are a number of institutions involved in charcoal production yet not one takes sole responsibility for overseeing production. Though MEMD is lead government agency in this project, however, its organizational structure does not give significant attention to biomass and charcoal that other sources of energy receive from the department. Therefore, there is a need for formation of a specific lead agency at MEMD to deal with sustainable charcoal/biomass, and legally collaborate with other organizations at local and national level. The agency will also collaborate with NGOs and CBOs to assist in the organization of charcoal producers, promoting charcoal, monitoring and assessing implementation.

203. Social Sustainability: The project's target beneficiaries are charcoal producers, rural farmers and land owners. For the project to be successful these groups must directly experience the benefits of the project in order for them to champion the project strategy and be the primary agents of change at the local level in terms of ensuring a paradigm shift from use of earth mounds to improved kilns; from use of non-renewable biomass to adoption of sustainable forestry and land management techniques; and from non-sustainable agricultural practices to sustainable techniques such as conservation farming. The project has dedicated substantial resources to capacity building efforts to overcome barriers to adoption of new technologies and management practices, and has also brought on board

partners such as PREEP (GIZ) and FAO that have extensive experience with community-based learning and technology transfer activities in Uganda.

However it is clear that capacity-building will not be enough to ensure that local communities will voluntarily switch to improved charcoal methods in the long term after the proposed project ends. For this reason the operationalization of BEST recommendations as regards expanding the capacity of the government to regulate the biomass sector is key; moreover it is important that the proper taxation scheme is put in place to support the enforcement of the local charcoal ordinances and certification schemes and ACC targets supported under Component #1. As regards the charcoal producer groups, if they see their earnings increase from the new technologies piloted there is every reason to believe that the technologies will continue to be utilized post-project. As regards the woodlot owners, the contracts to be signed between them and the charcoal producer groups for feedstock supply should similarly provide them with an incentive to maintain and sustain the woodlots. GEF funds can put in place the key local enabling conditions and technologies for the transformation of the sector but these will only be sustained if the activities are properly regulated and incentivized and the BAU alternatives discouraged and discredited. For this reason some of the parallel reforms supported by the SLM Enabling project are very important such as the recommendations for Ministry of Local Government to amend the Local Government Act so as to decentralise the function of energy management in accordance with subsidiarity principle; MEMD should improve staffing and capacity building of the Biomass Division under the Renewable Energy Department just as MWE should also improve staffing and facilitation of FSSD; government should assign responsibility for charcoal licensing to a single institution; and MEMD should advocate for and lobby Ministry of Finance, Planning and Economic Development to approve incentives for SCP, tree planting and production of briquettes from waste or invasive species. Such reforms would go a long to ensuring the long-term sustainability of the sector but nonetheless the forests of Uganda cannot wait and the site-specific interventions under this project remain highly relevant.

204. *Financial Sustainability:* Given the immaturity of improved kiln technologies in Uganda at this time and the current disorganized nature of most current charcoal production practices, it was decided that the improved kilns were not yet ready for full commercialization and it would be more appropriate for them to be piloted with GEF support with communities providing in-kind labor and maintenance costs. Although the kiln technologies will not be provided to the communities on a full cost-recovery basis, the project will support the development of a delivery model to support consumer financing schemes for charcoal producing groups with local financial institutions to allow for further uptake of the technologies post-project. Moreover the project-funded technical assistance for the biomass briquetting technologies – a technology more suited for immediate commercialization than kilns – will be coupled with energy loans provided by *CleanStart* FSPs and those loans will be provided to the briquetting enterprises on a commercial basis. As regards financial sustainability the project design has been heavily influenced by the *CleanStart* methodology (see Annex I) and the start-up of *CleanStart* in Uganda provides an excellent platform for future commercialization of the kiln technologies in line with the commercialization strategy for improved cook stoves and briquetting machines. The successful piloting of energy loans via *CleanStart* for improved cook stoves and briquetting machines and demonstration that biomass energy applications can be successfully commercialized is expected to provide many lessons for how similar market-based approaches can be transferred to other parts of the charcoal value chain. The *CleanStart* program in Uganda provides a strong value proposition for local FSPs through the support to develop and market a range of new energy loans targeted at demand from end users, as well as increasing capacity of energy technology market chain actors in a high growth market as clean energy adoption increases, and an additional potential revenue stream from carbon markets. This will enable those selected FSPs to further sustain and grow their services for all biomass energy technologies. Through increased awareness of the benefits of a range of energy technologies and services, increased access to targeted end-user energy financial products, and improved supply of these energy technologies, low-income households and

small businesses will be able to break out of the vicious cycle of energy poverty, increasing their productivity and ability to repay microfinance loans resulting in higher rates of return for FSPs and expanded access to low-carbon technologies.

205. Replicability: Uganda's economy is driven by agricultural production. Most rural farmers and pastoralists practice charcoal production. The project strategy of building capacity in SFM and SLM to produce wood for sustainable charcoal production and the adoption of improved technologies through incorporation of consumer financing, has very high replicability. Replication will be promoted through a number of means including training, encouraging exchange visits and participatory methodologies adopted in SFM. The project has embedded knowledge management and dissemination systems, which will entail production of technical and user-friendly guidelines and manuals. The project strategy also includes working closely with government extension services in agriculture and forestry, along with charcoal producer associations, which will be instrumental in replication.

2.2.4 Project Risks and Risk Mitigation

Table 20: Project Risks and Risk Mitigation

Risk	Rating	Risk Mitigation Measure
The failure of the GoU to speedily implement BEST or the policy-related initiatives such as putting in place National Agricultural Advisory Services (NAADS) structures from the Local Government restructuring program (as well as the land and charcoal policies requiring a legislative framework for local implementation supported under the other GEF SLM practices) could jeopardize project success. To successfully implement improved charcoal production technologies, appropriate government policies are required to promote their assimilation within a context of sustainable resource management. Sound government policies are critical to creating an enabling environment in which such technologies can thrive, the required resources can be mobilized, and needed private-sector investment is encouraged to complement public-sector investment.	M	The project team will work closely with the Consultant mandated to develop BEST and the stakeholders involved. The project will also liaise with other key projects such as PREEP and the existing GEF SLM project to support the targeted policy reforms in the biomass sector. The Permanent Secretary of Ministry of Energy and Mineral Development has assured UNDP that as part of BEST a sub-policy to establish a biomass energy department is underway and that once this department is formally established it will have linkages with DFS and Forestry Sector Support Department (FSSD) in the MWE, which offers supportive back-up to both the NFA and District Forest Services in the target districts through signings of Memoranda of Understanding (MOU).
The type of kilns proposed could prove to be unsuitable for the designated areas; semi-industrial charcoal kilns may only be a viable option in large-scale, plantation-based production	M	During the PPG phase two retort kilns – Adams and Sam1 – as well as Casamance retorts were piloted for demonstration in the four target districts. The assessment included an in-depth assessment of the social, institutional and environmental considerations of the targeted technologies for the targeted areas. Following participatory training and capacity building on the building, operation and

enterprises; and modern, stationary kilns may not be viable if the woodlots are not well-established and managed.		maintenance of the retorts and kilns, Saml and Casamance kilns were found to be appropriate to the target districts in view of factors such as affordability, accessibility and acceptability by the local community. The project has purposely decided to offer flexibility and mitigate uptake risks by introducing the two types of technologies with disparate strengths and weaknesses and very different costing structures. Saml will be targeted at areas with relatively large farms or biomass stocks and to charcoal producers who are already experienced whereas Casamance kilns will be targeted at itinerant producers. The group formation and structure for the two kilns will thus be different as one group is sedentary and the other more mobile. Moreover the project also now covers biomass briquetting technologies which will be third type of technology to be tested and supported.
The introduction of improved kilns in charcoal-producing areas with large areas of standing forest could actually create a perverse incentive whereby efficiencies incentivize more production of charcoal rather than replacement of inefficient methods and reduced pressure on forests.	M/H	The project will ensure that all kilns piloted have appropriate licenses and regulations and will be monitored by the forestry department and local authorities. As part of the certification schemes the producer cooperatives will have to document the amount of charcoal produced with each kiln and financial and operational records will be kept as a key element of the project. The activities will also take place within the context of appropriate land use planning involving a broad range of stakeholders in the districts. Best practices will be adopted by organizations such as FAO who have long-standing experience working on the ground in these areas and the project will seek to form partnerships with CSOs and private sector entities operating in the area to support training and SLM technology dissemination, e.g., Vi- Agro forestry, Rural Enterprise Development Services (REDS), Africa 2000 Network (A2N) and MUARIK. The project will also work very closely with DFS and charcoal traders association to ensure that self-monitoring is enhanced and that guidelines are being followed.
Resource use could exceed resource generation. Even fast growing short-rotation species will take four to five years to mature. Moreover climate change risks and rainfall variability could impact both sequestration rates for the forests under management, as well as the ability of the woodlots to produce a sufficient amount of renewable biomass for the kilns using coppicing methods.	M	During the PPG field work exercises, groups of selected farmers and leaders in selected sub-counties from the four selected districts were selected and trained in biomass estimation for natural forests and plantations. The purpose was to test whether those skills could be retained and appropriately applied by the trained groups. The training was done to equip participants with skills for valuation of biomass resources and included tree growers, landlords, tree buyers, charcoal producers and sub-county extension staff responsible for oversight of wood fuel production and development. The key parameter to resource valuation and realization of its commercial value is volume measurement. Participants were organized in groups not exceeding 20 people for maximum concentration and to have one-on-one trainings from the team. As a result the pilot phase has imparted the community with the ability to identify trees with the ability to coppice ²¹ which are also indigenous fast growing species. There are many such existing trees in the target areas and together with the use of certified seeds these will be multiplied and propagated widely during the project. In addition specific criteria will be developed to validate the areas in the districts that can support the activities in component #2 and 3

²¹ Leaving a short stump of a felled tree to encourage re-growth is known as coppicing. Re-growth from a cut tree stump or the base of a damaged stem is known as a 'coppice'

		and this will include evidence demonstrating: (i) available woodfuel resources, (ii) secure land tenure, (iii) access to markets, (iv) and past charcoal production experience.
Another project risk is the possible collapse in demand for carbon credits or a drop in the carbon prices. This will reduce the benefits accrued to the communities but will not affect the GEBs to be accrued from the project.	L	<p>With regards to the carbon finance component, the control of the carbon markets is beyond the scope of this project but every indication is that market demand for VCS VERs from LDCs (and Africa in particular) will continue to grow. Moreover the latest findings from the <i>Forest Trends' Ecosystem Marketplace. State of the Forest Carbon Markets 2013 Report</i> testify as to the attractiveness of any potential VERs issued under this project. That report states that:</p> <ul style="list-style-type: none"> - The average price of Africa-based forest carbon offsets remained strong in 2012, rising 18% to \$7.2/tCO₂e, as buyers continued to show interest in projects that can successfully establish their co-benefit credentials. This is expected to continue in the future (post-2013). - The report noted that "Smallholder-led sustainable agriculture and sustainably-managed energy production (e.g., charcoal production) that reduce pressure to forested areas were also priced slightly higher than other activities." - The report noted that Sustainable Energy projects (the type of project to be developed in this case) attracted an Average VER Price (\$/tCO₂e) of US \$7.6 tons, the third highest price by category among Transacted Forest Carbon Credit Types and Buyers. <p>Source: Forest Trends' Ecosystem Marketplace. State of the Forest Carbon Markets 2013.</p>
Several risks were identified during the course of implementing the <i>Promotion of Sustainable Charcoal Production Project</i> project which are relevant for this project.	L	The project design has already taken into account all of the lessons learned from that project which are now factored into the project design. The main risks from that project (such as getting buy-in from local governments, ensuring secure tenure systems and mitigating exploitation by middlemen) have been addressed in the design and management of this project and are also being addressed by other initiatives. Other risks from that project included inadequate sustainable feedstock during the onset of project. This will be mitigated in the case of this project by working with selected tree owners to allow selective cutting from existing biomass stocks while at the same time introducing dedicated woodlot plantations. The participating districts and producer associations with whom that pilot project worked were consulted during the PPG phase and will continue to be consulted as part of the M&E and adaptive management structures of this project.
Finally, various factors have to come together simultaneously to support technology transfer. The technology has to be adaptable to the local communities' preferences, affordable and accessible. The	M	First of all the project will work with and benefit from PREEP and FAO staff and partners who already have extensive experience in technology transfer for biomass energy (PREEP) and agriculture/forestry applications (FAO). Secondly, during the PPG phase participatory approaches and incentives to overcome technology barrier (including the need for gradual introduction of the technology and promotion of local adaptation and capacity building

financing options for the uptake of the technology transfer component post-project will have to be carefully assessed, as will maintenance issues.		<p>at community level) were discussed. The need for appropriate by-laws and ordinances at district level to support the technology as well as consumer financing through local micro-financing infrastructure were also advocated and were dealt with in detail as part of the <i>CleanStart</i> assessment. The PPG phase did an in-depth assessment on the best ways to ensure appropriate technology transfer uptake and these are incorporated into the design of the project. Please refer to the Prodoc for the detailed PPG assessments. Appropriate strategies for post-project maintenance of the assets will also be developed during the project. As noted in the section on sustainability the adoption of the <i>CleanStart</i> methodology under the project (with biomass briquetting targeted for CleanStart energy loans as a first step) provides an excellent platform for successful financing options for the targeted technologies to be operational post-project.</p> <p>Finally this is one of the host of projects focused on improved charcoal and technology transfer that UNDP is supporting in the region and best practices and lessons learned from other countries and projects will be shared with this project to ensure that there is continual learning and incorporation of best practices.</p>
Delays in the adoption of broader enforcement structures and capacities for sustainable biomass management (prioritized under BEST) will jeopardize enforcement of the proposed activities under this project	M	While the national regulations supporting enforcement of biomass energy are under development vis-à-vis BEST and the SLM Enabling project, this project will build off successful examples of self-regulation by district authorities as showcased under the UNDP-funded <i>Promotion of Sustainable Charcoal Production Project</i> . Under that project district ordinances and by-laws on charcoal production were successfully adopted in Luwero and Nakasongola Districts and handed over to the relevant District Councils for enactment and further management of the process up to gazettement. The relevant District Environment Offices together with the District Forest Offices took the lead in completing the process of enactment and later in operationalizing and enforcing the ordinance on behalf of the District Council. As planned, CPAs were formed and formally registered with the respective District Director of Community Services and a good number of these associations have since become vibrant and self-sustaining and are now regulated by the relevant district authorities.
Delays in the adoption of the legal reforms earmarked under BEST will impact the ability of the project to deliver on outcomes under Component #1	M	As mentioned earlier although BEST is a key step in institutionalizing a more formalized biomass sector – including charcoal production and use – delay in its final adoption will not affect delivery of this project's project outputs, which are mostly focused on supporting existing regulations and platforms and technologies that have already been prioritized under other government plans. All activities under Component #1 in the log frame are government priorities irrespective of BEST recommendations and will be completed even if the envisioned legal reforms under BEST fail to be expeditiously adopted.
Studies have demonstrated the need to ensure fair sharing of resources and benefits by both men and women involved in charcoal production, including raising tree seedlings, and the	M	As noted in Section B.2 the project includes specific targets for adequate gender representation in the participating producer groups and the promotion of measures to heighten advocacy on SFM and charcoal production particularly as it applies to encouraging equitable participation of men and women in the charcoal value chain so that there is equal sharing of benefits accrued from the charcoal

distribution and marketing process, particularly at the small-scale community level.		production and woodlots. This will be done through a gender-balanced training program that covers biomass estimation, forest/plantation management, improved charcoal conversion technologies and business skills. The education and awareness campaigns done under Output 1.5..1 will lobby and advocate at the community level as to the importance of increasing women's access to and control over tree and charcoal production resources
Landscape processes are dynamic and the assumptions in the project as regards natural assets and sustainability criteria will have to continuously tested and refined.	L	Despite the underlying uncertainties in causes and effects, changes in landscape attributes must inform decision-making. Learning from outcomes can and should improve management and this project in particular must adopt adaptive management practices. Nonlinear relationships, external shocks, and unforeseen interactions and thresholds imply never-ending potential for surprise. Each surprise is an opportunity for learning, leading to the development of new understandings as a basis for revised strategies. This learning and revision requires continual adjustment in which new knowledge is derived from multiple sources and field evidence. This project is part of a portfolio of new MFA projects developed by UNDP under GEF V that aim to generate multiple GEBs over a given landscape and this project will seek to liaise with other such projects in developing a robust adaptive management culture but also a very detailed M&E plan that will allow for continues updating and learning.

3 PART 3: PROJECT MANAGEMENT ARRANGEMENTS

3.1 General Project Management Arrangements

206. The Implementing Agency for the project will be the Ministry of Energy and Mineral Resources (MEMD) as per its mandate which is *"to establish and promote the development, strategically manage and safeguard the rational and sustainable exploitation and utilization of energy and mineral resources for social and economic development"*. One of the ministry's policy goals is to meet the energy needs of Uganda's population for social and economic development in an environmentally sustainable manner. Over the years the ministry has implemented a number of biomass energy interventions including the National Biomass Energy Demand Strategy 2001 – 2010 and is currently the lead agency developing the on-going Biomass Energy Strategy (BEST).

Direct technical supervision of the project will be the responsibility of the MEMD with close technical support and collaboration from the MWE through the NFA and DFS. The MEMD will be directly responsible for the timely delivery of inputs and outputs and for coordination with all other executing agencies through a Project Management Unit (PMU). The Project Management Unit (PMU) will coordinate project execution and it will be headed by a Project Coordinator (PC). He/she will be a national professional recruited for the 4-year duration of the project and will be directly responsible for the project execution including day to day operations guided by approved work plans and budgets. The PC will work under the direction of the Permanent Secretary of MEMD. A full description of project management arrangements can be found in Section 3 of the Project Document.

As part of the project MEMD will work closely with a number of government and non-government agencies including MWE, MLG, NFA, DFS and FSSD at the national and local level and with NGOs and private sector that are active in the field. At the field level MEMD will also work in close collaboration with FAO Uganda, since they are implementing a large number of Farmer Field Schools (FFS) and Agro-Pastoral Field Schools (APFFS) in the districts, and PREEP staff. The project will

build on the already existing FAO FFS network, as well as FAO's existing relationships with district governments to create awareness on the project as well as involve interested farmers who have already been trained by FAO in the various platforms mentioned. In addition the project will also work very closely with the *EU financed project on promoting bio-energy plantation and improved charcoal production technologies* implemented by FAO whose overall objective is to contribute to the sustainable improvement of livelihoods and food security of the rural populations in Uganda. The specific objectives of this project include: 1) strengthening the resilience of rural populations and agricultural production systems in the central part of the cattle corridor (Nakasongola, Nakaseke, Luweero, Kiboga, Mubende and Sembabule); and 2) Build the capacities of communities, commercial farmers and the Government of Uganda to cope with climate change.

In addition the project will use the LADA, a project tool of FAO to assess land degradation at the district level in conjunction with the WOCAT approach. As regards support for dissemination of briquetting technology, the project will work with the relevant project staff and financial service providers working under *CleanStart*, which as mentioned in the business plan is also intended to be coordinated by MEMD since it has been identified as the organization best placed in Uganda to coordinate its activities given its mandate to lead all energy programs in the country (including policy formulation, and ensuring quality and financial assistance with relevant national partner organizations as required). MEMD will enter into Memoranda of Understanding (MoUs) with the above named actors to ensure that each entity is well aware of their roles and responsibilities in the project. Biomass mapping activities will be done with NFA while BTC will assist with support for carbon finance activities. Component #2 activities will be supported by GIZ PREEP staff its associated local partners in the four districts. The tracking of emission reductions from the project will in integration with MWE's Climate Change Unit and the UNDP LECB Project to make sure that they are consistent with NAMA MRV criteria.

207. A summary of the role of the different actors involved in each of the three components is provided below:

Component 1: Data collection and improved coordination and enforcement of regulations governing the biomass energy sector, in particular those related to sustainable charcoal	
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Lead Organizations	MEMD working closely with DFS NFA, FSSD, MWE, NGOs and charcoal producers. Close collaboration with BEST stakeholders and the GEF SLM project (Ministry of Agriculture)
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Component 2: Dissemination of appropriate technologies for sustainable charcoal production in selected (4) charcoal-producing districts (Mubende, Kiboga, Nakaseke and Kiryandongo)	
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Lead Organization	MEMD working closely with charcoal producers, biomass specialists, FAO, DFS and FSSD. District-level PREEP and FAO staff (and their affiliated partners) will be key collaborators. Other partners will include the <i>CleanStart</i> Programme and briquetting enterprises and local financial institutions. Carbon finance activities will be supported via MWE's Climate Change Unit, the UNDP LECB Project and the Belgian Technical Cooperation.
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Component 3: Strengthening the capacity of key stakeholders in SFM and SLM best practices and establishment of sustainable woodlots	
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Lead organization and others	MEMD working closely with DFS, NFA and FSSD in the MWE; Ministry of Local Government; District Chief Administrative offices, District Environment Offices and District Forest Offices; Land owners; Charcoal Producer Associations; NGOs; and FAO FFS.
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The main stakeholders and beneficiaries of the project will be the land users, local communities, local government agencies, biomass energy entrepreneurs and the private sector in the four pilot districts. The table below provides an overview of different stakeholders' involvement in the project.

208. Given that MEMD will be in charge of the overall project management, they will second or employ suitable staff. Such staff will include a Project coordinator answerable to the Project Management Unit (PMU) that will be set up at the MEMD.
209. In order to ensure a successful sustainable charcoal programme, a Project Manager responsible for implementation will work with suitable officers on the ground in such a way to address the following four key cornerstones of this projects:
210. **Policy and Institutional Management:** This requires a person with policy and related skills and experience. This person will be overall in charge, working with appropriate stakeholders and keeping track of all Policy, Legal and Regulatory processes including bye-laws and ordinances; Certification and Licensing procedures ensuring simplicity, transparency and accountability; Training/Capacity Development and awareness programmes to heighten understanding of new and emerging policies, regulations and guidelines as well as extension programmes to enhance implementation and enforcement of new policies. Ideally a member of the Project Steering Committee working very closely with the Project Coordinator should have responsibility for this.
211. **Feedstock Production and SFM Management:** To realize global and local benefits of this project will require continued feedstock production from well managed forests. This should ideally be headed by Natural Resource specialists with knowledge and skills in forestry practices, agroforestry, forest conservation and land use planning. The person will be responsible for agroforestry – multipurpose species, woodlots, plantations, selective harvesting in natural forests, enrichment planting and optimal land utilization: - management plans, harvesting plans, silviculture and land use planning. This role will ideally be performed by suitable forestry staff seconded to the PSC by MWE.
212. **Efficient Conversion and Carbonization Management:** this will be managed together with the feedstock and SFM pillar through delegation to a suitably qualified person who will also be a member of the PSC. This person will be in charge of overseeing the operational and maintenance of efficient conversion and carbonization technology. Training programmes will be put in place to build capacity of charcoal producers to harvest feedstock, treat feedstock, feed and operate kilns and retorts efficiently. The unit will also be in charge of recording to keep track of amount of charcoal recovered, emission reductions and losses.
213. **Marketing and Value Chain Management:** The reason for this position and for employing value chain management in such a business is to integrate communication and increase cooperation between production chain members in order to decrease delivery times, cooperatively reduce barriers and increase customer satisfaction. As such this unit will be in charge of organizing (not forming) charcoal producers associations, linking them to charcoal collection centers, recommend packaging, and ensure organized transportation to end consumers through an organized vendor association in urban areas. This person should ideally have excellent communication as well as actually co-operating with different people in different national and local environments. In addition technological capacity and good knowledge of the charcoal sector and strong focus on marketing the product by focusing on management of individual partnerships as a member of the whole and promoting

teamwork in the sense that producer association see the benefits of doing things together. The idea is to introduce formal organization into the Charcoal Value Chain to enable proper monitoring as well as incentivize investment in the sector.

3.1.1 Project Implementation Arrangements

214. **General Framework:** The project will be implemented over a period of 48 months beginning in September 2013 and be managed using standard GEF modality.
215. The project will be executed under National Implementation modality (NIM) where UNDP will act as the provider of the services and facilities that come through a successful proposal. The project will be funded by GEF through UNDP, which is accountable to GEF for project delivery. UNDP thus has overall responsibility for supervision, project development, guiding project activities through technical backstopping, logistical support and quality assurance.
216. The Implementing Agency for the project will be the Ministry of Energy and Mineral Development (MEMD) collaboration from the MWE through the NFA, DFSS and District Local Governments which will be responsible for delivery of specific project outs as Responsible Parties. Other collaborating partners will include; NARO, MAAIF, FAO, UNCDF and GIZ.
217. The MEMD will be directly responsible for the timely delivery of inputs and outputs and for coordination with all other collaborating agencies through a Project Management Unit (PMU) which will report to the Project Board/**Project Steering Committee** (PSC), allowing for project assurance and technical advisory support from UNDP and government. The PSC will allow not only high-level coordination between government agencies and collaborating partners, but also provide a mechanism for open and effective project management...
218. The Project Steering Committee (PSC), is the highest decision making organ of the project, responsible for providing strategic guidance during project implementation. The Permanent Secretary Ministry of Energy and Mineral Development who represents the Senior Beneficiary and acts as the 'National Project Director' will chair the PSC. UNDP shall be represented on the PSC as the Senior Supplier of resources and represent the interests of GEF and co-chair. . The PSC will be composed of Heads of relevant collaborating agencies and departments as well as representatives of the private sector and NGOs. The PSC shall meet at least once every six (6) months after Project Technical Committee meeting. The PM will be a member of the PSC as an ex-officio responsible for taking and distributing minutes. Staff of the PMU working under the PM shall attend meetings of the PSC by invitation and only on a need to basis. The role of the PSC will be to:
- Provide overall guidance and direction to the project, ensuring it remains within any specified constraints;
 - Address project issues as raised by the project manager;
 - Provide guidance on new project risks and agree on possible countermeasures and management actions to address specific risks;
 - Agree on project manager's tolerances as required;
 - Review the project progress and provide direction and recommendations to ensure that the agreed deliverables are produced satisfactorily according to plans;
 - Appraise the project annual review report, make recommendations for the next annual work plan, and inform the outcome group about the results of the review;
 - Provide ad-hoc direction and advice for exception situations when project manager's tolerances are exceeded;

- Review and approve work plans, financial plans and reports
- Provide strategic advice to the PCU for the implementation of project activities to ensure the integration of project activities with poverty alleviation and sustainable development objectives
- Ensure coordination between the project and other on-going activities in the country
- Ensure interagency coordination
- Ensure full participation of stakeholders in project activities.

219. The PMU will have overall responsibility for project management, administrative, technical and financial reporting. The Project Manager (PM) shall be the head of the project management unit and will be responsible for day-to-day oversight and coordination on implementation of project activities including supervision of activities contracted to consultants by Government. The PM will report to UNDP through the Permanent Secretary on a quarterly basis and maintain a direct liaison with UNDP through the Energy and Environment Unit. The Project Manager (PM) shall be a fulltime salaried resource acquired competitively. Within the focus districts, the PM will work closely with the district technical staff from the natural resources department. The District Forest Officer shall be the main link in each project district. S/he will liaise with the Project and other relevant district technical staff for the purposes of enhancing implementation of the project at district level.

220. A Project Technical Committee (PTC) comprising of selected technical staff of collaborating agencies, civil society and private sector shall be established to provide guidance on technical aspects of project implementation. The committee will thus support the PMU and PSC in their work to ensure that implementation of project activities is on course and producing the desired outputs. The committee will meet at least once per quarter

Duties of the PM:

- Plan the activities of the project and monitor progress against the approved work-plan;
- Mobilize personnel, goods and services, training and micro-capital grants to initiative activities, including drafting terms of reference and work specifications and overseeing all contractors' work;
- Monitor events as determined in the project monitoring schedule plan, and update the plan as required;
- Manage requests for the provision of financial resources by UNDP, through advance of funds, direct payments, or reimbursement using the FACE (Fund Authorisation and Certificate of Expenditures);
- Monitor financial resources and accounting to ensure accuracy and reliability of financial reports;
- Be responsible for preparing and submitting financial reports to UNDP on a quarterly basis;
- Manage and monitor the project risks initially identified and submit new risks to the project board for consideration and decision on possible actions if required; update the status of these risks by maintaining the project risks log;
- Capture lessons learnt during project implementation – a lessons learnt log can be used in this regard
- Perform regular progress reporting to the project board as agreed to with the board;
- Prepare the annual review report, and submit the report to the project board and the outcome group;
- Prepare the annual work plan for the each year, as well as quarterly plans as required;

- Update the Atlas Project Management module if external access is made available.
221. The representative of the Ministry of Energy and Mineral Development will chair the PTC.
222. He/she will be a national professional recruited for the 5-year duration of the project and will be directly responsible for the project execution including day to day operations guided by approved work plans and budgets. The PC will work under the direction of the Permanent Secretary of MEMD. The project coordinator will have a good understanding of the overall project framework and ensure that all components are implemented according to plan. As such, the Project Coordinator needs to be an energy professional with multidisciplinary background and experience that responds to the cross-cutting issues that will significantly affect the overall outcome (i.e., the four pillars outlined above).

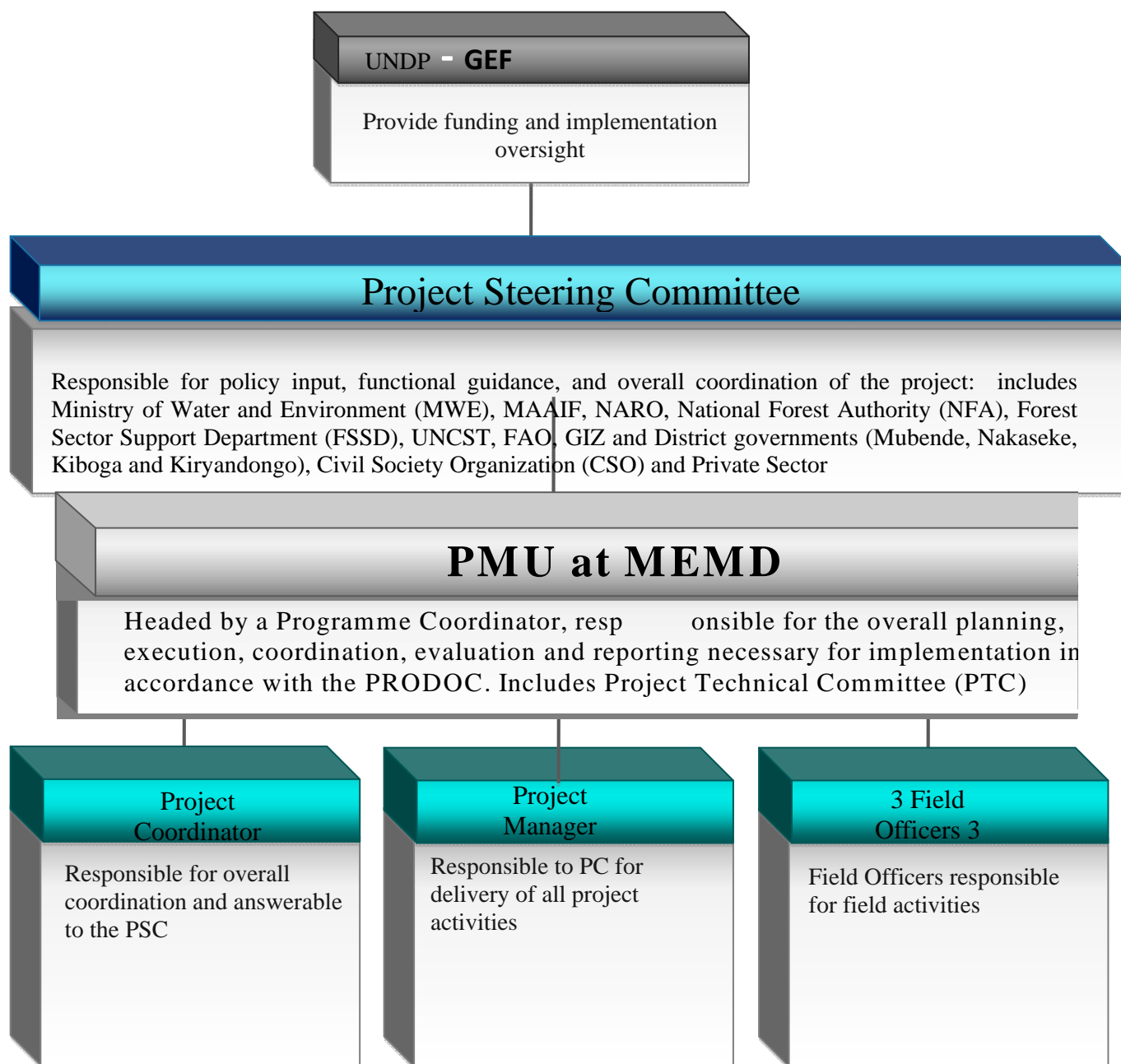


Figure 2: Overview of Project Organization and Implementation Structure

223. **Responsibilities for managing project funds:** The project will follow the UNDP National Execution modality. UNDP will advance funds for a three-month period. At the end of three-month intervals, the PMU will submit justification for expenses and the funds spent will be renewed by the GEF. The Government of Uganda will provide the GEF Country Representative with certified periodic financial reports and open its accounts to certified auditors in keeping with UNDP and GEF requirements.
224. **Implementation Arrangements:** UNDP through its office in Uganda will serve as the Implementing Agency. The project will utilize Direct Request Payment modality for funds disbursement to ensure greater financial accountability and transparency. UNDP Uganda will act to ensure that all implementation activities comply with policies outlined in UNDP's Programming and Financial manuals and are in line with UNDP GEF procedures. The project will comply with UNDP's monitoring, evaluation and reporting requirements as spelled out in the UNDP Programming Manual. The PIU PM will have lead responsibility for reporting requirements to UNDP.
225. In accordance with standard UNDP procedures, all resources and equipment gained through project support remain the property of UNDP until project closure when a decision will be taken as to how to dispose of these resources.
226. UNDP-Uganda will also act to provide management oversight and is ultimately responsible for project monitoring, evaluation, timely reporting by the PMU and ensuring the submission of annual audits to UNDP HQ. The regional UNDP-GEF Coordination Unit for Africa will provide technical backstopping, UNDP GEF policy advice, trouble-shooting and advisory services as necessary.
227. Mechanisms will be developed to ensure that the project receives the maximum level of recognition, commitment, support and involvement at the highest level of Government. Agreements will be made between co-financing and partner institutions to ensure full commitment and assure that the objectives of the Project are met.

3.1.2 Project Staffing

Below are the terms of reference for project staff required for successful implementation and achievement of the project's deliverables. To keep costs down, MEMD should work closely with staff on the ground and have some staff seconded from government to the project.

228. **Project Coordinator (PC):** The PC shall be responsible for:
- a. Design of the integrated sustainable charcoal implementation programme
 - b. Oversee initiation and analysis of cost-benefit and set-up of interlinked sustainable charcoal project activities
 - c. Coordinate inter-ministerial/inter-agency collaboration
 - d. Feasibility and viability analysis of more sustainable supply-demand linkages
 - e. Initiation of tax, price, licensing and enforcement system negotiations with relevant government agencies
 - f. Developing training programme of relevant staff and designated officials
 - g. Monitoring of the whole charcoal programme
 - h. Development of traditional energy supply demand linkages
 - i. Preparation of programme report describing and analyzing the entire process and outcomes
229. **The Project Manager (PM)** will have specialist qualifications in forest engineering or biomass energy engineering with more than 10 years' experience of working with fuel wood energy saving enterprises. Monitoring and evaluation and/or economic skills are also required. The PM will be answerable to PC and in charge of field project deliverables. As such the PM will work closely with the following:

230. **Three Field Officers 1:** Responsible for training, extension, data collection and monitoring activities during **Feedstock Production and SFM Management in agroforestry** – multipurpose species, woodlots, plantations, selective harvesting in natural forests, enrichment planting and optimal land utilization; management, land use and harvesting plans, and silviculture. **Field Officer 2: Responsible for efficient conversion and carbonization management:** **Responsible for efficient conversion and carbonization management:** As noted above, this field officer will oversee the operational and maintenance of efficient conversion and carbonization technology. Training programmes will be put in place to build capacity of charcoal producers to harvest feedstock, treat feedstock, feed and operate kilns and retorts efficiently. The position will also be in charge of record keeping in order tracking the amount of charcoal recovered, emission reductions and losses. **Field Officer 3: Responsible for charcoal value chain management:** Field Officer 3, also the project manager, shall be **responsible for marketing and value chain management** as noted above. The position requires excellent communication as well as actually co-operating with different people in different national and local environments. In addition technological capacity and good knowledge of the charcoal sector and strong focus on marketing the product by focusing on management of individual partnerships as a member of the whole and promoting teamwork in the sense that producer association see the benefits of doing things together. Eligible person should have been involved in works related to charcoal production and marketing, economic analysis of produce production and marketing, tax and licensing of forest products, as well as law enforcement aspects of forest produce marketing.

4.1 Introduction

231. Project monitoring and evaluation will be conducted in accordance with established UNDP and GEF procedures for GEF-5 STAR will be provided by the project team and the UNDP country office with support from UNDP/GEF Global Support Programme and includes the following elements: The Logical Framework Matrix (attached) provides performance and impact indicators for project implementation along with their corresponding means of verification. These indicators have been derived from the Resource Kit for Monitoring, Evaluation, and Reporting on GEF/UNDP supported Sustainable Land Management Full-Sized Projects in LDC and SIDS countries as well as field data. The baseline situation presented in this document also utilizes these indicators.
232. **A Project Inception Workshop** will be conducted with the full project team, relevant government counterparts, co-financing partners, the UNDP-CO and representation from the UNDP-GEF Regional Coordinating Unit. A fundamental objective of this Inception Workshop will be to assist the project team to understand and take ownership of the project's goal and objective, as well as finalise preparation of the project's first annual work plan. This will include reviewing the log frame (indicators, means of verification, assumptions), imparting additional detail as needed, and on the basis of this exercise, finalizing the Annual Work Plan (AWP) with precise and measurable performance indicators, and in a manner consistent with the expected outcomes for the project.
233. The purpose and objective of the Inception Workshop (IW) will be to: (i) introduce project staff with the UNDP-GEF team which will support the project during its implementation, namely the CO and responsible Regional Coordinating Unit staff; (ii) detail the roles, support services and complementary responsibilities of UNDP-CO and the project team; (iii) provide a detailed overview of UNDP-GEF reporting and monitoring and evaluation (M&E) requirements, with particular emphasis on the Annual Project Implementation Reviews (PIRs) and related documentation, the Annual Review Report (ARR), as well as mid-term and final evaluations. Equally, the IW will provide an opportunity to inform the project team on UNDP project related budgetary planning, budget reviews, and mandatory budget rephrasing. The IW will also provide an opportunity for all parties to understand their roles and responsibilities within the project's decision-making structures, including reporting and communication lines.
234. Measurement of impact indicators related to global environmental benefits will occur according to the schedules defined in the Inception Workshop, using METT scores, assessments of forest cover, wildlife movements and other means. Periodic monitoring of implementation progress will be undertaken by the UNDP-CO through quarterly meetings with the Implementing Partner, or more frequently as deemed necessary. This will allow parties to take stock and to troubleshoot any problems pertaining to the project in a timely fashion to ensure smooth implementation of project activities. Annual Monitoring will occur through the Project Steering Committee Meetings. This is the highest policy-level meeting of the parties directly involved in the implementation of a project. The project will be subject to PSCM four times a year. The first such meeting will be held within the first six months of the start of full implementation.
235. **Monitoring Responsibilities, Events and Communication:** A detailed schedule of project review meetings will be developed by the MEMD in close liaison with UNDP and in consultation with project implementation partners and stakeholder representatives and incorporated in the project document. The schedule will include: (i) Tentative time frames for reviews, project coordination committee meetings, (or relevant advisory and/or coordination mechanisms); and (ii) project related monitoring and evaluation activities (see Indicative Monitoring and Evaluation Budget, Table 22).
236. The PMU, in conjunction with the UNDP-GEF extended team, will be responsible for the

preparation and submission of the following reports that form part of the monitoring process. The first six reports are mandatory and strictly related to monitoring, while the last two have a broader function and their focus will be defined during implementation.

237. A Project Inception Report will be prepared immediately following the Inception Workshop. It will include a detailed First Year Work Plan divided in quarterly time-frames detailing the activities and progress indicators that will guide implementation during the first year of the project. This Work Plan will include the dates of specific field visits, support missions from the UNDP-CO or the Regional Coordinating Unit (RCU) or consultants, as well as time-frames for meetings of the project's decision making structures. The Report will also include the detailed project budget for the first full year of implementation, prepared on the basis of the Annual Work Plan, and including any monitoring and evaluation requirements to effectively measure project performance during the targeted 12 months' time-frame.
238. The Inception Report will include a more detailed narrative on the institutional roles, responsibilities, coordinating actions and feedback mechanisms of project related partners. In addition, a section will be included on progress to date on project establishment and start-up activities and an update of any changed external conditions that may affect project implementation. When finalised, the report will be circulated to project counterparts who will be given a period of one calendar month in which to respond with comments or queries. Prior to this circulation of the IR, the UNDP Country Office and UNDP-GEF's Regional Coordinating Unit will review the document.
239. The Annual Project Report/ Project Implementation Review (PIR) must be completed once a year. The APR/ PIR is an essential management and monitoring tool for UNDP, the Executing Agency and Project Coordinators and offers the main vehicle for extracting lessons from on-going projects at the portfolio level.
240. Quarterly progress reports: Short reports outlining main updates in project progress will be provided quarterly to the local UNDP Country Office and the UNDP-GEF RCU by the project team, headed by the Policy Specialist using UNDP formats.
241. UNDP ATLAS Monitoring Reports: A Combined Delivery Report (CDR) summarizing all project expenditures, is mandatory and should be issued quarterly. The PC will send it to the PSC for review and the Executing Partner will certify it. The following logs should be prepared: (i) The Issues Log is used to capture and track the status of all project issues throughout the implementation of the project. It will be the responsibility of the PC to track, capture and assign issues, and to ensure that all project issues are appropriately addressed; (ii) the Risk Log is maintained throughout the project to capture potential risks to the project and associated measures to manage risks. It will be the responsibility of the PC to maintain and update the Risk Log, using Atlas; and (iii) the Lessons Learned Log is maintained throughout the project to capture insights and lessons based on the positive and negative outcomes of the project. It is the responsibility of the PC to maintain and update the Lessons Learned Log.
242. Project Terminal Report: During the last three months of the project the project team under the PC will prepare the Project Terminal Report. This comprehensive report will summarise all activities, achievements and outputs of the Project, lessons learnt, objectives met, or not achieved, structures and systems implemented, etc. and will be the definitive statement of the Project's activities during its lifetime. It will also lay out recommendations for any further steps that may need to be taken to ensure the long term sustainability and the wide replicability of the Project's outcomes.
243. Periodic Thematic Reports: As and when called for by UNDP, UNDP-GEF or the Implementing Partner, the project team will prepare Specific Thematic Reports, focusing on specific issues or areas of activity. The request for a Thematic Report will be provided to the project team in written form by UNDP and will clearly state the issue or activities that need to be reported on. These reports can be

used as a form of lessons learnt exercise, specific oversight in key areas, or as troubleshooting exercises to evaluate and overcome obstacles and difficulties encountered.

244. Technical Reports are detailed documents covering specific areas of analysis or scientific specialisations within the overall project. As part of the Inception Report, the project team will prepare a draft Reports List, detailing the technical reports that are expected to be prepared on key areas of activity during the course of the Project, and tentative due dates. Where necessary this Reports List will be revised and updated, and included in subsequent APRs. Technical Reports may also be prepared by external consultants and should be comprehensive, specialised analyses of clearly defined areas of research within the framework of the project and its sites. These technical reports will represent, as appropriate, the project's substantive contribution to specific areas, and will be used in efforts to disseminate relevant information and best practices at local, national and international levels.

245. Project Publications will form a key method of crystallizing and disseminating the results and achievements of the Project. These publications may be scientific or informational texts on the activities and achievements of the Project, in the form of journal articles, multimedia publications, etc. These publications can be based on Technical Reports, depending upon the relevance, scientific worth, etc. of these Reports, or may be summaries or compilations of a series of Technical Reports and other research. The project team, under the PC, will determine if any of the Technical Reports merit formal publication, and will also (in consultation with UNDP, the government and other relevant stakeholder groups) plan and produce these Publications in a consistent and recognisable format. Project resources will need to be defined and allocated for these activities as appropriate and in a manner commensurate with the project's budget.

Table 21: Indicative Monitoring and Evaluation Plan and Budget

Type of M&E activity	Responsible Parties	Budget USD <i>Excluding project team Staff time</i>	Time frame
Inception Workshop	<ul style="list-style-type: none"> Project Coordinator UNDP CO UNDP GEF 	\$10,000	Within first two months of project start up
Inception Report	<ul style="list-style-type: none"> Project Team UNDP CO 	None	Immediately following Inception workshop
Measurement of Means of Verification for Project Purpose Indicators	<ul style="list-style-type: none"> Project Coordinator will oversee the hiring of specific studies and institutions, and delegate responsibilities to relevant team members 	To be finalized in Inception Phase.	Start, mid and end of project
Measurement of Means of Verification for Project Progress and Performance (measured on an annual basis)	<ul style="list-style-type: none"> Oversight by Project Coordinator Monitoring and Evaluation Officer Project team 	To be determined as part of the Annual Work Plan's preparation.	Annually prior to ARR/PIR and to the definition of annual work plans
ARR and PIR	<ul style="list-style-type: none"> Project Team UNDP-CO UNDP-GEF 	None	Annually
Quarterly progress reports	<ul style="list-style-type: none"> Project team 	None	Quarterly

Type of M&E activity	Responsible Parties	Budget USD <i>Excluding project team Staff time</i>	Time frame
CDRs	<ul style="list-style-type: none"> Project Coordinator 	None	Quarterly
Issues Log	<ul style="list-style-type: none"> Project Coordinator UNDP CO Programme Staff 	None	Quarterly
Risks Log	<ul style="list-style-type: none"> Project Coordinator UNDP CO Programme Staff 	None	Quarterly
Lessons Learned Log	<ul style="list-style-type: none"> Project Coordinator UNDP CO Programme Staff 	None	Quarterly
Mid-term Evaluation	<ul style="list-style-type: none"> Project team UNDP- CO UNDP-GEF Regional Coordinating Unit External Consultants (i.e. evaluation team) 	\$30,000	At the mid-point of project implementation.
Final Evaluation	<ul style="list-style-type: none"> Project team, UNDP-CO UNDP-GEF Regional Coordinating Unit External Consultants (i.e. evaluation team) 	\$30,000	At the end of project implementation
Terminal Report	<ul style="list-style-type: none"> Project team UNDP-CO local consultant 	Funds are budgeted for local consultants to assist where needed	At least one month before the end of the project
Lessons learned	<ul style="list-style-type: none"> Project team Monitoring and Evaluation Officer UNDP-GEF Regional Coordinating Unit (suggested formats for documenting best practices, etc) 	0	Yearly
Audit	<ul style="list-style-type: none"> UNDP CO Project team 	\$3,000 per annum (12,000 total)	Yearly
Visits to field sites	<ul style="list-style-type: none"> UNDP Country Office UNDP-GEF Regional Coordinating Unit (as appropriate) Government representatives 	Paid from IA fees and operational budget	Yearly
TOTAL INDICATIVE COST		USD 82,000	

246. **Audit Clause:** Audit will be conducted according to UNDP Financial Regulations and Rules and applicable Audit policies.

4.2 Annual Project Report (APR) and Project Implementation Review (PIR)

247. The APR is a self-assessment report by project management to the country office and provides CO input to the reporting process and the Results Oriented Annual Report (ROAR), as well as forming a key input to the Tripartite Project Review. The PIR is an annual monitoring process mandated by the GEF. These two reporting requirements are so similar in input, purpose and timing that they can be amalgamated into a single report.
248. An APR/PIR is prepared on an annual basis following the first 12 months of project implementation and prior to the Tripartite Project Review. The purpose of the APR/PIR is to reflect progress achieved in meeting the project's annual work plan and assess performance of the project in contributing to intended outcomes through outputs and partnership work. The APR/PIR is discussed in the TPR so that the resultant report represents a document that has been agreed upon by all of the primary stakeholders.
249. A standard format/template for the APR/PIR is provided by UNDP GEF. This includes the following:
- a. An analysis of project performance over the reporting period, including outputs produced and, where possible, information on the status of the outcome.
 - b. The constraints experienced in the progress towards results and the reasons for these.
 - c. The major constraints to achievement of results.
 - d. Annual work plans and related expenditure reports.
 - e. Lessons learned
 - f. Clear recommendations for future orientation in addressing key problems in lack of progress.

4.3 Independent Evaluation

250. The project will be subjected to at least two independent external evaluations as follows: An independent Mid-Term Evaluation will be undertaken at exactly the mid-point of the project lifetime. The Mid-Term Evaluation will determine progress being made towards the achievement of outcomes and will identify course correction if needed. It will focus on the effectiveness, efficiency and timeliness of project implementation; will highlight issues requiring decisions and actions; and will present initial lessons learned about project design, implementation and management. Findings of this review will be incorporated as recommendations for enhanced implementation during the final half of the project's term. The organisation, terms of reference and timing of the mid-term evaluation will be decided after consultation between the parties to the project document. The Terms of Reference for this Mid-term evaluation will be prepared by the UNDP CO based on guidance from the UNDP-GEF Regional Coordinating Unit.
251. An independent Final Technical Evaluation will take place three months prior to the terminal Project Board meeting, and will focus on the same issues as the mid-term evaluation. The final evaluation will also look at impact and sustainability of results, including the contribution to capacity development and the achievement of global environmental goals. The Final Technical Evaluation should also provide recommendations for follow-up activities.
252. The project will be subject to two independent external evaluations. An independent external mid-term evaluation (MTE) will be undertaken 18 months after project initiation. The MTE will focus on making recommendations that will assist in adaptive management of the project and enable the PM to better achieve the project objectives and outcomes during the remaining life of the project. The final evaluation will take place three months before the project is operationally closed, prior to the terminal tripartite review meeting. This evaluation will focus on determining progress being made towards the

achievement of outcomes and will identify effectiveness, efficiency and timeliness of project implementation; highlight issues requiring decisions and actions; and present initial lessons learned about project design, implementation and management. It will also look at impact and sustainability of results, including the contribution to capacity development and the achievement of global environmental goals.

ANNEX A. PROJECT RESULTS FRAMEWORK: Logical Framework specifying the Project Goal, Objectives, Outcomes, Success Indicators, Targets as well as Assumptions and Risks					
<p>Applicable GEF Strategic Objective and Program:</p> <p>CCM-2: Promote investment in energy efficient technologies</p> <p>2.1 Investment in market transformation for energy efficiency increased</p> <p>Output - Energy Savings achieved</p> <p>CCM-5: Promote conservation of carbon stocks through sustainable management of land use, land-use change and forestry</p> <p>5.1 Good management practices in LULUCF adopted both within the forest land and in the wider landscape</p> <p>Output - Forests and non- forest lands under good management practices</p> <p>Output - Carbon stock monitoring systems established</p> <p>LD-2: Forest Landscapes: Generate sustainable flows of forest ecosystem services in drylands, including sustaining livelihoods of forest dependent people</p> <p>2.1: An enhanced enabling environment within the forest sector in dryland dominated countries</p> <p>Output - Types of innovative SFM practices introduced at field level</p> <p>2.2: Improved forest management in drylands</p> <p>Output - Suitable SFM interventions to increase/maintain natural forest cover in dryland production landscapes</p> <p>2.3: Sustained flow of services in forest ecosystems in drylands</p> <p>Output- Appropriate actions to diversify the financial resource base</p> <p>2.4: Increased investments in SFM in dryland forests ecosystems</p> <p>Output - Information on SFM technologies and good practice guidelines disseminated</p> <p>SFM REDD+1: Reduce pressures on forest resources and generate sustainable flows of forest ecosystem services</p> <p>1.2: Good management practices applied in existing forests</p> <p>Output - Forest area under sustainable management, separated by forest type</p> <p>1.3: Good management practices adopted by relevant economic actors</p> <p>Output - Types and quantity of services generated through SFM</p>					
Project Objective: To secure multiple environmental benefits by addressing the twin challenges of unsustainable utilization of biomass for charcoal and poor land management practices common in Uganda's Woodlands.					
Outcomes	KPI	Baseline	Target	Means of Verification	Assumptions and Risks
COMPONENT 1: Data collection and improved coordination and enforcement of regulations governing the biomass energy sector, in particular those related to sustainable charcoal					

Outcome 1.1: <i>Existing & ongoing policy, regulatory and institutional work on sustainable charcoal and land tenure security integrated with new biomass energy strategy (BEST) under development</i>	Biomass Energy Strategy (BEST) developed, validated, approved and in use. National charcoal survey and updated standardized baseline reports completed based on current data	BEST still in design form	Investment mobilized to implement BEST recommendations Standardized baseline accepted by UNFCCC	Budgetary estimates and allocation reports to MEMD. Ministry progress and development reports National charcoal survey published Standardized baseline report updated and accepted by UNFCCC	A. Continued government and donor support for BEST; regulatory work from SLM enabling project translates into actual regulations R. Donor support wanes due to governance issues
Outcome 1.2: <i>Improved coordination of institutions managing sustainable charcoal production at pilot district level</i>	Framework for institutional coordination and resource mobilization developed between MEMD, local government authorities and the National Forest Authority to manage charcoal trade at district level Charcoal by-laws including licensing procedures standardized and strengthened	Biomass energy mandate is distributed across many government agency with no focal point License fees not standardized	Biomass Unit funded in proportion to revenue collected from the sector & central government budget by year 3. Higher revenue collection by local administration from charcoal by the district by year 2.	Published budgetary estimates and allocations to unit and published district revenue records on charcoal production licenses District records and annual MEMD reports and Economic Review Reports	A: Political support for integrating sustainable charcoal into overall energy and development plans R: Charcoal associations formed and putting sustained pressure on local government
Outcome 1.3: <i>Improved data collection and monitoring of biomass energy and charcoal production and use (integrated into national database and for use as baseline information in a possible NAMA)</i>	Baseline report and functional biomass database established and hosted at MEMD and published in Uganda Bureau of Standards reports	Current database is uncoordinated, inadequate and unreliable	Updateable baseline and functional database established at MEMD and UBS by end of year 1	MEMD, UBS & MWE use data for planning purposes. Charcoal data linked to UBS Statistics and Economic review reports, as well as for use in baseline in a future NAMA	A: Ministry of Planning and Finance taking interest in charcoal; charcoal NAMA is selected for development R: Baseline is not regularly maintained and updated post-project

Outcome 1.4: <i>Improved charcoal and biomass guidelines and ordinances at district level</i>	Local guidelines and standards for certification schemes developed, adopted and publicized in targeted pilot districts ²²	Guidelines and standards non-existent	Guidelines and certification schemes developed and operational by end of year 2.	A model ordinance for one of the districts legislated and replicated in other districts	A: MEMD and MWE work in harmony to develop guidelines and certification schemes
Outcome 1.5: <i>Heightened awareness of new institutional frameworks and ordinances, guidelines and certification schemes at district level</i>	<p>Awareness and educational program on local guidelines and standards completed in all targeted pilot districts</p> <p>Updated guidelines for measuring biomass (CAI & MAI) calculated using the biomass study technical manual. The technical manual will be updated and revised by year 2</p>	<p>Inadequate and uncoordinated individual /NGO driven and project based programs</p> <p>Biomass measurement guidelines and technical manual are not in use. The technical manual is outdated.</p>	<p>Coordinated awareness campaigns completed in each district by end of year 3</p> <p>Biomass technical manual is updated and available for use by year 2. Updated guidelines developed and in use by year</p>	<p>Validated and approved awareness and educational programs published, with specific gender-sensitive materials developed</p> <p>Outreach and awareness materials developed</p> <p>PIRs and MTE validates increased awareness levels and use of updated guidelines and technical manual</p>	<p>A: The timing of the awareness campaigns are contingent on the completion of the guidelines and certification schemes being developed and operational by end of year 2</p> <p>The updated guidelines for measuring biomass and the revision of the technical manual should happen in close conjunction with and in sequence with activities under Outcomes 1.2-1.4</p> <p>R: Outcomes 1.4 and 1.5 are closely interlinked. If there are delays in Outcome 1.4 then Outcome 1.5 cannot be undertaken</p>
Outcomes	KPI	Baseline	Target	Means of Verification	Assumptions and Risks
Component 2: Financial incentives and roll-out of appropriate technologies (i.e. improved kilns) for sustainable charcoal production and SLM in selected (4)					

²² The targeted districts for this project are **Mubende, Kiboga, Nakaseke and Kiryandongo**

charcoal-producing districts established					
Outcome 2.1: Low-carbon charcoal production technologies have successfully replaced inefficient systems in targeted pilot districts	<p>60 sustainable charcoal cooperatives organized and operational²³ with 2,400 charcoal champions in pilot districts. Activities to meet this KPI will involve:</p> <ul style="list-style-type: none"> • Developing ranking criteria for categorizing charcoal producers or entrepreneurs • Conducting surveys to rank different actors into pre-determined categories • Training of all groups on local ordinances and standards for sustainable charcoal certification schemes as well as improved kiln technologies • Demonstration of Casamance kiln operation and viability to target group (total of 400 casamance kilns deployed) • Demonstration of retort kiln operation and viability to target groups (total of 200 retort kilns deployed) • MRV, tracking and licensing system established for all 	<p>BAU Carbonization Technologies = Earthmound Kilns @ 10% efficiency conversion</p> <p>Biomass Sources = non-renewable</p> <p>No widespread use of improved kiln technologies and those that are in use are not licensed or monitored</p> <p>Charcoal producers in target districts are not formally organized and do not have access to improved carbonization technologies</p>	<p>- 143,314 metric tons of wood saved over project lifetime from improved kilns compared to BAU scenario (14,431 hectares of avoided deforestation)</p> <p>Lifetime energy savings (compared to BAU scenario) of :</p> <p>- 1,843,200,000 MJ for Casamance kilns (avoided emissions of 210,816 tCO₂eq) ; and</p> <p>- 9,737,142,857 MJ for retort kilns (avoided emissions of 1,113,686 tCO₂eq)</p> <p>- additional lifetime avoided methane emissions for all retort kilns introduced of 252,000 tCO₂ eq</p>	<p>Documented records of 60 groups formed with membership information</p> <p>All participating charcoal cooperatives receiving kilns keeping records of wood use, batches, and charcoal produced from kilns</p> <p>Records confirm that at least 50% of all participating group members are women</p> <p>Monitoring, tracking and licensing system established for all improved kilns piloted with records kept at project level</p> <p>Amount of sustainably produced charcoal recorded by chief administrative officers in the local districts and DFS</p> <p>Amount of charcoal revenue recorded in the district.</p> <p>PIRs report on wood consumption (MT) from improved kilns for each participating group</p>	<p>Monitoring, tracking and licensing system are put in place and records kept</p> <p>Participating charcoal producers respond to improved kilns and do not revert back to inefficient practices</p> <p>Local administrative officers work closely with MEMD and charcoal producer groups to monitor and track improved charcoal production.</p>

²³ The charcoal cooperatives will likely be drawn from existing FAO APFS and FFS in districts where FAO is operational such as Nakaseke, Kiboga and Mubende; in Kiryandongo they will be formed in consultation with existing projects and structures already on the ground.

	<p>improved kilns piloted</p> <ul style="list-style-type: none"> All groups in compliance with certification standards (as per Output 1.4.1) 			CCM TT and MTE	
Outcome 2.2: <i>Sustainable charcoal recognized as a viable SME in pilot districts by end of project</i>	Delivery model to support consumer financing schemes for charcoal producing groups with local financial institutions established.	<p>No recognized charcoal production SMEs in target areas</p> <p>No organized charcoal producer organizations</p>	<p>60 charcoal producer associations with over 2400 members established and registered (15 in each district) and operating sustainable charcoal businesses by end of project</p> <p>Consumer financing schemes available for registered charcoal producing (CPA) associations by end of project. By end of project 20% of the registered CPA qualify for credit facilities from local financial institutions</p>	<p>All charcoal producer associations are registered and licensed with annual financial statements showing revenue and expenditures from operations</p> <p>Project reports</p> <p>TE validates that by end of project 20% of the registered CPAs working within the target area have qualified for credit facilities at local financial institutions</p>	<p>Government sub-policy on charcoal provides guidelines for legalizing sustainable charcoal enterprises</p> <p>Charcoal will continue playing a significant role in Uganda's energy mix</p>
Outcome 2.3: <i>Carbon finance is integrated into sustainable charcoal practice in targeted areas</i>	Basic Project submitted for registration to appropriate authority under an appropriate carbon development methodology in the Voluntary Market and/or a Sustainable Charcoal NAMA Design Document developed and endorsed	<p>No carbon finance projects in Uganda dealing with sustainable charcoal have been registered with a carbon authority</p> <p>No charcoal NAMA Design Document developed or submitted</p>	<p>Carbon Project successfully registered for carbon financing under Voluntary Carbon Standards by end of year 3.</p> <p>NAMA Design Document developed and endorsed by end of year 3</p>	<p>Appropriate carbon registry shows project has been registered</p> <p>Project reports and TE</p> <p>NAMA Design Document</p>	<p>Sustained interest in carbon finance projects by carbon buyers</p> <p>Price of VERs is favorable and provides incentive for development of a project</p> <p>Land owners to make land available for carbon project interventions</p>
Outcome 2.4: <i>Increased incomes for all charcoal</i>	Profit margin per output unit of charcoal produced with new technologies	Average income of a typical itinerant charcoal producer in	At least 5 CPAs in each district supply charcoal directly to large	District revenue records and charcoal business	Charcoal producer groups willing to invest in new technology and practices, and

<i>cooperatives involved in project</i>	increased by at least 20% per group (with new kilns) as compared to baseline scenario for all participating charcoal cooperatives	target districts established as baseline during year 1	wholesalers in urban areas	records Project reports and TE	organized production system
Outcome 2.5: Technical support for charcoal briquetting producers enhanced	Training and technical assistance provided to all briquetting businesses that are receiving loans from Micro-Finance Institutions in conjunction with CleanStart	CleanStart scoping mission documented that at present there are about 17 formal briquette makers in Uganda, receiving limited training and financial assistance A detailed baseline will be done as part of the CleanStart operations	The CleanStart business plan noted that the opportunity exists for the number of briquette producers to increase to at least 50 and daily production can easily be raised 8 tons to 50 tons per day. If confirmed the target would then be to provide training and TA to at least 50 charcoal briquetting enterprises by the end of the project A detailed baseline will be done as part of the CleanStart start-up and call for proposals with FSPs Emission reductions from TA for the briquetting enterprises will be developed once its confirmed whether the relevant FSPs will indeed provide loans for the improved machines	The monitoring and evaluation of this output will be done in close conjunction with the targets and verification platforms used in the CleanStart business plan, which is still in draft form. CleanStart will be tracking all loans from participating FSPs to briquetting businesses and in conjunction will track associated TA support to these same enterprises done under this output The C/S M&E framework will be harmonized with the framework for this project so both projects will track progress Project reports and TE	A: In the area of biomass energy applications, briquetting machines and institutional cook stoves have been identified as potential clean technologies for support by CleanStart in Uganda. Since the selection of technologies to finance rests with CleanStart's partner financial institutions, this output assumes that indeed the participating FSPs are willing to provide energy loans for briquetting machines and do not decide to choose other technologies instead R: That the C/S FSPs are not willing to deliver and provide loans for briquetting machines
Outcomes	KPI	Baseline	Target	Means of Verification	Assumptions and Risks
Component 3. Strengthening the capacity of key stakeholders in SFM and SLM best practices and establishment of sustainable woodlots					
Outcome 3.1: Strengthening the capacity of key stakeholders in SFM	Improved capacities of stakeholders in targeted districts to manage SFM and establish dedicated	No community or private woodlots for charcoal production in	By end of project: - Accumulated yields of	Local registry of private forests at district offices with names of farmers and the acreage of land	A: Private landowners are willing to allocate land for woodlots.

and SLM best practices and establishment of sustainable woodlots	<p>renewable biomass feed stocks. More specifically:</p> <ul style="list-style-type: none"> - At least 1,100 private woodlot owners in the four pilot districts identified, trained and contracted to make land available for woodlot establishment (minimum 5,900 hectares set-aside). - Training all communities/woodlot managers on new charcoal regulations and SFM best practices, including use of specified tree species and optimal ecological yield from such species. - Technical support provided to all woodlot owners on tree nursery management as an entrepreneurial activity with target to plant over 17.4 million seedlings²⁴ - Dissemination of over 17.4 million tree seedlings to woodlot owners²⁵ - Establishment of land use and forest management plans 	<p>targeted districts</p> <p>Degraded forests and agricultural land in the four districts</p>	<p>368,770²⁶ MT of renewable biomass produced over 5,900 hectares under woodlot management by end of project (year 5) and 1,475,083 MT of biomass accumulation over the lifetime.</p> <p>- Net avoided lifetime emission reductions of 2,699,402 tCO₂ of avoided deforestation compared to the BAU scenario from use of this renewable biomass in kilns compared to a BAU scenario²⁷</p>	<p>under tree plantation available for inspection.</p> <p>Reports from DFS & NFA confirming proper management of existing forest</p> <p>CCM and LD TTs, Project reports and MTE/TE</p>	<p>Funding mechanism is established to support private woodlots</p> <p>Chosen species are appropriate for the woodlots and achieve expected growth targets from seedlings</p> <p>There is adequate extension services</p> <p>Appropriate woodlot and silviculture management practices are adopted</p> <p>R: major climatic shocks or increased rainfall/drought could impact successful achievement of targets</p>
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²⁴ 3,000 tree seedlings will be planted per hectare at the recommended spacing of 1.5 x 1.5 metres bringing a total of 17.4 million seedlings to be planted across 5,800 hectares

²⁵ For more details refer to Project Document section 1.7.4 on Sustainable Forest Management and Opportunities for Charcoal Production

²⁶ See Section A.5 for detailed assumptions behind figure

²⁷ This figure nets out estimated BAU CO₂ eq emissions from deforestation activities for charcoal production in the four targeted districts – see Annex F

	(including zoning and mapping of forest areas) for all targeted woodlot areas - Contracts signed between woodlots owners and charcoal producer groups for feedstock supply				
Outcome 3.2: SLM/SFM knowledge effectively transferred from ongoing SLM Best Practices in the neighboring Cattle Corridor districts replicated in the four target districts	SLM/SFM knowledge effectively transferred from ongoing SLM projects ²⁸ in neighboring districts to four pilot districts for this project.	<ul style="list-style-type: none"> - Limited amount of land in targeted districts under SFM regimes or benefiting from SFM practices (baseline to be established during year 1) - 4,800 ha of land across four districts deforested each year for charcoal production - Conservation farming not widely practiced across target districts - Communities in targeted districts have not had exposure to the SCI-SLM approach or LADA tool - District Land Use Planning staff have little 	<p>By end of project:</p> <ul style="list-style-type: none"> - 50,000 ha of forestlands across four pilot districts brought under improved multifunctional forest management leading to enhanced carbon sequestration of 2,100,000 tCO₂eq over lifetime²⁹ - A least half of land under improved SFM registers reduction in land degradation by at least 20% as measured by reduction in soil erosion and improvement in soil organic matter - Conservation farming practices piloted leading to verified improved soil organic matter and yield increased across 400 hectares 	<p>Vegetation modeling done as part of carbon finance project MRV requirements</p> <p>Vegetation modeling and ABG stock assessments done by NFA</p> <p>Visual Soil Field Assessment Tool assessments and LADA WOCAT LD measurement tools (to be chosen and developed during the first year of the project)</p> <p>Verified increase in yields and organic soil matter for all CA plots (same M&E methodology as was used in UNDP DDC project framework)</p>	<p>A: There is stakeholder consensus and buy-in for all the targeted practices and knowledge sharing platforms</p> <p>FAO can provide key technical input into use of LADA and WOCAT methodologies and tools</p> <p>Continued political support for integration of SLM into Development Plans</p> <p>R: major climatic shocks or increased rainfall/drought could impact successful achievement of targets</p>

²⁸ The best practices to be transferred will be those from two other SLM projects operating in neighboring districts, namely the “Sustainable Land Management in the Cattle Corridor Districts of Uganda” a 4 year project which commenced in 2009 to 2014 and is funded by the Government of Norway through UNDP/DDC and the UNDP/GEF “Enabling Environment for SLM to overcome land degradation in the cattle corridor of Uganda” – for a description of best practices please see Sections A.5 and A.7

²⁹ As per GEF guidelines the lifetime is 20 years

		<p>knowledge of techniques that support community planning, implementation processes and land degradation assessment</p> <ul style="list-style-type: none"> - No detailed mapping of biomass stocks (both forestry and agricultural areas) done in targeted districts - No method in place to accurately measure and monitor land use change and deforestation in targeted districts 	<ul style="list-style-type: none"> - Community's indigenous knowledge of SLM enhanced using the "Stimulating Community Innovations (SCI-SLM) approach³⁰," to generate local solutions to land degradation - Land use planning (one each target district) done using FAO-LADA-WOCAT developed.³¹ - District Land Use Planning staff trained in the use of techniques that support community planning, implementation processes and land degradation assessment - Mapping completed of all targeted areas under sustainable forestry management as well as agricultural lands under SLM in collaboration with FAO and National Forestry Authority's new GIS/mapping platform 	<p>CCM and LD TTs, Project reports and MTE/TE</p> <ul style="list-style-type: none"> - Published and disseminated land use plans and District Environment Action Plans for each target district - Published new land cover map and statistics on forestry stocks and land use change published by NFA that includes meso-scale analysis of biomass stocks in the targeted districts 	
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³⁰ SCI-SLM stands for Stimulating Community Innovations centred on identifying innovative forms of land management within communities themselves (community generated solutions to land degradation). This included characterizing communities, validating their innovations, and improving them through joint experimentation with researchers and scientists and stimulating the communities to go forward with their efforts through farmer to farmer cross visits

³¹ The Land Degradation Assessment in Drylands (LADA) is a tool of FAO and has as part of its objectives to assess land degradation at local, national and global scale. In order to do so, the project has developed guidelines for each assessment level. WOCAT (World Overview of Conservation Approaches and Technologies) is an established global network of Soil and Water Conservation (SWC) specialists, contributing to sustainable land management (SLM). WOCAT's goal is to prevent and reduce land degradation through SLM technologies and their implementation approaches. The network provides tools that allow SLM specialists to identify fields and needs of action, share their valuable knowledge in land management, that assist them in their search for appropriate SLM technologies and approaches, and that support them in making decisions in the field and at the planning level and in up-scaling identified best practices.

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Background

This field report is part of the fulfillment of the United Nations Development Programme (UNDP) Contract number 2012/RLA/008 “Addressing Barriers to the Adoption of Improved Charcoal Production Technologies and Sustainable Land Management Practices through an Integrated Approach” for the baseline survey and the piloting of technologies. The project has involved information gathering using field survey methods, stakeholder consultation processes, training in the use of low carbon emission sustainable charcoal technologies broader sustainable land and forest management practices in the four districts of: Mubende, Kiboga, Nakaseke and Kiryandongo. The report covers activities as indicated in the amendment to the special service agreement No: 2012/133:

1. The focus group discussions
2. Directed structured questionnaires
3. Biomass estimation
4. Improved Retort and Kiln construction
5. Training charcoal producers on the operation of the retorts and kiln and collecting data on greenhouse gas (GHG) emissions

The field exercise is being guided by the approach below which involves:

- a) Establishing relevant baselines on the basis of charcoal trade
- b) Piloting efficient carbonization technologies (to reduce GHG emissions)
- c) Strengthening stakeholders’ capacity in SLM/SFM to ensure access to renewable biomass stocks
- d) Establishing a functional production-supply chain extending incentives for producers to adopt more sustainable practices

As per the contract and the description of services, this report covers parts one and two of the activity schedule. Activity one involved establishing baselines in four selected districts through individual interviews and focus group discussions has been completed as indicated in Annex I below. Three quarters of activity two have also been completed and work on activity three is in progress as indicated in Annex II.

RELEVANT BASELINES OF THE CHARCOAL TRADE

The Focus Group Discussion Exercises

The focus group discussions were held between the 7 December 2012 and the 25 January 2013. The exercise was meant to gather data from potential project actors and beneficiaries along the charcoal production chain in the target districts of Mubende, Nakaseke, Kiryandongo and Kiboga for inclusion in the project document and to corroborate the data with other sources. The participants included: policy makers at the districts, charcoal producers, private land owners, those in the charcoal business including traders and transporters.

DISCUSSION PROCEEDINGS

This section generally summarizes key responses and proposals from different actors along the charcoal production chain in all the focal Districts.

Policy concerns

In all districts, the respondents in attendance agreed that there were no guiding policies relevant to charcoal production. In Mubende, the district passed a by-law that due to the environmental challenges associated with its production, only those who had been issued with operating licenses had permission to operate. However, operationalizing the ban limiting production became difficult because charcoal production is one of the only few sources of revenue for district. It was observed that charcoal production provided employment for a significant section of voters who in turn pay taxes to the district. The by-law was never enforced and the district issues out licenses or temporal letters of authority to operate to some individuals.

In the district of Kiryandongo, authorities tried using punitive measures like the imposition of heavy taxes on charcoal production to stop people from taking up the activity. Nakaseke District has no plan to promote sustainable charcoal production. However, authorities are advocating for household tree planting to of at least 150 trees per household with the aim of ecosystem restoration.

“Enforcing the by-law of burning charcoal production became politically sensitive that it left the district to be like a barking dog that that hides its face from reality in its own home”.

*Chairperson, Production Committee,
Mubende*

It was found that Kiboga District has an act on general forest products. As a policy, every charcoal producer pays US\$700 per bag of charcoal produced. Since it was hard to implement, the same fee was imposed on a very bag of charcoal for each truck load as transportation permits. The district issues a policy of charcoal producers (burners) to pay US\$ 36,000 as a way of reducing their numbers to engage in charcoaling. As a way of promoting forestry, Kiboga District has introduced and helped its farmers take on farm income forestry at policy level. Though not in place yet, it was generally agreed that a policy that will lead to reduced losses during harvesting of charcoal, encourage and promote tree growth at the household level and proper monitoring by the district, will help to promote sustainable charcoal production along the cattle corridor.

To promote sustainable charcoal production, it was suggested that policies that do reduce waste of wood like encouraging the use of improved-efficient Kilns and partnering with NGOs to support tree planting including new adaptable species will help greatly. In other districts, particularly Nakaseke, sustainable land management practices will encourage sustainable charcoal production as it does not only affect the tree resources but also the environment where they grow in terms of fauna and flora and soil productivity.

In summary, in all districts, it was noted that there was no clear policy for sustainable forestry management which has enabled the “clean cutting” down of trees for agriculture and charcoal use without consideration for the future of the land and soil quality. Even with the significant revenue that is collected along the charcoal value chain, nowhere in any of the districts has anyone advocated for charcoal production as a business for the population. The data was clear that the forestry department only encourages the use of trees for timber, poles and the environment and not at all for charcoal even when more revenue is collected from charcoal than timber.

As there are no clear policies on charcoal production and sustainable forestry management and no monitoring systems in place. Absence of clear monitoring systems has resulted in tree cover loss because a significant number of the charcoal producers are outsiders (not natives of the target districts), which in part explains the rampant deforestation. Less thought is accorded to improving carbonization efficiency since most times charcoal producers get trees from landlords who are in immediate need of promoting pastoralism, hence need the land cleared as soon as possible.

Suggested Interventions

The data reveals that in all four districts surveyed, participants realized that charcoal production could easily be encompassed by National Agricultural Advisory Services Act (NAADS) programs, given the fact that trees and crops can co-exist in an agroforestry system. In Mubende District, respondents pointed out that they did not know why the NAADS programme left out forestry related activities even those these activities could have registered a lot of success in that area. Generally, respondents said there is a lot of potential for integration since farmers’ clear trees before establishing gardens.

According to Mr. Makanga from Nakaseke district, NAADS Phase Two is mostly concerned with service provision and therefore it may not be able to lobby for the growing of good tree species for charcoal production due to absence of technical expertise therein. Others argue that NAADS should be able to introduce at least exotic species such as eucalyptus, pine, etc., to contain deforestation as it eventually impacts on crop and animal productivity.

In Mubende, it was suggested that integrating fuel wood production in the NAADS programme will only work with residents that have enough land for tree planting for charcoal production but not through people who only come to mine charcoal and leave the district. For provision of labor, the landless charcoal producers and the non-resident business people should be allowed to operate only through permanent residents or who own land in the district and who are willing to uphold the principles of sustainable charcoal production. Thus, outsiders should not be given operational licenses except when they go through permanent residents who own land or have a letter of approval from the landlords. These individuals should be clearly designated “charcoal farmers” in the area.

It was further proposed that NAADS should have a tree planting component in its activities from which sustainable charcoal production can get the charge since it is also geared towards poverty alleviation without jeopardy to the environment. These trees could be integrated in gardens and in grazing land as shade trees and later selectively harvested for charcoal.

Land Use and Land Use Changes

Generally participants attested to the fact that there are no food security issues in their districts only that with time these could be a problem when there is shortage of land since the soil around the kiln is left unproductive after charcoal production. Currently this is not a problem largely because most of the charcoal is taken from relatively dry areas where certain food crops cannot grow. Food insecurity may only arise due to the ever increasing numbers of people entering these districts. The average landholding per district was found to be 2 – 5 acres. In the northern cattle keeping region of Nakaseke, land holding was approximated at 100-200 acres of land on average. The predominant land tenure systems were: customary, Mailo (free-holding) and lease. The current land tenure system in the project area provides

opportunities for tree farmers and charcoal producers who are non-native to the area to lease land from landlords and use it for establishing woodlots. In the case of Bibanja holders (lawful bonafide occupants) the Land Amendment Act 2010 has increased their security of tenure by empowering them to obtain certificate of tenancy which allows them to undertake long term development activities including tree planting. In February 2013, Cabinet approved the Uganda Land Policy. Approval of the land policy is major reform in the land tenure system. The policy provides that Uganda shall maintain multiple tenure systems as enshrined in the Constitution' and makes it clear that 'all land tenure systems will be defined in detail to confer social, economic, environmental and political security to land owners, occupiers and users'. These land reforms are expected to address hitherto tenure insecurity for tenants "bibanja" holders to invest in long term activities such as tree planting.

Through the GEF-Enabling Environment for SLM, a review of policy framework for sustainable charcoal production has been completed. Key recommendations of the report include development of a standalone charcoal regulatory framework, need to designate forest reserves as demonstrations for raising energy tree species, revision of the Local Government Act with a view of decentralising biomass energy management and strengthening staffing and capacity of the Division of Biomass Energy Management in Ministry of Energy and Mineral Development to continually improve and monitor the policy framework for biomass energy, introduce well targeted incentives to support SCP especially among land owners, private firms and Non-Governmental Organizations. These recommendations have been taken into account and informed the design of this project.

In the current land use system, areas where people prefer keeping cattle to charcoal production, expansive forests/pieces of land have been cleared to pave way for animal grazing farms. To compound the problem, the charcoal producers or charcoal burners are native to these districts and so are not as concerned with keeping the tree resource intact. These producers are mostly from Busoga and Mbale whose interests may be in cutting down as many trees as possible since they have no strong attachments to these districts. It is important to note that some land owners like Mr. Mafende in Nakaseke district have considered charcoal production as a business on a large scale and export charcoal to countries such as Rwanda. These entrepreneurs may easily have an interest in tree growing for charcoal production.

Carbonization Technologies

Like other Ugandan communities, participants have been carbonizing wood either through Kabasi, Kasisira or Kadinda. Although Kasisira gives best quality charcoal, Kabasi is preferred as it takes less labor to package and cover with soil while harvesting can be done slowly as the carbonization process continues. .

Charcoal Prices

At the production site, a bag of charcoal was found to be at US\$ 20,000 and between US\$ 30,000 – 50,000 a bag at market places like Matuga, Luwero, Mubende, Kiboga, Mityana and Kampala.

Challenges to the Charcoal Production Business in the District

The diminishing land sizes, due to a high rate of population growth coupled with the influx of people in the districts and the increasing need for agricultural land, threatens the existing forests; hence the need for immediate intervention (improving on the technologies currently being used).

It was found that the charcoal production business has the following challenges:

1. Absence of clear standards that result in the production of one bag of charcoal from two bags.
2. Lack of clear designated common markets in which case charcoal transporters are cheated by brokers commonly known as dealers since these have to link charcoal owners to potential markets and failure to use them will result into one staying with their charcoal for some time.

3. There are high taxes levied on charcoal almost at all levels right from the production site through transportation to the sub-county and district where the truck will pass including traffic officers by the road side. According to the charcoal businessmen in Mubende, the district imposed a heavy service duty on them. The district charges US\$ 800 for every bag loaded. This is in addition to the transportation costs to Kampala incurred by the businessmen.
4. Poor charcoal production methods. It was pointed out that the current production technologies are inefficient and lead to a lot of waste, low return, and poor quality charcoal.
5. During the dry season it is hard to cover the Kabassi or Kadindda charcoal kilns with soil leading to low production/yield and non-profitable businesses during that season.
6. Charcoal theft during the process of carbonization was reported.
7. Loss of life during production especially when people go on top of a kiln to cover it with soil, many times the soil is pulled inside and they get buried in the burning wood.
8. Poor tree harvesting methods
9. Poor transportation means

It was generally observed that participants had not heard about charcoal standardization, showing the age, tree species and source of charcoal, but very much welcomed the idea as it will help in controlling poor charcoal production methods. The charcoal value chain comprises the following actors: land owners, charcoal producers, managers, labourers, transporters, roadside sellers, brokers or middle man, and vendors/retailers. The brokers earn the most seconded by the retailers along the chain.

Challenges to Food Security as a Result of Charcoal Production

As indicated earlier, participants pointed out that though the poor technologies and unsustainable methods of tree harvesting have resulted in environmental degradation, generally there are no major food security threats as a result of charcoal production. On the contrary, it is the population increase and emigration that are threatening food security due to land shortage. To charcoal producers, money realized from the sale of charcoal helps them to buy food at home; they are food secure because of charcoal production.

District Sources of Revenue

The sources of district revenue included but not limited to the following:

1. Livestock
2. Trading licenses
3. Property tax
4. Service tax
5. Charcoal production
6. Motorcyclists (Boda Boda)

It was reported that the after charcoal production and woodland clearing, the main income source was livestock.

District Land Tenure System

Like other districts within the central region, it was pointed out the predominant land tenure system in the districts is that of Kibanjja (tenants). This type of tenure however, works on the principle that one only remains a Kibanjja holder if they are putting the land to “productive” usage. Under this arrangement, farmers are unable to practice fallowing since the fallowed land will be viewed as unutilized land by other farmers. Respondents suggested something needed to be done to allow fallowing, otherwise if left alone, the land will be grabbed by others. Because of this tenure system people continuously cultivate the land resulting in low agriculture production.

Modern Charcoal Production Technologies

Participants in the survey unanimously agreed that no modern or efficient carbonization methods have ever been introduced in their area. To many, sustainable charcoal production where efficiency could be improved to a tune of 30% from the usual 10% was a new concept. They had never had any training to that effect and were very anxious about the proposed new technology but willing to learn once given the opportunity. Due to a lack of exposure to alternatives, a perception that local technologies are cheaper and require less technical operational knowledge, inefficient traditional technologies of carbonization irrespective of the challenges in efficiency, labor requirement and time, have been employed.

Charcoal Marketing and Standardization

As reported by farmers, a bag of charcoal goes for different prices depending on the level of the person selling along the value chain. The only stable price is at the production site where a bag was reported to cost US\$ 22,000. A further analysis of the chain by participants brought up the idea that the (middle man) person who buys from the production site and sells to a seller in Kampala usually gets a better share per bag compared to the rest of the people along the chain. Most participants had not heard about packaging charcoal in boxes and supplying to clean markets such as supermarkets, however, they welcomed a standardization process to reduce cheating and the production of poor quality charcoal since all actors will have to adhere to the set standards. The most common tree species from which charcoal is made are indicated in the table below. In Mubende, from the tree species listed, *Blighia unijugata* germinates and grows faster than the others.

Table 1: Most common trees considered to give good charcoal

LOCAL NAME	SCIENTIFIC NAME
Nsambya,	<i>Markhamia lutea</i>
Mugali,	<i>Piliostigma thonningii</i>
Mukoola	<i>Combretum collinum</i>
Ndagi,	<i>Combretum molle</i>
Musita,	<i>Alizia coriaria</i>
Mukuzanyana	<i>Blighia unijugata</i>
Muyatti.	<i>Terminalia glaucescens</i>
Nzo	<i>Teclea nobilis</i>

Biomass Estimation Training

BIOMASS ESTIMATION

One of the motivating factors for farmers and business people is the ability to predict the yields and the profits of the business. The ability to predict the proceeds of an investment makes planning easier and meaningful. One can then plan for sustainability and improvement. Currently in the charcoal production business there is very little knowledge among the producers as to how to ensure sustainable commercialization of charcoal. Many times buyers and sellers are not aware of the value of the resource they selling or buying. Biomass estimation therefore becomes handy and timely in a business where people have never known how to ensure sustainability and financial planning.

During the field work exercises groups of selected farmers and leaders in a selected sub-county from the four selected districts were selected and trained in biomass estimation for natural forests and plantations. This was done to equip participants with skills for valuation of the tree resources. The purpose of this exercise was to test whether biomass estimation skills could be appreciated, retained and appropriately applied by these grass root farmers in the focal districts. The exercise was intended to:

- a. To facilitate the grassroots tree farmers with skill that will facilitate their own planning and investment in biomass production for charcoal

- b. To establish the possibility of data capture regarding at the production sites by the stake holders in the charcoal chain

The categories of people trained included:

1. Tree growers
2. Landlords
3. Tree buyers
4. Charcoal producers and
5. Sub-county extension staff responsible for production, environment and development.

The key parameter to resource valuation and realization of its commercial value is volume measurement. Participants were organized in groups not exceeding 20 people for maximum concentration and having a one-on one training from the team.

Training Proceedings

In all the four districts the training was started by making mention of the objectives and content and finding out farmers' expectations. This was to try and help the trainers orient the training information with explanations so that all participants were catered for. Among their expectations included the following:

- Getting more knowledge on management of the tree resource
- Learning better-efficient methods of charcoal production
- More clarity on quick-maturing tree species that are good for charcoal production
- How to save firewood and charcoal during cooking
- How to sustainably harvest trees while thinking of the future
- How to get a loan from the bank while waiting for the stage at which trees will yield better charcoal

One participant from Kapeke Sub-county in Kiboga district said “we have been thinking that bigger logs will help us get more bags of charcoal from our kilns. Yet these small ones yield a lot and if we use them we will reduce the number of labourers and eventually increase our profit margin.”

TREE GROWING AND CHARCOAL PRODUCTION

This session started by asking whether it was possible to grow trees and deal in charcoal production from such trees?

Participants responded by saying it is possible to carry out tree planting and engage in charcoal production since some of them were already doing it. However, they had a challenge understanding the stage at which maximum good quality charcoal can be realized from their trees or plantation. Participants were taken through training to understand the best size of the bole/stem that is good for charcoal. In a participatory manner it was revealed that on average, the best quality charcoal is from a tree of diameter ranging between 10 – 15 cm, measured from one side of tree bole to the other at the breast height (DBH) using a tape measure.

EFFECT OF AGE ON SIZE FOR CHARCOAL PRODUCTION

Farmers have been searching for bigger tree logs on the assumption that they will offer good quality charcoal. Normally such logs do take a long time to reach the stage at which charcoal producers find them; hence scaring them off from planting trees for charcoal. The training revealed that all good trees for

charcoal will take between 2 - 3years to attain the diameter that offers good quality charcoal. It was pointed out that if a relatively larger log of wood was harvested for charcoal it should be seasoned to allow its moisture content reduce considerably. Tree species like Ndagi, Nkola can be harvested by that time and then coppice faster the next season.

DETERMINATION OF TREE VOLUME

Through the training participants learned that tree volume (V) is a function of its height (H), and that the volume of one tree can help estimate the volume of the entire plantation provided the numbers of the trees thereof are known. Participants learned that depending on the tree height, they could stand about 10M away from the tree basal area then hold any piece of stick, pointer or mineral water bottle to look at the tip of the object to determine the corresponding height on the tree and mark it. While back at the 10M distance from the tree basal area, participants were able to view the lower end of the object at the starting point and then view the tip at the tree. It was found that the number of times the object is moved up multiplied by the distance between the first point at the basal area will give the tree height estimate.

This method was found to be very similar to the one most of the communities visited used. Most used a 12 feet long stick and then with their eyes divided the tree into segments equaling 12ft. the number of sections found on the tree is multiplied by 12 to get the total number of feet on the tree, hence its height in feet. When the total number of trees in the plantation or a section bought from a landlord is established, their volume can then be established by multiplying the volume for a single tree with the total number of trees in the plantation or section.

Determination of Tree Volume for a Plantation

Here farmers came to know that determination of tree volume from a plantation is easier than it is for a natural forest. In a plantation the number of trees per unit area vary by the distance between them, which is always dependent on the purpose for which the trees were planted. The number of trees per acre can be determined or estimated depending on their spacing (within a row and between rows). Participants were instructed that, keeping all other factors constant, an average tree size whose height and volume is measured can be used to assume the whole plantation's height. The same is true for the diameter which can be assumed to be the same for all the trees at breast height. This will be multiplied by the volume for a single tree to get for the biomass for the whole plantation.

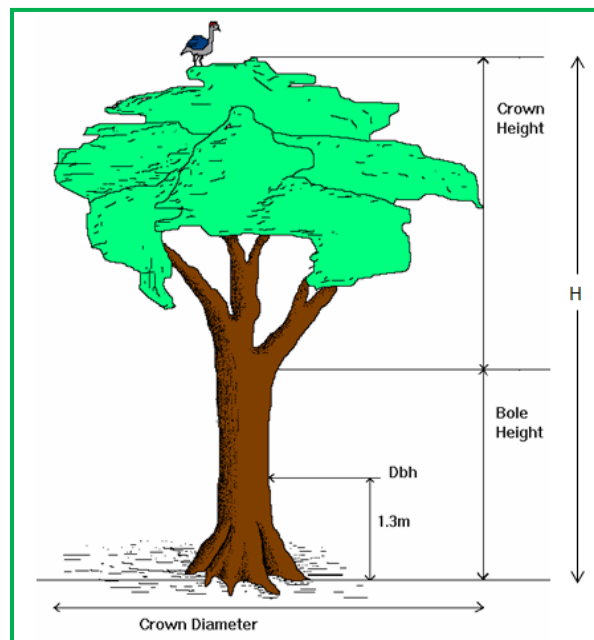


Fig. 1: Height and diameter measurements

How to determine tree volume for a natural section (bought from a landlord by a charcoal producer)

The principle is the same as above, however, participants were taught that for a natural section whose volume is to be determined say a square mile (SM) will first be divided into sections of trees with some uniform growth (mainly for height and common average diameter). If that is done the volume of one representative tree is multiplied by the total number of trees in a particular section. Participants appreciated the zoning or mapping the land from which trees for charcoal production were bought into sections as a sustainable method. It was revealed that trees from a particular section could be cut down, billets left to dry before carbonization after which another section depending on the plan and arrangement by the buyer is then cut for the next carbonization process. If the only interest is in knowing total volume of trees in the square mile that the total sum of the individual plot/section volumes will give that of the SM. This means that even within the same SM, trees can be managed sustainably and harvested selectively depending on the established DBH.

Volume Calculations

Generally tree volume was calculated from the general formula;

Tree volume (m^3) = Tree Basal Area (m^2) X Tree Height (m); this formula may change little depending on the general shape of the tree as whether it is cylindrical or conical. For cylindrical trees: Tree volume (m^3) = Tree Basal Area (m^2) X Tree Height (m) /3. For cylindrical shaped trees: Tree volume (m^3) = Tree Basal Area (m^2) X Tree Height (m) /2. Participants were told not to memorize the formula as the manual would be placed at the sub-county level with technical people.

Biomass Determination and Estimation of Charcoal Yields

Participants were told that the sub-county technical staff on environment and the Community Development Officer would be able to determine mass of the tree from the density of wood. Mass of wood in the plantation at a given age (kg) = Density of wood (Kg/m^3) X Volume (m^3).

From the efficiency of the kiln being used, local or retort, participants were taken through how the mass obtained can then be converted into charcoal kilograms. For a local kiln, participants learned that for every 100kg of wood carbonized only 10 kg of charcoal are obtained. For sustainability of the wood/tree resource, it was compared to the retort, which on average yields 35kg of charcoal from 100kg of wood carbonized. Taking the estimate of 50 kg of wood per bag of charcoal, participants were able to estimate the number of charcoal bags expected from a particular block/section of trees or plantation.

IMPORTANCE OF BIOMASS ESTIMATION



Fig. 2: Types of trees planted

Many participants had a problem of engaging in tree growing for charcoal production, but through biomass estimation, it is clear they can be able to acquire a loan from the bank and other financial institutions given that the value of their resource can be estimated. Participants were told that after the first cutting, as trees sprout or do coppice, care should be taken to keep the coppices within the carrying capacity of the area, which is mainly dependent on the size agreed upon to be giving good quality charcoal, that is; between 10 – 15 cm. the number of sprouts per tree stump should be able to promote sustainable charcoal production.

FACTORS AND PRACTICES FOR SUSTAINABLE CHARCOAL PRODUCTION, MARKETING: THE VALUE CHAIN ANALYSIS

INTRODUCTION

Among the characteristics of many rural areas are a weak infrastructure, low cash income, low skill levels, limited services and irregular supplies as well as particular social political structures which can hamper the access to resources or their effective utilization in the creation of sustainable income (Hulscher, 1991). These characteristics are predominant in the targeted charcoal producing communities and they constitute challenges to the promotion of sustainable charcoal production. For successful promotion of sustainable energy technologies, the proper identification of the combination of technology and target group is a major determining factor. In a number of cases, for rural energy technology innovations to diffuse, there is a need for a support structure in terms of skills and equipment.

The majority of charcoal producers in the selected districts are subsistence farmers. Todaro (1991), defined subsistence farming as farming in which production is mainly for “own consumption” and is characterized by low productivity, high risk, application of the simplest traditional methods and tools and high uncertainty. In such circumstances, the main motivating force in the peasant’s life may be the maximization, not of income, but survival. When the production intention is survival and not improving income, then adoption of improved methods and technologies for production is most unlikely. This is because the tendency in such circumstances will be to practice what is well known by the farmer or producer. A new product therefore, that requires reallocation of resources, will be perceived as risky. “In economic statistics, farmers are likely to prefer a technology that combines a low yield with a low variance, to the alternative technology that may promise a higher yield but also present the risk of unpredictable variance” (Todaro 1991).

Development of a Charcoal Value Chain

Improving the stability and the predictability of the investment climate, the returns on investment and making the implementation of regulations established by national and local governments more supportive, is crucial for reducing real and perceived risks by the potential investors, which motivates investment in sustainable technologies for charcoal production. The development of a charcoal value chain is an attempt to increase producer incomes by meeting the demands of consumers through coordinating the sequence of production stages in the chain that will be marked by predictable value growth at every stage. The major stages include: Wood production, charcoal production, charcoal trade and charcoal consumption. The charcoal value chain development will define and indicate how the support functions such as promotion of technology, financial services, packaging and market research to improve product quality, promote economic opportunities and market access will be applied.

VALUE CHAIN ANALYSES

The value chain analyses will borrow from the framework for charcoal sector policy design and implementation by Sepp (Undated) and the analytical framework for the charcoal chain (VanBeukering, *et al.* 2007). The analyses will consider the following value creating stages/activities of the chain: Biomass production, charcoal production, charcoal trade and charcoal consumption. The frame of analysis will include: Socio-economic characteristics and technology.

Table 2: Wood Production

SOCIAL CHARACTERISTICS		BIOMASS PRODUCERS		RECOMANDATIONS/COMMENTS
		Natural Forests	Planted Trees	
		(No. of Resp. 24)	(No. of Resp. 20)	
Gender	Men	83.3%	85%	Wood production is dominated by men. For sustainability, there is need to shift wood production to women who dominate agricultural production.
	Women	16.7%	15%	
	None	4.2%	0%	
Education	Primary	8.3%	33.3%	Land ownership is shifting to the more educated. This creates the opportunity for the introduction of more productive technologies for wood production or change of land use practices for increased wood production.
	Secondary	16.7%	25.0%	
	Tertiary	20.8%	20.8%	
	University	50.0%	20.8%	
ECONOMIC CHARACTERISTICS				
Source of House Hold Income	Agriculture and Business	54.2%		For the forest owners, forestry contributes very little to household income. There is need for demonstration that forestry and particularly trees for charcoal production can be a profitable investment. Natural forests can be managed in a very profitable way and yet biodiversity and other eco benefits are maintained.
	Employment	16.7%		
	Forest Produce	29.2%		
Reasons for the	Unclear	12.5%		For forest owners land clearance is mainly for agricultural

Charcoal Activity	Clearing Land For Charcoal	16.7%	expansion. Charcoal production is not taken seriously as an investment. There is need for creation of an environment that will project sustainable charcoal production as a profitable venture just like agriculture.
	Clearing Land For Agriculture	70.8%	
Availability of Land that could be used for Charcoal Production	Unclear	16.7%	Tree growers are willing to commit their land for sustainable charcoal production if supported. Provision of the appropriate technologies like seedlings, extension services and financial services, will enhance tree production for sustainable charcoal.
	7.00acres	8.3%	
	1-100 acres	62.5%	
	301- 400 acres	12.5%	

Table 3: Charcoal Production

SOCIAL CHARACTERISTICS		CHARCOAL PRODUCERS (%)	RECOMANDATIONS/COMMENTS
Gender	Men	89.5	The charcoal production sector is male dominated. This could be attributed to two reasons: <ul style="list-style-type: none">• Technology is not gender responsive, requires excessive manual labor• The majority of charcoal producers do not own the land from which the charcoal is produced. Out of 124 respondents, only 21% owned the land and 7% were not clear. This scenario is unlikely to motivate investment in eco-friendly technologies.
	women	10.5	
Education	None	28*	Charcoal production is dominated by people of little education (80%). Access to information and appreciation of technology is therefore very low. There is need for introduction of low cost and high efficiency production technologies with associated support structures and investment in training to ensure adoption.
	Primary	52*	
	Secondary	9*	
	Tertiary	10*	
	University	1*	
*Source of this data is Kazoora <i>et.al.</i> (2010)			
ECONOMIC CHARACTERISTICS			
Monthly Income	USh	%	These are predominantly poor without capacity of investment in high cost efficient and eco-friendly technologies. An appropriate financing mechanism is a prerequisite for sustainable technologies to diffuse. Out of the 124 respondents 50.8% indicated that charcoal was not their main source of
	<100000	8.9	
	100000- 200000	29.3	
	200000- 400000	22.8	

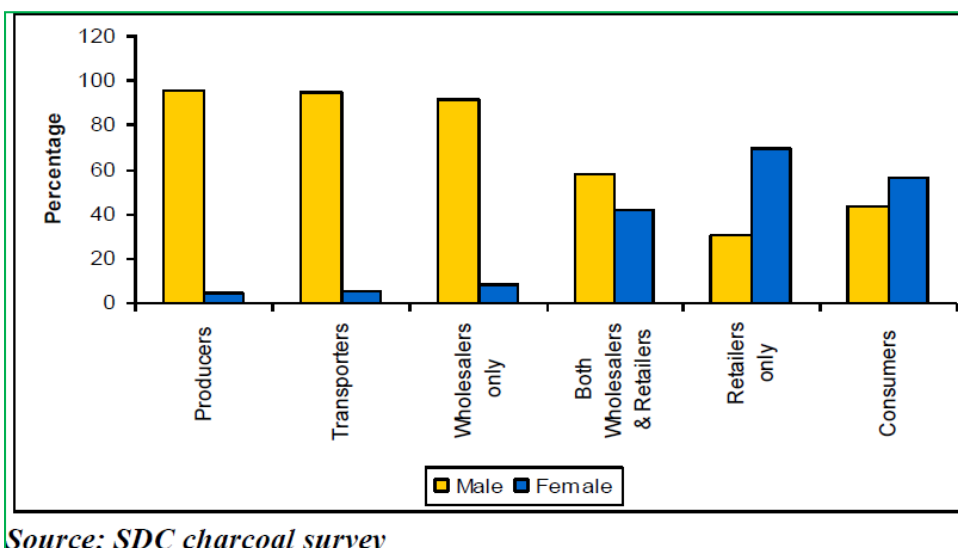
	400000- 600000	18.7	income. 47.2% indicated they did not see themselves in the charcoal industry five years from now. This creates challenges for programmes that aim at investing in sustainable technologies and practices.
	600000-800000	7.3	
	>800000	13.0	
Total Land Available to Household	Land Size	%	Majority of charcoal producers do not have adequate land. Promotion of agroforestry and improved fallow is the way to keep these producers in the sustainable charcoal industry. 41.9% of the respondents indicated they practice fallowing from one to over five years.
	<5 acres	64.0	
	5- 10 acres	14.4	
	10- 15 acres	.9	
	15- 20 acres	2.7	
	20- 25 acres	2.7	
	> 25 acres	15.3	
Source of wood	Source	%	<p>Comment: Predominantly the source of wood is the natural standing forests. The species that produce dense charcoal are preferred because the major application of the charcoal fuel is cooking; either for domestic or commercial in restaurants and hotels. The species commonly used in the target districts are; <i>Markhamia lutea</i>, <i>Piliostigma thonningii</i>, <i>Combretum collinum</i>, <i>Combretum molle</i>, <i>Alizia coriaria</i>, <i>Blighia unijugata</i>, <i>Terminalia glaucescens</i> and <i>Teclea nobilis</i>. Due to high demand, these species are disappearing at a very high rate. Alternative fast growing species should be introduced.</p> <p>Recommendation: Among the fast growing species common in all the target districts is <i>Markhamia lutea</i>. Currently it is planted mainly for poles, but it could be promoted for charcoal as an agroforestry tree or as a plantation tree. The other preferred tree species as listed above may take up to 20 years to mature, but coppice very well after maturity. Coppices can be harvested every three to four years. Selective harvesting and enrichment planting can ensure sustainability. Promotion of land use practices that encourage integration of cattle and fuel wood trees is a viable intervention.</p> <p>Bamboo which is abundantly and commonly available in the country is specie that has very high potential for charcoal production. It is fast growing and a highly renewable resource; unlike timber, it can be harvested every year. Bamboo makes excellent charcoal with high potential meeting both rural and urban energy needs for heating and cooking, as a commercial cooking and heating fuel, as an industrial fuel, and also for making products such as activated carbon.</p>
	<i>Natural Forest</i>	41.2	
	<i>Farmland</i>	41.2	
	<i>Communal Land</i>	5.9	
	<i>Savannah woodland</i>	11.8	
Production	No. of Kiln Runs	%	<p>Comment: The demand for charcoal as a domestic fuel is still very high as it is a generally preferred fuel for cooking and barbecuing even to paraffin and LPG. The issue of demand for charcoal quality therefore</p>

	1	60.2	has not been a critical need. Production has been dominated by small scale charcoal producers who carbonize on average once a month with modal production between 20 and 40 bags of 75kg. <u>Recommendation:</u> The technology promoted should take this production level into consideration. As wood fuel resources and capacities increase, technologies that match the needs of the producers will gradually be introduced. There should be consideration for introducing technologies that produce for specialized industrial markets. This will increase awareness to issues of standardization and the needs of consumers. Charcoal is still the most valued reductant of the metallurgical industry especially in the reduction of silica to silicon
	2	26.3	
	3	7.6	
	4	2.5	
	5	1.7	
	6	.8	
	8	.8	
TECHNOLOGY			
Carbonization Technologies	Earth Mound	Tones	Production is predominantly rudimentary technology and only targets the cooking and heating market. There are no improved practices.
	113 (96%)	3 (2.6%)	
Wood fuel preparation	Billet Size	Huge billets are predominantly used. This makes transporting the billets very expensive, hence the need for a mobile carbonization kiln. The use of big billets also leads to enormous losses due to the production of large quantities of charcoal fines resulting from the stiff thermal gradients during pyrolysis. When the wood is grown, smaller billets that give less charcoal fines and thus giving higher yields will be used. These can easily be transported especially in the case of small scale production that are predominant the charcoal producers. The application of the fixed and more efficient brick retorts becomes possible and affordable.	
	Moisture Content	Green wood is frequently used because of the requirements by the tree owners. The land owners want the land to be cleared quickly for agriculture or cattle. This becomes extremely wasteful since green wood will contain so much water entrained within the cell and will require so much wood for drying the wood for carbonization and at the same time because of the stiff thermal gradients, the ‘Dowell Bursting’ effect will cause large amounts of charcoal fines. <u>Recommendation:</u> Wood preparation should be demonstrated and standards should be set.	
	Specie mix during carbonization	Specie mix during carbonization very common. Different species have different chemical and physical compositions, this leads to different carbonization characteristics and rates. When different species are mixed, it will lead production of excessive charcoal fines and at the same time un-carbonized pieces of wood.	

Table 4: Charcoal Marketing

MARKETING		%	RECOMANDATIONS/COMMENTS
Transportation			
Gender	Male	95	This appears to be the case because mainly the drivers were interviewed. But if the owners of the trucks had been interviewed, the percentage of female transporters would rise. On the whole, the transporters are not organized. The transport structure needs organization.
	Female	5	
Employment	Full time transporters	50	Charcoal transport is dominated by tracks especially to Kampala, but occasionally charcoal is transported by other modes as well. 1. Bicycles are often used where the markets are within short radius, 2. Public vehicles transport charcoal on return routes from official assignments 3. Drivers of commercial vehicles transport charcoal on return routes of their deliveries at extremely below market prices.
	Part time transporters	50	
Education	None	19	The rather significant percentage of university and tertiary graduates getting involved may be attributed to the quick money that the activity provides.
	Primary	35	
	Secondary	29	
	Tertiary	11	
	University	6	
Cost of Transport	The areas surrounding major towns are deforested and or highly degraded, which means that charcoal must be transported for long distances. To cut down on the transport costs, the practice is to overload and this compromises the quality of charcoal. The trucks used are mainly very old and in bad mechanical conditions. This results in high fuel consumption making the final useful energy to be very expensive.		
Packaging	<u>Comment:</u> In all cases the packaging is the gunny bag. Because charcoal is friable, the overload coupled with the poor roads from the charcoal production sites, ends crashing the useful charcoal to powder and fines. Between 15 - 35% of a 70kg bag of charcoal in Kampala are charcoal fines which are normally regarded as waste. <u>Recommendation:</u> There is need for better packaging such as the use of three ply boxes wooden compartments on the tracks to avoid charcoal crashing under its own weight. Charcoal could be transported in the gunny bags on bicycles to a central point (a charcoal market) within the sub-counties. It should be mandatory, as is the case for cattle markets, that charcoal should be sold at a central place. At this point the re-packaging into boxes could be done. Then all the charcoal fines and powder could be converted into briquettes at this point and also packed in appropriate boxes. This will save the waste that creates an urban disposal problem, by converting waste into useful fuel yet rural employment will be created.		

Wholesaling and Retailing	<p>Comment:</p> <ol style="list-style-type: none"> 1. Charcoal is not sold by mass or specific standardized volume. It is by observation and depends on appearance and the person selling. There are standardized packages and no labels; meaning the source cannot be traced. 2. It is difficult to know the actual quality (including amount of charcoal fines per bag) and quantity. Bags vary sometimes widely as to the amount of charcoal fines (From 15kg to 35kg) depending on the tree species or mix of tree species used, carbonization practices employed and handling after carbonization. It is difficult for the retailer to predict profits ex-ante. 3. The supply structure is not organized which creates an information gap. This has created a group of people called “dealers/brokers” whose job is to connect the wholesaler to the retailer. They determine their own fees and they ensure that one cannot sell without them. This makes wholesalers vulnerable and leads to challenges of taxation.
Consumers	<ul style="list-style-type: none"> • For consumers that buy full bags, it is difficult to determine the actual quantity and quality of charcoal they buy. It is therefore difficult to determine value for money. There is need for standardization to protect the consumers. • The conversion technologies are predominantly very inefficient.



Source: SDC charcoal survey

Fig. 3: Distribution of respondents in chain of charcoal enterprise by gender

TECHNOLOGY TRANSFER MODELS FOR FOREST OWNERS

INTRODUCTION

Miranda et al. (2010), in their lessons learned, observe that economic benefits are the driving force for sustainability of commercial wood fuel production. This was also observed by Sanchez (1995) who noted that for agroforestry to be sustainable, it should be able to put money in farmers' pockets. Sanchez argued that availability of markets for fuel wood could be one of the crucial elements for determining diffusion and adoption of tree planting technologies. Miranda et al. (2010) further observed that scarcity of wood products spurs reforestation. This implies that the scarcity of tree products increases the economic value of remaining forests. This increased value in turn directly translates into better forest management and the establishment of woodlots and tree plantations. However, there are several barriers to sustainable charcoal production.

Despite government acknowledgment that biomass energy consumption accounts for more than 90% of the total energy consumption, charcoal and other biomass are regarded as traditional, backward, ecologically risky and even illegal energy sources. They are generally shunned and because of necessity and lack of appropriate alternatives, charcoal production and marketing is left to the informal sector. There is a general lack of coherent and appropriate policy to ensure sustainable charcoal production. Relevant policies that would address sustainable charcoal production are fragmented; they overlap, and result in unnecessary additional transaction costs. Policy coherence, consensus, and commitment in the wood-fuel sector suffer from insufficient open discussion of policy options (Sepp, Undated). Additionally, the authority and jurisdiction of relevant ministries and agencies (Energy and Environment) lack clarity, with the result that some encroach on the others' 'terrains.'

The result of this state of affairs has been the dominance of small-scale self-help project type approaches as opposed to national strategic and concerted efforts. The key barriers to a sustainable charcoal production sector therefore include the following;

Absence of a Nationally Driven Biomass Energy Research Agenda

In order to accurately capture and analyze information regarding to biomass energy production issues, access to charcoal as a fuel and consumption including cost, gender related concerns and climate change impacts, a national research agenda is imperative. The fact that these factors are very dynamic makes consistent innovation and creativity unavoidable. This therefore calls for well-established and adequately funded research institutions that will both monitor and generate timely knowledge for appropriate interventions and responses.

Lack of Relevant Charcoal Data along the Charcoal Value Chain

Both the directed structured interviews and focus group interviews indicate that there is no reliable mechanism for capturing charcoal data along the value chain. This makes planning for the charcoal sector impossible. Shaping policy presupposes reliable baseline information as a precondition for rational decisions. Past assumptions and predictions by national and international organizations regarding wood-based fuels were disproven in many cases (Sepp, Undated). This could explain the lack of capacity and interest by the government in formulating effective policy for the sector. The sector therefore is perceived negatively with some authorities including the police generally treating it as an illegal activity. Some of the consequences have been:

- a) Although charcoal is one of the key sources of revenue to the local governments and at the same time a source of employment and income to many households, it is generally perceived as an illegal activity by the authorities. During the focus group interviews in Nakaseke, it was reported that the charcoal sector contributes more than 70% of the District revenue collections. But because the charcoal sector is largely informal with many unchecked taxes both official and unofficial, the taxes to be collected were not clear to the actors along the chain. This was expressed clearly during the

focused group discussions in Mubende. In addition to the confusion in taxation, out of the 124 charcoal producers interviewed 41 (33.1%) reported that money is extracted from them in bribes and that this leads to low profitability to the actors along the chain and also reduced revenue collections. This effectively makes charcoal production unattractive to many potential investors.

Table 1: Respondents who confessed to have paid a bribe

Bribe	Frequency	Per cent
Yes	41	33.1
No	83	66.9
Total	124	100.0

- b) Due to the lack of data and information, development of the relevant support structures, institutions and correct infrastructure becomes difficult.

Lack of Standards for the Biomass Sector

The lack of standards in the sector has hindered market development and a formal market infrastructure is grossly lacking. It is therefore very difficult plan, regulate and effectively monitor the charcoal sector. This makes charcoal production and marketing difficult to finance and to collect revenue. Formal banking institutions are always reluctant to provide financing for actors in the sector.

Table 2: Reasons for failure to get loans

Reason for failing to get loans	Frequency	Per cent
Did not apply for loan	114	91.9
No security	4	3.2
Charcoal Business not first priority for loan	3	2.4
Charcoal business not dependable	2	1.6
Total	124	100.0

Lack of Relevant Business and Technical Skills

The actors in the sector lack business and technical skills. Technology issues are therefore not easily understood. This also makes access to information and communication very difficult. Access to appropriate efficient conversion technologies is hampered and makes their diffusion very difficult. The actors in the value chain do not know their rights and obligations, which makes them vulnerable unscrupulous state actors.

TECHNOLOGY TRANSFER

The role of technology transfer is to effectively and efficiently disseminate products and technical information to forest owners for long-term improved sustainable forest management that leads to ecologically sustainable charcoal production. For this to happen, mechanisms and the infrastructure to facilitate technology transfer must be in place. The following are the prerequisites for a functional technology transfer mechanism:

The Charcoal Production, Marketing and Monitoring System (CPMMS)

The need for accurate and timely data is a prerequisite for planning and implementing technology transfer. For an innovation to be accepted, it must be compatible. Compatibility is the degree to which the innovation is perceived as being consistent with existing values, norms, past experiences and the needs of the potential adopter. Its relative advantage must be clear to the adopters. According to Rogers (1983), relative advantage is defined as the degree to which an innovation is perceived to be better than the innovation it tries to replace and is measured in either economic profitability or a contribution to subsistence needs like convenience. For the planners to ensure that the technology they are transferring is both compatible and with a clear advantage, they should have access to reliable and timely data/information. This will be necessary in the formulation and implementation of measures for market transformation to ensure that the technologies being transferred get the clear advantage to motivate the farmers. The charcoal production and marketing monitoring system will be structured as follows;

i. Standardization and Market Transformation

Market transformation is the strategic process of market intervention which aims to alter market behaviour by removing identified barriers and leveraging opportunities to further the internalization of cost-effective energy efficiency as a matter of standard practice (Wikipedia, 2012). Standardization is one of the effective tools for market transformation and is a prerequisite for charcoal production to be environmentally clean and sustainable, Standardization should:

- Take into account the source of the charcoal (the name of the farmer or producer, the size of his forest or plantation and if plantation when it was established)
- Specify the tree species and their age at which they were harvested before conversion into charcoal
- Should specify the charcoal conversion technologies (including preparation of billets; size and moisture content and kiln/retort technology used).

This information should be captured on a label put on every charcoal package on any market as a requirement to facilitate traceability. The standardization plan should therefore look at enrichment planting and or woodlot establishment/tree planting for charcoal production and the improved charcoal production processes. The standardization process will entail identifying farmers that have access to land which is currently either under crop, animal production or fallow, which could be used for tree production without affecting food security and income for the household. The farmers should at the same time be willing to invest in improved charcoal production technologies.

ii. Develop Capacity for Biomass Estimation at the village Level

During the field work exercises, two groups of selected farmers and leaders in a selected sub-county from the four selected districts were trained. The first group was trained in biomass estimation for natural forests and plantations. The second group was trained in wood preparation for carbonization and kiln and retort operation during carbonization. The purpose was to test whether those skills could be retained and appropriately applied by the trained groups. So far the findings are that the skills can be applied at that level.

For the communities to capture and record the necessary data and information, capacity to estimate standing biomass at the level of the household has to be created. This will involve training the local council members at the LC I, especially the secretaries for the environment, youth and women. The local council officials should be trained in skills for biomass estimation (for natural forests and plantations) and improved charcoal production techniques. At this level there should be a register of farmers who produce fuel wood for charcoal production. Land tenure, size of landholding and size of land committed to tree production for charcoal, species planted and therefore expected yields should be specified at this level. It should be a requirement for every farmer participating in commercial fuel wood and charcoal production to get the

details of their farm registered. This information should be periodically updated and submitted to the responsible officers at the sub-county.

iii. Software Development

User friendly software that is able to capture the charcoal production data and information can be developed. The responsible officers at the sub-county and the district could be facilitated with solar powered computers to capture the charcoal production information. With the country wide coverage mobile networks, computers could be provided with modems for uploading information and data along the charcoal chain to the districts and at the MEMD. As the local council secretaries submit data and information from the farms, the expected charcoal production levels can be captured. The use of the software should be concerned primarily with: capturing data on land acreage to be planted with tree species, number of households participating, plantation sizes, charcoal production technologies, saving/absorption of carbon dioxide and the location of plantations.

iv. Establishing Charcoal Markets

Like the case for livestock, special market areas within the sub-counties should be gazetted. The name of the charcoal producer and the standards of the charcoal sold in these markets should be specified (like the tree species used, evidence of conversion technology employed and quantity of charcoal). This information should be provided by the responsible local council secretary in the form of labels on the charcoal bags and corroborated with the information submitted at the sub-county.

The traders in charcoal and fuel wood should only be allowed to buy charcoal from these established centers. Repackaging and branding of charcoal in more appropriate materials for transportation and standardizing (e.g. by mass) could take place at these centers. When charcoal is packed in polythene bags and transported on trucks, huge amounts of charcoal fines are generated. A charcoal vendor in Bukoto in Kampala indicated that depending on the quality of charcoal, one bag of 70 kg could generate up to 25kg of charcoal fines. When charcoal is packed in proper boxes, there will be no fines generated as a result of transportation and handling.

Charcoal Fines at the Vendors Kiosk

Farmers should register and be members of the charcoal centers. The registration of sustainable charcoal producers should therefore also indicate/allocate quarters depending on the size of land and expected biomass yields for charcoal production for every registered farmer. This will be verified by the district forest and environment departments before the issuance of production permits. No farmer should be allowed to sell beyond the allocated quarter on the exclusive market.

APPROACH FOR TECHNOLOGY TRANSFER

When the relevant infrastructure and institutions for sustainable charcoal production are in place, the following steps are suggested:

Charcoal Development Guidelines

Charcoal production creates both risks and opportunities in the target areas. By understanding, planning for and adapting charcoal production and marketing to a dynamic socio-economic and climatic environment, individuals and societies can take advantage of opportunities and are able to reduce on emerging risks. There is need to develop general guidelines for charcoal development for use by the Districts and lower governments. These should integrate policies and measures to address climate change into on-going sector planning and management, so as to ensure the long-term viability and sustainability of sectoral and development investments. The guidelines therefore, will complement existing tools, and should be informed by recent work on climate change, environment sub-sector strategy and other adaptive policy frameworks. The guidelines should articulate the charcoal standards and these should be known by every actor.

Technology Needs Assessment

The socio-economic characteristics in the target areas may differ from location to location. It is imperative therefore to conduct a technology needs assessment to identify barriers and opportunities that are specific to geographic locations. Then match needs to solutions that are compatible. The hardware technologies may not necessarily differ, but the institutions and organizations may require different arrangements. During the focus group discussions in Nakaseke District, the participants noted that although charcoal is produced throughout the District, there are two distinct production systems. The south (Nakaseke) produce mainly crops and the north (Ngoma) are pastoralists. The cultures therefore differ and the reasons and quantities of charcoal production differ significantly. This may call for differences in both the type and scale of technology and therefore the organization and rules.

Awareness Creation

There should be a serious systematic campaign on the risks and opportunities of charcoal production and marketing in the entire target area. Every possible form of media should be employed. Sensitization should cover issues concerning effects of climate change and agricultural productivity and food security and the need for mitigation measures, and the benefits of investing in sustainable and clean charcoal production technologies vis-à-vis other land utilization types.

Establish Support Structures

Some of the technologies require special skills for construction. In addition they may require maintenance by specialized personnel. Support structures will ensure that there is no break in production. Financing could also be a big issue in some communities and a mechanism for financing may be required.

Training and Demonstrations

There should be a programme for training that covers biomass estimation, forest/plantation management, in the improved charcoal conversion technologies and business skills. Demonstration centers for the technologies should be set up at least at every sub-county. The training programme should be gender sensitive.

TECHNOLOGIES FOR FOREST OWNERS AND TREE GROWERS

For sustainable charcoal production to be realized there should be a shift from the project-oriented approach in the delivery of services to those within the charcoal production chain; an approach that has dominated the management of non-conventional energy services as opposed to an overall strategy for sustainable charcoal demand and supply. What is required is a demand-oriented policy that indicates the role and commitment of the government in charcoal pricing and market development. The formulation and shaping of such policy and strategic interventions will require a reliable mechanism for monitoring and capturing of the relevant information and data.

Interventions for Wood Fuel Supply for Sustainable Charcoal Production

Establishing effective strategies that will shape human behaviour for sustainable charcoal production, represents one of the most challenging tasks in the quest for environmental sustainability at all levels, from the village to the national level. Environmental problems, such as climate change, biodiversity loss, water quality issues, soil erosion and forest degradation will require interventions that are compatible and consistent with the culture, socio-economic and geo-climatic characteristics of the targeted areas, in addition to an effective information system that captures the relevant data. The following interventions are therefore proposed:

- **Tree Growing For Sustainable Charcoal Production**

For charcoal production to be a sustainable process, using planted tree biomass as raw materials for charcoal production is the most sustainable option. However this may be an expensive option in some areas where there is a relative abundance of biomass compared to clear felling and selective cutting in which

cases the biomass is available at (close to) zero opportunity costs. In areas of scarce wood biomass, availability of land to produce trees for charcoal production vis-à-vis food security is often an issue of concern by environmentalists. However there are opportunities that could be exploited in the targeted area for this project:

i) Tree Regeneration and Improved Fallowing for Wood Fuel Production

Eighty per cent of the Ugandan population is rural based and 68% of them survive on subsisting agriculture (UBOS, 2002). The decline in soil fertility in smallholder systems is a major factor inhibiting equitable development in much of Sub-Saharan Africa and especially Uganda. Despite widespread recognition of the importance of inorganic fertilizer use, use rates remain alarmingly low – Ugandan farmers use an average of one kilogram of nutrients per hectare of arable land, compared to 35 in Kenya, 22 in Malawi and 13 in Tanzania (Wallace & Knausenberger, 1997). This low rate of fertilizer use is particularly worrisome given that Uganda has one of the highest rates of soil nutrient depletion among countries in Sub-Saharan Africa (Stoorvogel and Smaling, 1990).

The farmers therefore, periodically fallow their land, which allows it to lie idle for one or more seasons primarily to restore its fertility (Kwesiga, *et.al*, 1999). Improved fallow, which is the deliberate planting of trees or shrubs in rotation with crops have great potential for improving soil fertility. By providing nitrogen to crops, tree fallows can help farmers increase their incomes and food security. They may also help in the reduction of soil degradation and curb deforestation. Forage, shrubs, trees and grasses are very important for agriculture and livestock, particularly the trees have high foliage productivity, and high leaf protein content (Rehman, 2010). The woody biomass from these shrubs and trees provide a very high potential charcoal production and thus can sustainably improve incomes of subsisting communities.

ii) Use of marginal and Fragile Lands

In many countries, the traditional land utilization practice is to have woodlots on non-arable land, since this does not lead to any reduction of land set aside for crops and pastures. In case non-arable land is unavailable, the growth of trees may be restricted to the borders of fields, water-bodies or roadsides. This can tremendously increase available wood for charcoal production in a community.

- **Promotion of Agro-forestry and Agro-Silvo Practices**

The other option that could be sustainable with proper management is the selective cutting of trees in the agro-silvo production system. This means that certain trees that provide good quality charcoal are selected and cut for charcoal production. Preference and suitability of trees used for charcoal production may vary with size, availability and accessibility of the tree species (Beukering et al, 2007).

Cattle are classified as grazers which, means that they generally prefer grass to trees. However, during the dry season, some trees provide an essential share of the animal's diet since grass is either not available or it has dried up. Other trees provide shade for the cows when the temperatures are unmanageable. Many trees grow new leaves towards the end of the dry season and quality of tree forage is high at this time of the year (Lamprey, *et.al*, 1980). In any cattle/tree crop system maximum productivity will be obtained when the maximum quantity of animal products are produced without any decrease in the production of the tree crop and vice-versa. If the genetic quality of the cattle and their health and management are optimal for the environment then the productivity of the cattle depends upon the growth and efficient utilization of the maximum quantity of highly nutritious forage. Forage production, in turn, depends upon the amount of light radiation available, the availability of water and plant nutrients, the type and management of forage species and the management of the cattle.

- **Managing Natural Forests for Charcoal Production**

Natural forests can be managed to provide wood for charcoal production. In this case the trees for charcoal production will be selectively harvested in a manner that allows coppicing and sprouting. The coppices and sprouts can then be managed to provide sustainable wood stock for charcoal production.

BASIS FOR CHARCOAL TECHNOLOGY SELECTION

INTRODUCTION

Charcoal production is done through a surprisingly variety of systems that rely on similar principles but, different in detail. The differences in detail however, affect the operations and yields of the conversion technology, with some being grossly inefficient and others very expensive. Therefore, the choice of an optimum production method is imperative for an efficient and sustainable charcoal industry. Most charcoal is made by small scale peasant type producers, either for their own local needs or for a restricted market (FAO, 1987). In the target districts, the predominant technology is the earth mound kiln (See Table 1). When the earth mound kiln is combined with poor billet preparation, efficiency gets extremely poor with only 10% charcoal recovery by mass.

Table 1: Charcoal Conversion Technologies

Carbonisation Technology	Frequency	Percent
.00	8	6.5
Earth Mound	111	89.5
Casamance	3	2.4
Earth Pit Kiln and Earth Mound	1	.8
11.00	1	.8
Total	124	100.0

TECHNOLOGY AND DESIGN SPECIFICS

From a review of relevant charcoal production literature, the existing retort/kiln designs and the charcoal production environment in the sampled districts, it is evident that charcoal production methods cannot be evaluated just on the basis of technical factors only, social factors and cultural factors are of equal importance. For successful diffusion and adoption of energy technologies, proper identification of the combination of technology and the target group is a major determining factor. In business terms, the analogy would be the product-market combination (Hulscher, 1991). Matching innovation attributes with the characteristics of the potential adopters is critical for diffusion and adoption of innovations. These are being carefully considered and three designs have been selected for demonstration and consequently piloting. The basis for selection of these designs was as follows:

Socio-Economic Factors

In communities where social factors are dominant, it is usually very difficult to introduce a new technology of charcoal-making unless the social factors have been addressed. The practice where there are attempts to modify the technology of charcoal-making by providing inputs such as chain saws, new kilns and any other inputs has resulted in disappointments when these inputs stop flowing. In addition, burning of charcoal requires skill, patience, experience and readiness to observe correct working methods at all times. The economics of the operation is determined by the yield achieved in the burning stage. In a situation where capacity to use the new and efficient technologies is not well developed and the necessary inputs lacking, economic necessity will force the producers to revert to the traditional but predictable and well understood methods with all their obvious technical faults. The technologies selected therefore took into consideration the following factors:

Appropriateness to the Target Users

Appropriateness will address issues of user friendliness and safety during operation. If the operation of the technology is not well understood, it will lead to high losses. As mentioned earlier, the economics of the charcoal enterprise depends to a great extent on the charcoal yields during the carbonization process. Safety will address issues of not only protection from injury, but also protection from pollution. Carbonization being a process that takes place in circumstances of limited oxygen and inevitably results in substantial diversion of biomass carbon into products of incomplete combustion (PIC), which include carbon monoxide (CO) that is poisonous to human beings. Most important is the need to identify the crucial players for sustainable charcoal production. According to Kazoora, et.al, (2010), and the focus group discussions in the target districts, the majority of charcoal producers are small scale (see Fig. 1 and 2)

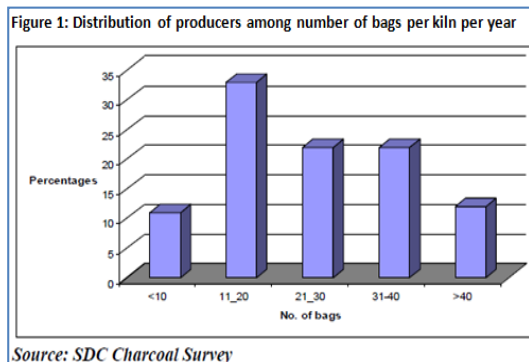


Fig. 1 and 2: Distribution of charcoal producers by numbers of bags and kiln loads per

Table 2: Gender Participation in Charcoal Production

Gender	Frequency	Percent
Male	111	89.5
Female	13	10.5
Total	124	100.0

The results of the structured interviews indicate that only 10.5% of charcoal producers interviewed were women. This could indicate that the technologies used in charcoal production are not appropriate to women. Therefore, in the technology selection process, we had to consider technologies that would be easy for women to operate.

Affordability

When determining affordability of the technologies, both the cost of the hardware (conversion technology, the kiln/retort) and the cost of operations were considered. Operations include: Cost of felling trees, transporting billets, billet preparation, loading and or stacking the kiln/retort, operating retort during carbonization and unloading/harvesting the charcoal. The other important cost is the time taken for the

entire operations, although it can be argued that rural people have more time than money and could therefore afford to be patient for several weeks.

CULTURAL AND GENDER FACTORS

Gender sensitivity

Women in most Sub-Saharan African countries participate in village woodlots or take care of home gardens that supply the much needed fuel wood. Women, therefore, play a significant role in the production of fuel wood. They have knowledge on the art of making charcoal and can identify what the properties of materials suitable for fuel wood are and they even gather woods both for commercial and domestic purposes (Texon, 1998). Gender considerations in the choice of a charcoal production system and or technology is important because fuel wood gathering for domestic and commercial purposes requires the utilization of human energy, in which, women contribute the larger part. In Uganda, agriculture is the main occupation of women. Nationwide, agriculture employs 72% of all employed women and 90% of all rural women work in agriculture. Only 53% of rural men do so (FOWODE, 2012). Hence, in the event of deforestation, it would become more difficult for rural women to gather firewood. Women are more likely to appreciate issues of sustainability compared to men.

According to the focus group discussions, the majority of casual labourers in the charcoal conversion processes are from outside the districts and mostly men. When the wood resources get scarce, it is the men that will follow the trees. Women have to stay home and bear with the fuel wood scarcity. The women, therefore, are most likely to appreciate issues of sustainable production of wood fuels. According to Texon (1998), extra efforts should be undertaken to deal with issues confronting women as they play an important role in wood energy systems.

Compatibility with norms and beliefs

The choice of an appropriate charcoal conversion technology must contend with the challenges of providing a consistent and reliable technology that will generate more income and benefits in comparison with the traditional sources of income and survival. To cause sustainable change in the charcoal production system, it is imperative to introduce a production system that is compatible with values and expectations of the target communities. Given that for sustainability, the wood should be grown, or selective cutting of coppices from properly managed forests, the conversion technology should be able to efficiently convert wood of small diameter. Fortunately, for planted trees, the age determines the diameter. This is true of the coppices. The slow-growing trees respond well to coppicing, lopping and pollarding. Where tree planting is taking place and where forest management or selective harvesting is taking place, the required diameter can be achieved.

TECHNICAL FACTORS

Carbonization Conditions

Wood Species and Size of Billets

According to FAO, (1987), the carbonization rate is closely related to wood size. Large wood pieces carbonize slowly since the transfer of heat into the interior of the wood is a relatively slow process. On the other hand, large diameter trunks of dense species may either shatter when carbonized and thus making the charcoal more friable than otherwise or fail to carbonize completely leading to loss of wood and time.



Fig. 3: Big logs that failed to carbonize in Kiryandongo

Attempting to ensure complete carbonization of the huge billets does not only lead to time wasting, but for earth mounds could lead complete burning to ashes of the smaller pieces of charcoal. Studies have shown that charcoal with optimum properties for the iron industry is produced with wood pieces measuring about 25-80 mm across the grain. The moisture content of the wood charge is a critical factor in carbonization. High moisture content promotes inefficiency in conversion by requiring more fuel to dry the charge and by enhancing the 'Dowell bursting' effect. Smaller diameter wood dries faster compared to larger diameters.

With grown wood, uniformity in wood size is possible and with the right diameters, the carbonization cycle can be tremendously shortened. The natural forests however if not well managed, yield a wide range of sizes. For carbonizing large diameter trunks and mixed size charges of wood the slow cycles are best. In a production system that is characterized by a lack of investment with the predominant use of rudimentary technology, the pit and earth mound systems is preferred, unfortunately these are frequently inefficient. Cutting and splitting of wood for purposes of increasing charcoal recovery, is very costly in labor, fuel and capital and should be avoided wherever possible.

Efficient carbonization of large diameter trunks and mixed size charges is best using the slower cycle, larger masonry kilns. They are a well proven method for carbonizing large diameter (> 0.5 m) dense wood from natural forests. These types of kilns are unaffordable by the majority charcoal producers in the targeted Districts. Metal kilns which lose much heat through the walls and cool quickly are ineffective in carbonizing large section wood.

The cost of cutting up wood is a serious and growing one as fuel, labor and capital costs increase and this favours the use of earth pits, mounds and brick kilns. It is also usually easier and faster to charge kilns with large size wood, especially if its length conforms to the size of the kiln, pit or mound. It is worthwhile carefully studying the relation between growing, harvesting, drying and kiln charging to decide the optimum dimensions of the wood both in length and diameter, so that overall handling and carbonizing costs are minimized and charcoal of optimum properties for the final end use is obtained.

Climatic and Soil Conditions

Charcoal production is often a seasonal activity. The rainy season may close down operations or the labor force may traditionally be employed at certain times in harvesting or planting operations in agriculture. Focus group discussions have revealed that the dry season on the other hand hardens the soil and makes it difficult to make mounds. It is often necessary to fetch water and pour it on the ground to soften the soil before covering the kiln. This hard labor eliminates the women who are central in the sustainable production of charcoal. The prices for charcoal have always increased during the dry season.

During high rainfall seasons special attention needs to be paid to keeping the covering of the timber charge intact. Coverings during these seasons tend to be stronger and more substantial than those in dry seasons. Pit kilns require channeling of surface water from the pit. Winds are also an important factor especially for the earth mound kilns and the use of windshields or strategic positioning of the kiln is often a requirement with some methods.

These two extreme conditions have serious implications for efficiency and as a result the yields. They lead to sometimes serious losses and waste. Charcoal prices fluctuate accordingly during these extreme weather conditions. An all-weather technology whose efficiency is not affected by weather conditions is the solution to these challenges.

CARBONIZATION: THE KILN AND RETORT TECHNOLOGIES

The process of transforming biomass to charcoal is fundamentally different from that of biomass combustion. Unlike complete combustion of biomass which produces little more than just CO₂ and water, charcoal-making involves combustion of the biomass in circumstances of very limited oxygen and the result is substantial diversion of biomass carbon into PIC. PIC, which include CO, CH₄, HC, are more dangerous greenhouse gases compared to CO₂ because, once emitted, there are no known processes yet that can re-absorb them from the atmosphere. Indeed, current estimates are that biomass combustion accounts not only for 25 - 45% of the annual global emissions of CO₂, but also for 15-50% of CO, 3 -10% of CH₄, and 24% of total non-methane organic compounds (TNMOC) (Levine, 1990, Crutzen and Andreae, 1990, Andreae, 1991). CO₂ and CH₄ are in addition the two most important greenhouse gases (GHG) and CO and TNMOC indirectly affect global warming through atmospheric chemical reactions that in turn affect GHG levels.

According to US-EPA report (1999), combustion of biomass harvested or naturally re-grown on a sustainable basis does not cause a net increase of CO₂ in the atmosphere. Unfortunately, through deforestation and other non-renewable practices, much burned biomass is not replaced. Even with complete recycling of the carbon, however, a biomass fuel cycle can produce a net increase in global warming commitment (GWC) because of the emitted PIC, which have, on average, a higher global warming potential (GWP) per kilogram carbon than CO₂. Unfortunately the majority conversion technologies have no provision to deal with PIC.

The Tones Kiln Technology

The most common method of carbonization is the kiln method which employs direct burning of part of the charge to provide the necessary heat required for carbonization to take place. The problem with this method of carbonization is that part of the wood that would have been converted to useful charcoal, is actually burnt. The other problem is that when the carbonization process starts, it is very difficult to control in terms of temperature regulation and carbonization speed. There have been several efforts to improve kiln technology and especially for the small scale charcoal producers. One of the improvements is the Tones Kiln.

The Tones kiln was developed in Senegal and is an earth mound kiln equipped with a chimney. This chimney, which can be made out of oil drums, allows a better control of air flow. In addition, the hot flues do not escape completely but are partly redirected into the chimney of the kiln, which enhances pyrolysis. Due to this reverse draft, carbonization is faster and is more uniform than the traditional earth mound kilns giving a higher quality of charcoal and efficiency which ranges between 18 and 25% according to the level of expertise by the operators. Comparative tests of the Tones kiln and traditional mound kilns confirmed the advantages in terms of efficiency and the shorter carbonization times due to the enhanced hot flue circulation (Meule casamancaise PERACOD Mundhenk, 2010). The other advantage is its ability to carbonize billets with large diameters. The major disadvantage of this kiln type is that the PIC which include CO, CH₄, and HC cannot be condensed at those temperatures and inevitably escape to the atmosphere. The other disadvantages are that it requires some capital investment for the chimney and it is more difficult to construct compared to the traditional earth mound kilns.

Retort Technology

Retort technology is the standard method of production for industrial charcoal in western countries. In the retort method, the wood charge is placed in a closed container known as the "retort". This has a tightly closed door, and some means to allow tar and other gases escape. The retort is heated from the outside and air is not allowed to enter the retort. Because the heating is external, poor quality biomass that would not be converted into charcoal can be used to provide the necessary heat instead.

Fig. 5: Traditional Kiln Harvesting **Fig. 6: Stacking and Harvesting the Adam Retort**



This type of biomass could be the leaves and the very tiny branches and twigs that are normally left during the harvesting of wood for charcoal. This increases the overall useful charcoal yield.

When the wood in the retort has been heated to the right temperature, carbonization begins and the heat and by-products are given off and little additional outside heat is required at this stage. The gaseous by-products can be channeled through the fire box to provide the additional needed heat to complete the carbonization process. Since the by-products contain PIC, their channeling into the fire box provides the opportunity to completely burn them to CO₂ and H₂O. The resultant effect is that the dangerous GHG are reduced tremendously sometimes up to more than 80% in comparison with kiln technologies.

Carbonization in a brick retort produces uniform-quality charcoal with good yield and low investment. The other advantage of the retort technology is that it minimizes the crushing of the lump charcoal resulting from handling during the harvesting process compared to earth covered kilns.

The Adam Retort

The Adam Retort is one of the most efficient means of producing good quality charcoal. During carbonization, the wood gases, volatiles (PIC) and all the tar components from the retort are channeled to the external fire box and are burnt to provide the needed heat for the carbonization process. The Adam Retort also called the Improved Charcoal Production System (ICPS), is being piloted as one of the technologies. Efficiency can be as high as 40% and noxious emission can be reduced by 70%. In addition, the production cycle is completed within 24 to 30 hours depending on the size. The retort is suitable for semi-industrial production.

Disadvantages the rather high investment costs that could be nearly US\$1,000 depending on location and special skills are required for construction. However, if several retorts are to be constructed in the same location, the technology could benefit from the economics of scale and the cost could reduce tremendously.

The other disadvantage is that the retort may not handle mixed species and widely varied sizes of billets adequately. This calls for high investments in wood preparation. The Adam retort is being promoted in several countries including Senegal, Madagascar, Peru, etc. on a pilot basis. Currently, the method is being further refined for up-scaling. However, the design is patented and permission will be required from the patent owner.

The Sam1 Brick Retort

The Sam1 Brick Retort operates much in the same way as the Adam Retort. The major difference is that the fire box is within the retort as opposed to the external fire box. The heat losses to the walls of the fire box are minimized. The result is that it takes a shorter time and less fire wood to be fired. However, because the fire box is directly under the retort, the retort is slightly higher than the Adam Retort for the same capacity. But the retorts take the same quantities of cement, sand and bricks.

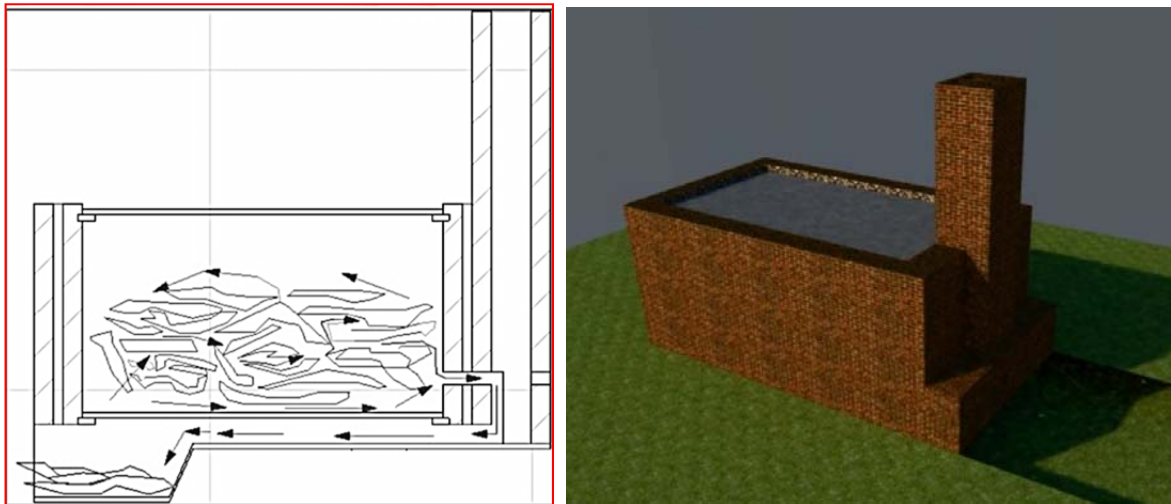


Fig. 8: Cross-sectional view and Architectural impression of the Sam1 Brick Retort

PURPOSE FOR PILOTING THE SELECTED DESIGNS (RETORT AND KILN)

Currently, the majority of charcoal producers get their wood fuels from natural forests. From the interviews however, there is evidence of interest in planting trees for charcoal production. Out of the 41 tree growers interviewed, 26.8% expressed interest in planting trees for charcoal production (See Table 3). Wood from the natural forests is often a mixture of sizes and species. Mixed species and varied diameter sizes cannot be handled well by the selected retort designs. Large billets require transport and labor to handle. They are best carbonized at the site of harvesting. The Tones kiln therefore will be appropriate in such circumstances. However, as forest management takes root and selective harvesting and the use of coppices and sprouts increases, smaller diameters (which give better charcoal and can be easily carried by the women) will become available. Then the more efficient conversion technology, which at the same time is more environmentally friendlier, will be preferred by the enterprises.

For the households that are already planting trees that can be converted into charcoal, the retorts make more sense to the enterprises because of the high conversion efficiencies, convenience, reduced costs of operations and safety. For those with access to natural forests, the application of the technologies could be sequenced; beginning with the Tones and then either the Adam Retort or the Sam1 Brick retort. If the household has access to all types of wood, all the conversion technologies could be applied at ago.

Table 3: Preference of Tree Species for Planting

Preferred Tree Species	Frequency	Percent
Albizia, Acacia, Combretums	11	26.8
Eucalyptus and Pine	6	14.6
Musizi and mangoes	1	2.4
Total	18	43.9
Missing Response	23	56.1
Total	41	100.0

PROGRESS ON ESTABLISHING SITES FOR PILOTING IMPROVED CHARCOAL TECHNOLOGIES

INTRODUCTION

As part of the piloting process of the improved charcoal technologies, groups of selected farmers and leaders in a selected sub-county from the four selected districts are chosen with the help of the District Forest Officers. They are then trained in improved methods of charcoal production. The purpose of piloting and training in the charcoal production technologies is to achieve the following objectives;

1. To be part of the sensitization process of the possibilities for improved charcoal production and improved incomes from charcoal-making.
2. To select in a participatory manner the most appropriate charcoal conversion technology for the target groups.
3. To identify areas of improvement in the designs to address issues of operations and cost.
4. To test whether the skills and methods for improved charcoal production could be retained and appropriately applied by the trained groups.

THE CONTENT OF TRAINING EXERCISE

The training exercise is covering the following topics:

1. Introduction to carbonization technologies (Kilns and Retorts),
2. The concept of efficiency in charcoal production and implications of yields, profits and resource management.
3. Introducing the concept of Green House Gas Emissions and the impact on agriculture production.
4. Wood preparation; why wood should be split to size, the benefits of drying billets and proper stacking of billets.
5. Retort/Kiln operation; process control and harvesting charcoal, how to test for good quality charcoal.

PROGRESS TO DATE

The section of site for piloting is done in consultation with the District staff. The piloting sites for Nakaseke, Kiryandongo and Kiboga are complete and operating. The constructions for Mubende are in progress. The training commenced on the 22nd January 2013, in Nakaseke District, Wakyato Sub-County, Mijumwe Village with the construction of the three selected conversion technologies. For Kiryandongo District, the pilot site is located in Kiberenge Village, Kiryandongo Sub-County. For Kiboga, the site of the retorts is at Kapeke village, Nyamiringa Parish, Kapeke Sub-County. In all cases the districts selected the participants in the construction. Charcoal producers selected by the districts, are participating in the piloting.



Fig. 9: Ms. Sarah from UNDP addresses some of the participants.



Fig.10: Ms. Sarah inspects the completed Sam1 Brick Retort



Fig. 11: The Adam Retort under construction, Nakaseke



Fig.12: The Retorts after the first firing and the Tones Kiln still carbonizing in the background, Nakaseke



Fig. 13: A trainer and a female participant on top of the Adam Retort in Kiryandongo

The Concept of SFM

The concept of forest sustainability dates from centuries ago, although the understanding of sustainable forest management (SFM) as an instrument that harmonizes ecological and socio-economic concerns is relatively new. The change in perspective occurred at the beginning of the 1990s in response to an increased awareness of the deterioration of the environment, in particular of the alarming loss of forest resources. The definition of SFM was developed by the Ministerial Conference on the Protection of Forests in Europe (MCPFE), and has since been adopted by the Food and Agriculture Organization (FAO). It defines sustainable forest management as:

The stewardship and use of forests and forest lands in a way, and at a rate, that maintains their biodiversity, productivity, regeneration capacity, vitality and their potential to fulfill, now and in the future, relevant ecological, economic and social functions, at local, national, and global levels, and that does not cause damage to other ecosystems.

The General Assembly of the UN has adopted the most widely, inter-governmentally agreed definition of SFM as:

a dynamic and evolving concept aims to maintain and enhance the economic, social and environmental value of all types of forests, for the benefit of present and future generations(UN 2008, Resolution 62/98).

In simpler terms, the concept can be described as the attainment of balance between society's increasing demands for forest products and benefits, and the preservation of forest health and diversity. This balance is critical to the survival of forests, and to the prosperity of forest-dependent communities.

In summary, the concept of sustainable forest management has grown into an industry of proving responsibility of sustainable management of forest based on a set of principles, criteria and indicators. These principles, indicators and criteria once developed must be applied, and an assessment made as to their applicability on the one hand, and their being met by the body responsible for forest management (this could be at a national level or at the level of the forest management unit, or both).

Examples of SFM Activities

The International Tropical Timber Organization (ITTO) and the International Union for Conservation of Nature (IUCN) have developed “Guidelines for the conservation and sustainable use of biodiversity in tropical timber production forests” (ITTO and IUCN 2009). Some of these include:

- Observe national laws, plans and practices of local communities in forest management activities, and support the implementation of international biodiversity related agreements.
- Establish a forest management plan in which biodiversity conservation objectives are clearly and explicitly identified for each area of forest under management.
- In preparation of harvesting plans, pay particular attention to the local occurrence of species or habitats of special conservation concern and species that perform vital ecological functions.
- Plan the allocation of tropical production forests at a landscape scale and plan harvesting blocks in ways that do not disrupt the continuity of mature forests.

- Raise public and political awareness on international/national laws and disseminate biodiversity information and strategies using various media.
- Coordinate actions of forest owners, users and managers across landscapes to best ensure the maintenance of sufficient high quality connected habitat for species.
- Large-scale planted forests can provide a forest matrix within which areas of high conservation value can be protected and managed. Encourage the establishment of representative natural forest within the plantation estate and, where possible, the restoration of natural forests on appropriate sites.

Countries in West and Central Africa such as Ghana, Ivory Coast, Cameroon, Central African Republic, Gabon and Republic of Congo have implemented SFM. Several key lessons can be drawn from the experiences in the countries:

- **The resource base:** Sustainability of forest management must be considered in terms of the forest resource base for wood production.
- **Health of the national economy and financial environment for forestry:** A healthy national economy and a favourable financial environment for forestry are required for SFM to succeed. In a depressed economy, not only is the pressure on forests and forestland from an enlarged informal sector, who are mostly poor and do not support timber production to be viable, but public and private sector investment in forestry is also depressed. Poor funding weakens the ability of the forestry services to function effectively and low economic activity limits the chances of private sector investment in wood production to reduce the pressure on natural forests.
- **Maintaining the profitability of forest management:** Measures, such as long concession terms, designed to minimize degradation, and improve forest management and the financial environment, are clearly unattractive to exploiters bent on short term profits. For this reason it is necessary to explore further ways of maintaining profitability in SFM.
- **The need for political stability:** Political stability is a necessary condition for SFM to take root.
- **Reforming policy, legislative and institutional framework:** Designing the policy, legislative and institutional framework, building the necessary human and infrastructural capacity and generating the knowledge base for decision making and planning are the necessary steps that link political commitment to actual practice.
- **Need for a more inclusive and participatory approach-effective partnerships:** Inclusive participation is a critical requirement for sustainable forest management. There is the need for a more inclusive approach than in the past.

Sustainable Forest Management (SFM) in Uganda

Sustainable Forest Management (SFM) as an ideal to aspire to by the Uganda Forest Department pre-dates the second half of the last century. Even then, the idea was about the “sustained yield” of wood products. Webster and Osmaston (1965) have documented some of the forest management activities that were being undertaken during the period 1951-1965. Many of the forest management challenges they describe are still faced by today’s foresters, and valuable lessons can be learned from the experiences of the 1950s and early 1960s. For example, the shortage of saw-timber was accelerating and ways of meeting this deficit are still being considered. Encroachment and the costly demarcation of boundaries are continuing problems for achieving SFM. The preparation of management plans, the training of staff and the advantages and problems of devolution of management responsibilities to local governments remain of central importance.

Compliance with laws and Sustainable Forest Management (SFM) Principles

Uganda's policies and legislation are well developed and are adequate for the implementation of SFM and particularly for compliance with all laws, regulations, treaties, conventions and agreements, together with all SFM Principles and Criteria.

The following form the foundations for the compliance with SFM principles in Uganda:

- Uganda has ratified most of the forest and related conventions (for example the convention on UNFCCC, CBD, and UNCCC) (UNFF is voluntary and does not require such an action).
- Uganda has also domesticated many of these conventions through national legislation or policy documents and action plans formulation.
- Many protected forest management unit areas have management plans which also comply with this principle (all the 560 CFRs and all the Wildlife Conservation Areas have plans at different stages of approval and implementation) that comply with some of the laws and policy obligation.
- At the national level, there is full knowledge of applicable fees, royalties and other charges payable.
- The country fully respects all the provisions of all binding relevant international conventions such as CITES, ILO, CBD, UNFCCC, UNCCCD.
- There is evidence that national forest management areas (especially protected areas) are protected from illegal harvesting, settlement and other unauthorised activities.
- There are procedures in place and known to all responsible stakeholders, to protect the management unit from illegal and unauthorized activities.
- There is commitment to sustainable forest management and maintenance of Permanent Forest Estate.
- They stipulate for full and effective stakeholder participation (private sector, academia, and communities, forest dependant people).

Barriers to compliance with SFM principles

The following are some of the barriers that will need to be addressed in order for SFM to meet this legal compliance principle:

- Uganda does follow an institutionalised system of compliance with these obligations. Where they exist they are not nationally available to both the national actors, forest management unit actors and later community actors (including forest dependant, marginalised groups and women).
- Some forest management unit managers (such as district forest officers, range managers and wildlife conservation area managers) and some private and civil society actors do not demonstrate knowledge of national law and obligations.
- Not all fees, royalties, taxes and other charges are paid. This is usually worse at lower levels especially at the forest management units or at the districts. Moreover, non-compliance with payment of applicable fees, taxes, royalties and other charges often go undetected and the fees are lost.
- Procedures for applying to conduct business in forest products and services are not universal (as compared with trading licences in the local governments).

- At the districts and the forest management units, knowledge of the provisions of the relevant binding conventions is not fully known and compliance and respect may be by omission out of lack of knowledge.
- Conflicts between national laws, policies and regulations and SFM Principles and Criteria are not documented and there is no mechanism for their resolution.
- Whereas the national forest management areas (especially protected areas) are protected from illegal harvesting, settlement and other unauthorised activities, there are still considerable illegal harvesting, settlements and other unauthorised activities.
- Even if there are procedures for handling of illegal and other unauthorised activities in forest management areas, many would be licence holders do not seek to get them and yet they continue to conduct illegal and unauthorised activities in forest management areas.
- While the responsible body takes special care to make local communities aware of actions or non-actions that might be considered unauthorized activities, not all communities are given this education, and of those who are aware, not all choose to abide by the guidance.
- At the national level, it is assumed that enactment of laws and preparation of policies that commit the government to SFM is self-evident. But it is not.

Compliance with Tenure and use rights and responsibilities

Forest tenure is a broad concept including forest ownership rights and other secondary rights to access, use and manage forest resources (WRI 2009). Forest tenure shapes the relationship between people and forests by defining who can use what resources, for how long and under what conditions. Forest tenure is fundamental for SFM because it recognizes, supports and protects a broad set of rights, with particular attention to the needs of indigenous groups and other communities who depend on forest resources for their livelihoods. It points to what extent Uganda forest management unit managers have been able to establish systems for implementing formal forest tenure systems. However, since much forest tenure continues to operate outside of the formal system, there is a fundamental problem regarding defining the relationship between formal and informal forest tenure, including implementing effective functioning of dispute resolution mechanisms.

The following can be noted regarding forest tenure and SFM:

- There are several tenure and forest use rights in Uganda. There are also several bodies and entities responsible for management of forest resources. All of these different mandates are clear under the law.
- Forest Management Units (FMUs) are under state control. Responsible bodies have legal rights to manage these FMUs and they are named on the legal documents delineating such FMUs; the lands are fairly well described with maps and management plans.
- In many FMUs (particularly in protected areas), there is evidence that managers and other responsible persons do their best to resolve disputes (resulting from tenure, or use rights).
- Both wildlife conservation and forest reserve area managers have made community forest management agreements with interested local communities to facilitate access by these communities of two forest products and services.
- There is evidence that communities are increasingly being involved in the planning of forest management.

The Government of Uganda (2011)³² (as part of the REDD+ proposal) summarized the relationship between land use, land tenure, forest resources and deforestation and forest degradation in the country. The assessment done in REDD+ proposal document is directly applicable to the requirements for sustainable forest management (SFM) because SFM is actually an element of REDD+. Table 1 below shows the assessment of land tenure in relation to deforestation with direct implications for SFM.

³²REDD Readiness Preparation Proposal For Uganda (2011)available at <http://www.forestcarbonpartnership.org/sites/forestcarbonpartnership.org>

Table 4: Assessment of land tenure in relation to deforestation and forest degradation (with direct implications for SFM)

Category	Implications for Deforestation and Forest Degradation
Freehold	Has a significant role in deforestation and forest degradation trends since most privately owned forests, agricultural activities and other developments fall on freehold lands. Enforcement of environmental policies and laws to regulate use of these lands is cumbersome and ineffective in most cases.
Mailo	Has a significant role in deforestation and forest degradation trends especially in the central region/Lake Victoria and western region where this form of land tenure is dominant. Enforcement of environmental policies and laws to regulate use of these lands is cumbersome and ineffective in most cases. Incentives for forestry resources development and management are weak due to relationships between land owners and tenants in as far as security of tenure are concerned.
Leasehold	This category of land tenure ownership in Uganda accounts for a very insignificant proportion of land outside urban areas. Little incentive for leaseholders to invest in forest conservation.
Customary	This is major form of land tenure ownership in Uganda. Most agricultural activities take place on this land. Use of forests and woodlands is virtually open-access, and there is no incentive for an individual's to invest in sustainable practices. Profits from woodlands are low and there are strong benefits from conversion to private tenure and agriculture. It stands as the most influential form of land use in terms of deforestation and forest degradation.

FAO's Role in Implementing SFM Work in Uganda

FAO's support to Uganda in the field of Sustainable Forest Management (SFM) has been about assessment and monitoring of forest resources. FAO's has assisted Uganda in the collection and analysis of data on the extent of forest resources including forest cover and use which is then used in the FAOSTA datasets to which all countries have access.

The following data sets on forestry were obtained.

Table 5: Removals and production of wood and paper products

	Units X 1,000	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Roundwood	Cubic meter	38,317	38,858	39,481	40,120	40,746	41,685	42,358	43,029	43,729	44,269
Industrial roundwood	Cubic meter	3,175	3,175	3,246	3,323	3,403	3,785	3,890	3,983	4,093	4,093
Sawlogs and veneer logs	Cubic meter	1,055	1,055	1,126	1,203	1,283	1,665	1,770	1,863	1,973	1,973
Other industrial roundwood	Cubic meter	2,120	2,120	2,120	2,120	2,120	2,120	2,120	2,120	2,120	2,120
Wood fuel	Cubic meter	35,142	35,683	36,235	36,797	37,343	37,900	38,468	39,046	39,636	40,176
Wood charcoal	Metric ton	752	772	792	814	836	859	882	907	931	957
Sawn wood	Cubic meter	264	264	264	125	117	117	117	117	117	117
Sawn wood (coniferous)	Cubic meter	67	67	67	24	24	24	24	24	24	24

	Units X 1,000	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Sawn wood(non-coniferous)	Cubic meter	197	197	197	101	93	93	93	93	93	93
Wood-based panels	Cubic meter	5	5	5	23	24	24	24	24	24	24
Veneer sheets	Cubic meter	–	–	–	15	16	16	16	16	16	16
Plywood	Cubic meter	4	4	4	5	5	5	5	5	5	5
Particle board	Cubic meter	1	1	1	1	1	1	1	1	1	1
Fiberboard	Cubic meter	–	–	–	2	2	2	2	2	2	2
Paper and paperboard	Metric ton	3	3	3	3	3	3	3	3	3	3
Other paper and paperboard	Metric ton	3	3	3	3	3	3	3	3	3	3

Data source: The data used to construct the following table are drawn from the [FAOSTAT](#) forestry statistics database. This database contains national and regional time series data from 1961 onwards, for production, imports and exports of more than 40 forest products categories for every country and territory in the world.

FAO's through its Country STAT project supports Uganda (and other developing countries) to gather and harmonize scattered institutional statistical information so that information tables become compatible with each other at the country level and with data at the international level. The main objectives are to facilitate decision-maker's access to information and to bind data sources that are currently spread throughout the different institutions. In during February and March 2013, the FAO will be holding a capacity building training in the country on integration of Remote sensing into forest resource assessment (FRA) for Uganda (this training is related to REDD+ and is relevant for SFM).

Current SFM Practices in the Pilot Districts

It is to be assumed that the baseline specific to the pilot districts are intended to synchronise the full project proposal requirements and are thus arranged alongside those that are relevant for REDD+. Additional work has recently been published by Arindam Basu, Courtney Blodgett, and Nicolas Müller (2013) who were retained by UNDP MDG Carbon to help Uganda shape its future low carbon development (this is one of the Climate Change Objectives in the National Development Plan (NDP)). What they found offers this project a basis for staying the course and it can be summarized as follows:

- Charcoal is a driver of deforestation and forest degradation (REDD+). If Uganda can implement an improved charcoal value chain as a NAMA it could increase the efficiency and effectiveness of the current value chain, as well as enable the country to remove a major driver of deforestation while increasing energy security and sustainability.
- The NAMA, once fully developed and approved, would be integrated with other relevant UNDP initiatives in Uganda, in particular the Low Emission Capacity Building Programme, which is part of a larger UNDP low-emission climate programme and addition to the GIZ Biomass Energy Strategy initiative to develop short-, medium- and long-term interventions to achieve sustainable management of biomass energy resources. The NAMA would also be integral to the recently approved UNDP-implemented and Global Environment Facility financed projects in the charcoal

sector related to addressing barriers to the adoption of improved production technologies and sustainable land management practices.

Stakeholders of SFM in Uganda

There are several stakeholders in SFM in Uganda. Table 4 shows key stakeholders in the project area.

Table 6: Stakeholders in the project area

Stakeholder Category	Role or Potential Influence
h) Government	<ol style="list-style-type: none"> 2. These are central government stakeholders that have programs and direct administrative linkages to the project sites. They also include local governments own stakeholders that are based in the district. Both these categories have a role to make the project successful. It is in the interest of the project to steer this important stakeholder category (fully aware that the project may have to build/strengthen their capacities) so that that they can genuinely help fulfilling the following, among other things: 3. Creation of the enabling environment for sustainable forest management by: <ol style="list-style-type: none"> a. Entrenching a culture of good governance, and promoting accountability and transparency in public life. b. Providing the appropriate policy, legislative and institutional framework. c. Coordinating national policies to exploit synergies and minimize conflicts. d. Adopting and striving for supportive macroeconomic policies. e. Implementing the project activities in line with the requirements of the National Development Plans and the district local plans as well as other sectoral plans such as in: f. Supporting and stimulating investment in sustainable forestry management; g. Providing appropriate incentives to encourage: <ol style="list-style-type: none"> i. private sector investment in plantation development, and ii. Production, processing and marketing practices that promote sustainable forest management. h. Investing a commensurate proportion of its budget (determined from a i. Calculation of at least the productive and environmental values of forestry) in all aspects of forestry development, including management, resource assessment, human and infrastructural capacity building, knowledge generation, production, processing and marketing. j. Promoting the development of local institutions and structures and creating space for <ol style="list-style-type: none"> i. Civil society action to facilitate participation of rural communities in forest management, conservation and protection. ii. Principal actors in forestry to participate in policy formulation and implementation. iii. Certification of forest products. 4. Designing and enforcing a land use plan that ensures long term security and tenure of the forest estate against encroachment or conversion.

		<p>5. Designing and monitoring the implementation of practices in exploitation, processing and marketing of timber/charcoal that promotes sustainable forest management; specifically for this project, creation and institutionalization of charcoal value chain activities at the district level.</p> <p>6. Subscribing to international conventions and relations that support sustainable forest management.</p>
i)	Organized Private Sector	<p>2. This category of stakeholders (for purposes of this project) includes the private actors directly involved in the forest products value chain and those private actors involved in related activities that have an effect on the sustainable management of forests. In this case we have:</p> <ul style="list-style-type: none"> a. Those who are directly involved in the production and supply of forest products (including but not limited to the licensed and non-licensed charcoal burners, saw millers or pit sawyers). b. Those who are act as intermediaries (usually as brokers, transporters and site based wholesalers). c. Stakeholders who actually retail the products within the project areas or outside the project areas (say in urban Kampala). <p>3. These stakeholders will better support the project if they can:</p> <ul style="list-style-type: none"> a. Develop appropriate partnerships with government and local communities. b. Be given the necessary economic incentives, to invest in plantation forest production to supplement production from natural forest. c. Apply enterprise and business skills to exploit opportunities for expanding the range of marketable products, technologies and markets. d. Participate fully (including financially) in policy formulation and inventories, and comply with exploitation, processing and marketing regulations deriving from the policies.
j)	Informal sector and local communities	<p>4. This category of stakeholders includes members listed in the private sector category (but just that some of their actions are not registered) as well as the communities who live on, and derive livelihoods on the lands that the project targets. The project will benefit from them if these stakeholders:</p> <ul style="list-style-type: none"> a. Are made the primary beneficiaries of the project interventions using affirmative action's when necessary, b. Supported to develop and maintain suitable organizational structures for interfacing with other actors in sustainable forest management. c. Participate in policy formulation, and are persuaded to abide by regulations deriving from the policies. d. Supported to exploit opportunities for building technical and other capacities for forest management. e. Are offered, and they respond to incentives and contribute through agroforestry and social forestry practices to wood supply.

	<ul style="list-style-type: none"> f. Exploit opportunities for joint or community forest management. g. Are active participants in the planning, monitoring of the activities that are intended to lead to sustainable management of their forests. <p>5. It is important to note that within this stakeholder category there will be unique members who are more vulnerable and marginalized and these need to be supported to play their true roles.</p>
k) Traditional leaders, Churches and Mosques	1. Traditional leaders, churches and mosques control public opinion and own considerable land parcels, which the project would love to transform. This group will need to be engaged and given the space to effectively participate.
l) International community including donors	<p>2. Because they hold the finances that support the project, as well as the hinterland to source the technology and human technical capacity, this stakeholder group sways a lot of power in the sustainable forest management (SFM) equation. The project will benefit most from them by working with them to:</p> <ul style="list-style-type: none"> a. Continue supporting provision of positive incentives for SFM/REDD+. b. Step up and sustain assistance by technical and financial inputs project. c. Work on a binding international regime that will favor SFM/REDD+.
m) Organized civil society (NGOs etc.)	<p>2. This important category will support the project:</p> <ul style="list-style-type: none"> a. Continue to empower local communities, by awareness raising and capacity building, for effective participation in forest management. b. Continue to serve as a watch-dog against unsustainable forest management policies and practices. c. Continue to provide technical assistance to governments for forest resources assessment, planning, management and conservation.
n) (f) Academia and Research Institutions	1. Universities, research institutions, training colleges, schools will need to be supported to continue generating and dissemination of new knowledge.

The SLM in the Cattle Corridor of Uganda Project

The progress report of the SFM activities in the cattle corridor has not been made public. The project results framework table mentions the main actions that the project intended to undertake. The overall objective of the “Enabling Environment for SLM to overcome land degradation in the cattle corridor of Uganda” project was to provide land and resource users/managers with the enabling environment (SLM model, tenure arrangements, charcoaling technologies, institutions) for effective adoption of SLM within the complexity of the cattle corridor production system

Table 7: The Project results framework

Components	Expected Outcomes	Expected Outputs
Policy and institutional framework	The policy, regulatory and institutional environment support sustainable land management in the cattle corridor (in particular policy and legislation for sustainable charcoal and tenure security strengthened)	<p>At least 50% of land and resource users have some form of security of tenure.</p> <p>At least a 40% improvement in the SLM environment enabling index, as measured using the SLM-Enabling index developed under TerrAfrica/SIP M&E initiative.</p> <p>At least 4 policies revised to mainstream SLM principles and so provide a better policy environment for SLM.</p> <p>Legislation and institutional arrangement guiding policy implementation for at least 4 key policies are influenced by project results and overtly recognize SLM principles.</p> <p>Charcoal legalization process in advanced stages.</p> <p>At least 10 charcoal associations have rules and regulations for sustainable charcoal and are actively enforcing them.</p> <p>Revenue collection from charcoal processes by Uganda Revenue Authority improves by at least 50% and a percentage of the revenue collected being used to support sustainable woodlands management.</p>
Knowledge and capacity generate and used for land use planning and	Knowledge based land use planning forms the basis for improving dry lands sustainable economic	<p>Over 780,000 ha under direct SLM (project pilot area) and 700,000 ha impacted by up-scaling in next 2 years, through the NORAD/UNDP Capacity Building project.</p> <p>At least 75% of the rangeland registering improvement in rangeland condition, measured by the</p>

Components	Expected Outcomes	<i>Expected Outputs</i>
management	development Capacity for improved management improved	<p>conventional “rangeland condition” methodology.</p> <p>At least 25% of woodlands showing recovery as measured by regeneration, improvements in population structure and improvements in species index.</p> <p>At least half of land under improved SLM registers reduction in land degradation by at least 20% as measured by reduction in soil erosion, reduction in termite attacks, improvement in soil organic matter, structure and fertility, increased ground cover.</p> <p>At least a million tons of carbon dioxide mitigated from sustainable charcoal in the districts and increased efficiency of burners and kilns as verified by the sustainable charcoal monitoring scheme and by the carbon credits sold to the voluntary markets.</p> <p>Participatory M&E system in place: Lessons on improving land and resource tenure, range rehabilitation, sustainable charcoaling, improving livestock mobility, crop and livestock insurance, and other important project initiatives available for dissemination through the up-scaling project.</p>

Components	Expected Outcomes	<i>Expected Outputs</i>
<p>Local economic development strengthened through diversification and improved access to finance and insurance</p>	<p>Agricultural productivity increased sustainably (Co-finance)</p> <p>Access to formal market institutions (micro credit and insurance) systems strengthens pastoralism and dry lands agriculture</p> <p>Sustainable charcoal provides incentives for woodlands management and leads to increased energy use efficiencies and mitigation</p> <p>Livestock mobility supported as an adaptation technology</p>	<p>At least 25% improvement in household welfare for a minimum of 75% of the households in pilot districts, as measured by percentage increase in household income, percentage reduction in number of food insecure days and other specific indicators to be determined during project inception.</p> <p>At least 65% of resource users provided with improved technologies for dry lands farming (conservation agriculture, water harvesting, drought tolerant crops, range improvement, using livestock mobility to exploit seasonal vegetation growth, etc.</p> <p>At least 50% increase in agricultural produce for key crops as a result of improved SLM practices increasing soil fertility and soil-water use by crops.</p> <p>At least 25% of pastoralists and agriculturalists participating in the index based insurance scheme and at least 25% increase in number of people accessing micro-finance and credits</p> <p>At least ten groups with sustainable charcoal production operations and earning money from carbon finance, and the number of charcoal producers using improved kiln in carbonization increase by at least 50% in pilot districts</p> <p>At least 50% of current mobile pastoralists still retain livestock mobility and at least 50% reduction in incidents of conflicts over land and resources in the pilot districts</p> <p>At least 25% change in attitudes towards nomadic pastoralism among policy makers.</p>

Table 8: A Highly Summarized overview of Uganda's compliance with the Criteria and Indicators for Sustainable Forest Management (SFM) (Based on FSC Template used: See table 1 above)

Principle/Criteria of SFM	Current Situation (combining National and Forest Management Unit (FMU))	Barriers to be addressed to better meet compliance requirements for this Principle/Criteria of SFM
<p>Principle 1: Compliance with laws and SFM Principles – to comply with all laws, regulations, treaties, conventions and agreements, together with all SFM Principles and Criteria</p>	<p>Uganda has ratified most of the forest and related conventions (for example the convention on UNFCCC, CBD, and UNCCC) (UNFF is voluntary and does not require such an action).</p> <p>Uganda has also domesticated many of these conventions through national legislation or policy document and action plans formulation.</p> <p>Many protected forest management unit areas have management plans which also comply with this principle (all the 560 CFRs and all the Wildlife Conservation Areas have plans at different stages of approval and implementation) that comply with some of the laws and policy obligation.</p> <p>At the national level, there is full knowledge of applicable fees, royalties and other charges payable.</p> <p>The country fully respects all the provisions of the all binding relevant international conventions such as CITES, ILO, CBD, UNFCCC, UNCCCD.</p> <p>There is evidence that national forest management areas (especially protected areas) are protected from illegal harvesting, settlement and other unauthorised activities</p> <p>There are procedures in place and</p>	<p>Uganda does follow an institutionalised system of compliance with these obligations. Where they exist they are not nationally available to both the national actors, forest management unit actors and later on community actors (including forest dependant, marginalised groups and women).</p> <p>Some forest management unit managers (such as district forest officers, range managers and wildlife conservation area managers) and some private and civil society actors can demonstrate knowledge of national law and obligations but may do not.</p> <p>But not all fees, royalties, taxes and other charges that should be paid are actually paid. This is usually worse at lower levels especially at the forest management units or at the districts.</p> <p>Procedures for applying for doing business in forest products and services are not universal (for example as compared with trading licences under municipalities).</p> <p>Non-compliance with payment of applicable fees, taxes, royalties and other charges often go undetected and those fees are lost.</p> <p>At the districts, and at the forest management units, knowledge of the provisions of the relevant binding conventions is not fully known and compliance and respect may not be by omission out of lack of knowledge.</p> <p>Conflicts between national laws, policies and regulations and SFM Principles and Criteria are not documented and there is no mechanism for their resolution.</p> <p>Whereas the national forest management areas (especially protected areas) are protected from illegal harvesting, settlement and other unauthorised activities; there are still considerable</p>

Principle/Criteria of SFM	Current Situation (combining National and Forest Management Unit (FMU))	Barriers to be addressed to better meet compliance requirements for this Principle/Criteria of SFM
	<p>known to all responsible stakeholders, to protect the management unit from illegal and unauthorized activities</p>	<p>illegal harvesting, settlements and other unauthorised activities.</p> <p>Even if the procedures for handling of illegal and other unauthorised activities in forest management areas, many would be licence holders do not seek to get them and yet they continue carry out illegal and other unauthorised activities in forest management areas.</p> <p>While the responsible body takes special care to make local communities aware of actions or non-actions that might be considered unauthorized activities, not all communities are made aware and of those who are aware, not all choose to abide by the guidance.</p> <p>At the national level, it is assumed that enactment of laws and preparation of policies that commit government to Sustainable forest management.</p>
<p>Principle 2: Tenure and use rights and responsibilities – to define, document and legally establish long-term tenure and use rights;</p>	<p>There are several tenure and forest use rights in Uganda. There are also several bodies and entities responsible for management of forest resources. All of these different mandates are clear under the law.</p> <p>Forest Management Units (FMU) under state controlled responsible bodies have legal rights to manage these FMUs; and they are actually named on the legal documents delineating such FMUs; and the lands are fairly well described with maps and management plans.</p> <p>In many forest management units (particularly in protected areas) there is evidence that managers and other responsible persons do their best to</p>	<p>Even though the law has pronounced itself on the different tenure and forest use rights, these rights are not well known to all the stakeholders and interested parties in forest management. In addition, sustainable management of forests has introduced combinations of products, goods and services that cut across several tenure use right regimes and require that they be clarified as well. An example is the new rights (including tenure) associated with several payments for ecosystems services and products such as carbon, water and biodiversity rights.</p> <p>The percentage of forest management areas owned by non-state entities that is not titled is not known but it is substantial (given the fact that nearly 70% of all forest land in Uganda falls under this category of non-state ownership); moreover, these lands are not described nor included in management plans.</p> <p>However, in spite of efforts by forest managers and other</p>

Principle/Criteria of SFM	Current Situation (combining National and Forest Management Unit (FMU))	Barriers to be addressed to better meet compliance requirements for this Principle/Criteria of SFM
	<p>resolve disputes (resulting from tenure, or use rights).</p> <p>Both wildlife conservation and forest reserve areas managers have made community forest management agreements interested local communities to facilitate access by local communities of two forest products and services.</p> <p>There is evidence that communities are increasingly being involved in the planning of forest management (both forests and wildlife conservation areas).</p>	<p>responsible persons doing their best to resolve disputes (resulting from tenure, or use rights), there several significant and outstanding disputes of substantial magnitude involving a significant number of interests in relation to the management unit (especially in protected areas); moreover, these do not include the disputes within forest areas outside of government protected areas (which on their own are very significant).</p> <p>Many of the community forest management agreements that both wildlife conservation and forest reserve areas managers have made with interested local communities (to facilitate access by local communities of two forest products and services) lie unimplemented, nor monitored and fall short of the very expectations that these communities had in the first case.</p> <p>Even if there is evidence that communities are increasingly being involved in the planning of forest management plans (they be for forests or for wildlife conservation areas), this is still short of their full and effective participation.</p> <p>Except for the formal ones, there no dedicated dispute resolution procedures known to all members of communities (especially the forest dependant and vulnerable and disadvantaged).</p>
Principle 3: Indigenous peoples' rights – to identify and uphold indigenous peoples' rights of ownership and use of land and resources.		

Principle/Criteria of SFM	Current Situation (combining National and Forest Management Unit (FMU))	Barriers to be addressed to better meet compliance requirements for this Principle/Criteria of SFM
Principle 4: Community relations and worker's rights – to maintain or enhance forest workers' and local communities' social and economic well-being.		
Principle 5: Benefits from the forest – to maintain or enhance long term economic, social and environmental benefits from the forest.		
Principle 6: Environmental impact – to maintain or restore the ecosystem, its biodiversity, resources and landscapes.		
Principle 7: Management plan – to have a management plan, implemented, monitored and documented.		
Principle 8: Monitoring and assessment – to demonstrate progress towards management objectives.		
Principle 9: Maintenance of high conservation value forests – to maintain or enhance the attributes which define such forests.		
Principle 10: Plantations – to plan and manage plantations		

Principle/Criteria of SFM	Current Situation (combining National and Forest Management Unit (FMU)	Barriers to be addressed to better meet compliance requirements for this Principle/Criteria of SFM
in accordance with FSC Principles and Criteria.		

Source: Author based on various sources including FSC

Project Objective: To secure multiple environmental benefits by addressing the twin challenges of unsustainable utilisation of biomass for charcoal and poor land management practices common in Uganda's Woodlands.						
Project Component	Grant Type	Expected Outcomes	Expected Outputs	Trust Fund	Grant Amount (\$)	Confirmed Cofinancing (\$)
Component 1: Data collection and improved coordination and enforcement of regulations governing the biomass energy sector, in particular those related to sustainable charcoal	TA	<p>Outcome 1.1: Existing & ongoing policy, regulatory and institutional work on sustainable charcoal and land tenure security integrated with recommendation from the new biomass energy strategy (BEST)</p> <p>Outcome 1.2: Improved coordination of institutions managing sustainable charcoal production at district level</p> <p>Outcome 1.3: Improved data collection and monitoring of biomass energy and charcoal production and use (integrated into national database and for use as baseline information in a possible NAMA)</p> <p>Outcome 1.4: Improved charcoal and biomass guidelines and ordinances at district level</p>	<p>Output 1.1.1: National charcoal survey and updated standardized baseline reports completed based on latest data³³</p> <p>Output 1.2.1: Framework for institutional coordination and resource mobilization developed between MEMD, local government authorities and the National Forest Authority to manage charcoal trade at district level</p> <p>Output 1.3.1: Baseline report and functional biomass database established and hosted at MEMD and published in Uganda Bureau of Standards reports³⁴ and used for a sustainable charcoal NAMA (see Output 2.3.1)</p> <p>Output 1.4.1: Local ordinances and standards for sustainable charcoal certification schemes developed, adopted and publicized in targeted pilot districts³⁵</p> <p>Output 1.5.1: Awareness and educational program on local ordinances</p>	GEFTF	<p>Total: \$332,500</p> <p>CCM: 167,200</p> <p>SFM: 165,300</p>	1,980,433

³³ Project will update the proposal for a new standardised baseline for charcoal projects in the Clean Development Mechanism prepared by Perspective GmbH and the Ugandan DNA (2011) Zurich, Switzerland.

³⁴ The database will be harmonized with the NFA biomass resource assessment

³⁵ The targeted districts for this project are **Mubende, Kiboga, Nakaseke and Kiryandongo**

		<p>Outcome 1.5: Heightened awareness of new institutional frameworks and ordinances, guidelines and certification schemes at district level</p>	<p>and standards for sustainable charcoal completed in all targeted pilot districts³⁶</p> <p>Output 1.5.2: Updated guidelines for measuring biomass (CAI³⁷ & MAI³⁸) calculated using the biomass study technical manual. Annual Allowable Cut (AAC) targets established for all districts by year 2.</p>			
<p>Component 2: Dissemination of appropriate technologies for sustainable charcoal production in selected (4) charcoal-producing districts (Mubende, Kiboga, Nakaseke and Kiryandongo)</p>	TA & INV	<p>Outcome 2.1: Low-carbon charcoal production technologies have successfully replaced inefficient systems in targeted pilot districts leading to:</p> <ul style="list-style-type: none"> - Wood usage is reduced by 723,000 MT over the asset lifetimes (15 years) from use of improved kilns compared to BAU scenario <p>Lifetime³⁹ energy savings (compared to BAU scenario) of :</p> <ul style="list-style-type: none"> - 1,843,200,000 MJ for Casamance kilns (avoided emissions of 210,816 tCO₂eq) ; and - 9,737,142,857 MJ for retort kilns (avoided emissions of 1,113,686 tCO₂eq) - additional lifetime avoided methane emissions for all retort 	<p>Output 2.1.1: 60 sustainable charcoal producer groups organized, trained and operational⁴⁰ comprised of a minimum 2,400 charcoal champions⁴¹ spread across pilot districts. Activities under this output will involve:</p> <ul style="list-style-type: none"> • Developing ranking criteria for categorizing types of charcoal producers or entrepreneurs with specific focus on ensuring gender equity among groups • Conducting surveys to rank different actors into pre-determined categories based on capacity analyses and technology needs • Training of all groups on local ordinances and standards for sustainable charcoal certification schemes as well as improved kiln technologies • Demonstration of Casamance kiln operation and viability to target groups (total of 400 Casamance 	GEFTF	<p>Total \$1,004,800 (CCM) INV: 360,000 TA : 644,800</p>	5,748,358

³⁶ As noted in section B.2 the educational materials will include awareness raising and information sharing on the need for gender equity as a vital component of sustainable charcoal production and tree management

³⁷ CAI – Current Annual Increment, i.e. the volumetric or biomass increment which a tree puts in a single year

³⁸ MAI – Mean Annual Increment, i.e. the total volumetric or biomass increment up to a given age divided by that age

³⁹ Casamance kilns have an estimated lifetime of 5 years; retort kilns have an estimated lifetime of 15 years

⁴⁰ The charcoal cooperatives will likely be drawn from existing FAO APFS and FFS in districts where FAO is operational such as Nakaseke, Kiboga and Mubende; in Kiryandongo they will be formed in consultation with existing projects and structures already on the ground

⁴¹ Disaggregated by gender

		<p>kilns introduced of 252,000 tCO₂ eq</p> <p>Total direct lifetime emissions avoided of 1,576,502 tCO₂eq</p> <p>Outcome 2.2: Sustainable charcoal recognized as a viable SME in pilot districts by end of project and for post-project sustainability</p> <p>Outcome 2.3: Carbon finance is integrated into sustainable charcoal practice in targeted areas</p> <p>Outcome 2.4: Increased incomes for all charcoal cooperatives involved in project</p> <p>Outcome 2.5: Technical support for charcoal briquetting producers enhanced</p>	<p>kilns disseminated)</p> <ul style="list-style-type: none"> • Demonstration of retort kiln operation and viability to target groups (total of 200 retort kilns disseminated) • MRV, tracking and licensing system established for all improved kilns piloted • All groups in compliance with certification standards (as per Output 1.4.1) <p>Output 2.2.1: Model scheme to support consumer financing schemes for charcoal producing groups (with local financial institutions) proposed by end of project.</p> <p>Output 2.3.1: Basic Program of Activities (PoA) project submitted for registration to appropriate authority under a VCS methodology or alternatively a Sustainable Charcoal NAMA Design Document developed and endorsed</p> <p>Output 2.4.1: Profit margin per output unit of charcoal produced with new technologies increased by at least 20% per group (with new kilns) as compared to baseline scenario for all participating charcoal cooperatives</p> <p>Output 2.5.1. Training and technical assistance provided to all briquetting businesses that are receiving loans for briquetting machines from Micro-</p>			
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			Finance Institutions (in conjunction with <i>CleanStart</i> ⁴²)			
Component 3. Strengthening the capacity of key stakeholders in SFM and SLM best practices and establishment of sustainable woodlots	INV & TA	<p>Outcome 3.1: Improved capacities of stakeholders in targeted districts to establish and manage dedicated sustainable woodlots leading to:</p> <ul style="list-style-type: none"> - Accumulated yields of 368,770⁴³ MT of renewable biomass produced over 5,900 hectares under woodlot management by end of project (year 5) and 1,475,083 MT of biomass accumulation over the lifetime. - Net avoided lifetime emission reductions of 2,699,402 tCO₂eq of avoided deforestation compared to the BAU scenario from use of this 	<p>Output 3.1.1: At least 1,100 private woodlot owners in the four pilot districts identified, trained and contracted to make land available for woodlot establishment (minimum 5,900 hectares set-aside). Activities under this output will involve:</p> <ul style="list-style-type: none"> • Training all communities/woodlot managers on new charcoal regulations and SFM best practices, including use of specified tree species and optimal ecological yield from such species. • Technical support provided to all woodlot owners on tree nursery management as an entrepreneurial 	GEFTF	Total: \$1,968,700 LD: 807,500 SFM: 661,200 CCM:500,000 (INV: \$917,647 TA: \$1,051,053)	6,249,043

⁴² See a description of C/S in the Baseline Section A.4 as well as the Uganda *CleanStart* Business Plan sent under separate cover. This output will provide technical support those biomass briquetting enterprises that receive loans through participating C/S FSPs.

⁴³ See Section A.5 for detailed assumptions behind figure

		<p>renewable biomass in kilns compared to a BAU scenario⁴⁴</p> <p>Outcome 3.2: Best practice SLM/SFM knowledge effectively transferred from successful SLM projects⁴⁵ in neighboring districts to four pilot districts for this project leading to:</p> <ul style="list-style-type: none"> - 50,000 ha of forestlands across four pilot districts brought under improved multifunctional forest management leading to enhanced carbon sequestration of 2,100,000 tCO₂e over lifetime⁴⁶ - A least half of land under improved SFM registers reduction in land degradation by at least 20% as measured by reduction in soil erosion and improvement in soil organic matter - Conservation farming practices piloted leading to verified improved soil organic matter and yield 	<p>activity with target to plant over 17.4 million seedlings⁴⁷</p> <ul style="list-style-type: none"> • Dissemination of over 17.4 million tree seedlings to woodlot owners⁴⁸ • Establishment of land use and forest management plans (including zoning and mapping of forest areas) for all targeted woodlot areas • Contracts signed between woodlots owners and charcoal producer groups for feedstock supply <p>Output 3.1.2: Sustainable woodlots (out-grower schemes) successfully established to supply improved kilns with renewable biomass established (5,900 ha).</p> <p>Output 3.2.1: Targeted communities indigenous knowledge of SLM enhanced using the “Stimulating Community Innovations (SCI–SLM) approach⁴⁹” to generate local solutions to land degradation</p> <p>Output 3.2.2: Conservation Agriculture (CA) practices introduced to 400 farming households (50 in each district) over 400 ha</p>			
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⁴⁴ This figure nets out estimated BAU CO₂ eq emissions from deforestation activities for charcoal production in the four targeted districts – see Annex F

⁴⁵ The best practices to be transferred will be those from FAO and two other SLM projects operating in neighboring districts, namely the “Sustainable Land Management in the Cattle Corridor Districts of Uganda” and the UNDP/GEF “Enabling Environment for SLM to overcome land degradation in the cattle corridor of Uganda” – for a description of best practices please see Sections A.5

⁴⁶ As per GEF guidelines the lifetime is 20 years

⁴⁷ 3,000 tree seedlings will be planted per hectare at the recommended spacing of 1.5 x 1.5 metres bringing a total of 17.4 million seedlings to be planted across 5,800 hectares

⁴⁸ For more details refer to Project Document section 1.7.4 on Sustainable Forest Management and Opportunities for Charcoal Production

⁴⁹ SCI-SLM stands for Stimulating Community Innovations centred on identifying innovative forms of land management within communities themselves (community generated solutions to land degradation). This included characterizing communities, validating their innovations, and improving them through joint experimentation with researchers and scientists and stimulating the communities to go forward with their efforts through farmer-to-farmer cross visits

		increased across 400 hectares	<p>Output 3.2.3: Land use planning done in each target district using FAO-LADA-WOCAT outcomes.⁵⁰</p> <p>Output 3.2.4: District Forestry and Land Use Planning staff trained in the use of techniques that support community planning, implementation processes and land degradation assessment.</p> <p>Output 3.2.5: Mapping completed of all targeted areas under sustainable forestry management as well as agricultural lands under SLM in collaboration with FAO and National Forestry Authority's new GIS/mapping platform⁵¹</p>			
Project management Cost (PMC)					174,000	684,273
Total project costs					3,480,000	14,662,108

⁵⁰ The Land Degradation Assessment in Drylands (LADA) is a tool of FAO and has as part of its objectives to assess land degradation at local, national and global scale. In order to do so, the project has developed guidelines for each assessment level. WOCAT (World Overview of Conservation Approaches and Technologies) is an established global network of Soil and Water Conservation (SWC) specialists, contributing to sustainable land management (SLM).

⁵¹ See explanation of the new FAO-supported open-source forest mapping platform NFA has been developing for biomass monitoring in Section A.5.

TOTAL BUDGET AND WORK PLAN

Award ID:		Project ID(s):	
Award Title:			
Business Unit:	UGA10		
Project Title:	Uganda -		
PIMS no. _____	4493		
Implementing Partner (Executing Agency)	Uganda_ Ministry of Energy and Mineral Development		

GEF Outcome / Atlas Activity	Responsible Party / Implementing Agent	Fund ID	Donor Name	Atlas Budget Code	ATLAS Budget Description	Amount Year 1 (USD)	Amount Year 2 (USD)	Amount Year 3 (USD)	Amount Year 4 (USD)	Total (USD)	Budget Note
Component 1: Data collection and improved coordination and enforcement of regulations governing the biomass energy sector, in particular those related to sustainable charcoal	MEMD	62000	GEF	71200	International Consultants	15,000	30,000	30,000	15,000	90,000	1
				71300	Local Consultants	10,000	28,750	28,750	15,000	82,500	2
				72100	Contractual Services - companies	5,000	10,000	10,000	10,000	35,000	3
				72200	Equipment and Furniture	10,000	40,000	2,000	10,000	62,000	4
				75700	Training, Workshops and Conference	5,000	10,000	10,000	5,000	30,000	5
				74200	Audio Visual & Print Prod Costs	2,500	2,500	2,500	2,500	10,000	6
				71600	Travel	5,000	6,000	6,000	6,000	23,000	7
					Total Component 1	52,500	127,250	89,250	63,500	332,500	
Component 2: Dissemination of appropriate technologies for sustainable charcoal production and SLM in selected	MEMD	62000	GEF	71200	International Consultants	7,500	22,500	22,500	7,500	60,000	8
				71300	Local Consultants	20,000	40,000	30,000	10,000	100,000	9
				72100	Contractual Services - Companies	75,000	86,000	75,000	75,000	311,000	10
				72600	Grants	6,800	50,000	50,000	7,000	113,800	11
				75700	Training, Workshops and Confer	10,000	30,000	30,000	10,000	80,000	12
				74100	Professional Services	20,000	20,000	20,000	20,000	80,000	13
				72200	Equipment and Furniture.	100,000	10,000	20,000	20,000	150,000	14
				74200	Audio Visual & Print Prod Costs	2,500	2,500	2,500	2,500	10,000	15

GEF Outcome / Atlas Activity	Responsible Party / Implementing Agent	Fund ID	Donor Name	Atlas Budget Code	ATLAS Budget Description	Amount Year 1 (USD)	Amount Year 2 (USD)	Amount Year 3 (USD)	Amount Year 4 (USD)	Total (USD)	Budget Note
(4) charcoal- producing districts (Mubende, Kiboga, Nakaseke and Kiryandongo)				71600	Travel	25,000	25,000	25,000	25,000	100,000	16
					Total Component 2	266,800	286,000	275,000	177,000	1,004,800	
Component 3: Strengthening the Capacity of key stakeholders in SFM and SLM best practices and establishment of sustainable woodlots	MWE	6200 0	GE F	71200	International Consultants	7,500	22,500	22,500	7,500	60,000	17
				71300	Local Consultants	40,000	115,000	115,000	30,000	300,000	18
				72100	Contractual Services - Companies	20,000	140,000	160,000	20,000	340,000	19
				72600	Grants	29,000	120,000	120,000	29,000	298,000	20
				72200	Equipment and Furniture	500,000	100,000	20,000	20,000	640,000	21
				75700	Training, Workshops and Conference	20,000	40,000	40,000	20,000	120,000	22
				74100	Professional Services	20,000	20,000	20,000	20,000	80,000	23
				74200	Audio Visual & Print Prod Costs	2,500	2,500	2,700	3,000	10,700	24
				71600	Travel	30,000	30,000	30,000	30,000	120,000	25
	Total Component 3	669,000	590,000	530,200	179,500	1,968,700					
Project Management	MEMD	6200 0	GE F	71200	International consultants	0	30,000	0	30,000	60,000	26
				74100	Professional Services (Audit)	3,000	3,000	3,000	3,000	12,000	27
				71400	Contractual Services - Individuals	19,500	19,500	19,500	19,500	78,000	28
				71600	Travel	3,500	3,500	3,500	3,500	14,000	29
				72200	Equipment and Furniture	8,000	0	2,000	0	10,000	29
					Total Project Management	34,000	56,000	28,000	56,000	174,000	
PROJECT TOTAL						1,022,300	1,059,250	922,450	476,000	3,480,000	

Budget notes:

	Budget Notes
1	International Consultants (IC). IC will be contracted to provide specific technical assistance to MEMD and project partners in undertaking national charcoal survey and development of standardised baselines, develop guidelines and standards for certification schemes for improved charcoal. (6 weeks total) Sub Total: \$90,000.
2	Local Consultants (LC). LC will be contracted to provide specific technical support to MEMD and project partners including project management unit and international consultants in strengthening existing and ongoing policy and regulatory and institutional framework for charcoal and biomass energy. Specifically, the LC will be utilised to undertake study of average carbon content of biomass used in charcoal production; determine average level of methane emissions from existing earth kilns and determine undertake biomass energy use and production surveys, typical share of non-renewable biomass used for production of charcoal Production by kiln type and volume of charcoal produced per district Integration of data into national system on charcoal use and production and; prepare awareness programmes and simplified guidelines for measuring biomass (20 weeks). Subtotal: \$82,500.
3	Contractual Services (CS). CS will be recruited in open processes and utilised to support formulation, enactment and gazettement of national guidelines and regulations including certification criteria, develop popular versions of national guidelines and regulations, Formulate, enact and gazette district ordinances, Develop popular versions of district ordinances, develop awareness materials; conduct educational campaign for landowners, charcoalers and traders; review existing guidelines and Stakeholder consultation to validate guidelines. (4.7 weeks) Subtotal: 35,000.
4	Machinery and Equipment. The following equipment will be purchased as investments to support the outcomes of component 1, 4-Laboratory Oven capable of holding 103°C +/- 2°C, 4-Weighing electronic balance with accuracy of 0.01gram, 500-Vapor-tight containers for wood samples, 4-Muffle furnace capable of holding ~900°C, 100-Platinum crucibles for holding samples in muffle furnace; 4-Dessicator cabinets for cooling samples from muffle furnace 5-Laboratory Rotary type kilns for the generation of lab-scale data; 200- Gas sample bags; 2- Calibrated gas chromatograph. Sub Total: \$62,000
5	Training. Project funds will be used to increase stakeholder participation and ownership of project implementation process during the inception phase including organising inception workshop and project board. The inception workshop will include representatives from the focal district local governments, charcoal producers, tree farmers, charcoal transporters and retailers. The training will also include capacitating District Technical Planning Committees to prepare District Ordinances to regulate charcoal trade. Sub Total: \$30,000
6	Printing and Publications. Funds will be required to ensure adequate stakeholder awareness of various planning and stakeholder processes as well as training processes. This will include printing of guidelines and regulations, byelaws and ordinances, Sub Total: \$10,000.
7	Travel. Funds will be required for travel for consultants, contractors and project staff to reach focal districts and pilot sites whether for research, project management or stakeholder meetings as well as to national level meetings. Stakeholders will be required to attend national

	Budget Notes
	and / or district level meetings and seminars as appropriate to the particular output and activity. Sub Total \$23,000
8	International Consultants (IC). IC will be contracted to support development of a framework for promoting appropriate carbonization technologies, and delivery model to support consumer financing schemes for charcoal producing groups and support development and registration of a project under small scale CDM methodology. (4 weeks total). Subtotal: \$60,000
9	Local Consultants (LC). LC will be contracted to provide specific technical support to MEMD and project partners including focus districts and communities, international consultants developing financial incentives and rolling out appropriate technologies and development of a carbon finance project. Specifically, LC will be utilised to facilitate promotion of improved kiln technology for the low income earners, promotion of retort technology to middle class farmers and local entrepreneurs, develop a suitable financing model, develop a communication strategy highlighting pilot project successes; carry out advocacy work among line ministry district heads to support Sustainable Charcoal investments and support carbon project development process. LCs will also be contracted to train beneficiaries in construction, operations and maintenance of retorts and kilns as well as provision of Technical Assistance for briquetting business (20 weeks total) Subtotal: \$100,000
10	Contractual Services (CS). CS will be utilised on a complete basis to undertake demonstration of kiln operation and viability to target group (600 total kilns @\$100), and demonstration of retort operation and viability to target group (200 total kilns @\$1000). Sub-total: \$311,000
11	Grants: Sub-total: This will involve support for consumer financing schemes for charcoal producing groups. Specifically these will be informed of financing packages developed through in depth consultations with targeted MFI's and SACCOs. \$ 113,800
12	Training. Trainings will be utilised to ensure preparation and awareness activities are carried out to achieve the key outputs as defined on the log frame including: charcoal producer organisations on construction of improved charcoal technologies; management charcoal production as a business, improving packaging and transportation of charcoal. This will also include gender equity and equality training programmes. Sub Total: \$80,000
13	Professional Services. Legal Specialists will be engaged for ratification of memoranda of understanding and related articles in formulation of various charcoal producer organisations, tree farmers and land owners, transporters and retailers; SACCOs, MFFIs and Banks with respect to financing mechanisms for access to technology and clean development funds. Sub Total: \$80,000
14	Machinery and Equipment. Equipment will be purchased as investments to assist the set up of efficient charcoal production value chain including, transportation technologies, vehicles, and packaging storage materials. Sub Total: \$150,000.
15	Printing and Publications. Funds will be required to ensure adequate stakeholder awareness of sustainable charcoal production value chain processes and practices, institutional coordination, conservation and management of biomass, documentation of lessons learnt, publishing feasibility studies. Sub Total: \$10,000.

	Budget Notes
16	Travel. Funds will be required for travel for consultants, contractors and project staff to reach landscape sites whether for research, project management or stakeholder meetings as well as to national level meetings. Stakeholders will be required to attend national and / or district level meetings and seminars as appropriate to the particular output and activity. Sub Total \$100,000
17	International Consultants (IC). IC will be contracted to support development of a strategy for enhancing carbon storage potential of forests for integrating into land use planning and decision making at different levels including development of a carbon flow monitoring protocol and system. (4 weeks total) Sub Total: \$60,000.
18	Local Consultants (LC). LC will be contracted to provide specific technical support to Ministry of Water and Environment and project partners including focus districts, communities and international consultants to mainstream sustainable Forest Management in development plans and activities, improving land and forest management and enhancing carbon storage potential of local forests. Specifically, LC will be utilised to facilitate establishment of community woodlots, training of charcoal producers and wood lot managers on new charcoal regulations, development of knowledge transfer tools and resources, development of land use and forest management plans, support private woodlot and plantation establishment; development of benefit sharing mechanism, framework for payment of ecosystem services, development of data collection system and develop tools and pilot systems for capacity building and communication (60 weeks total) Subtotal: \$300,000
19	Contractual Services (CS). CS will be utilised on a complete basis to provide technical support to tree nursery management as an entrepreneurial activity to produce over 17.4 million seedlings, supply of over 18 million tree seedlings to private tree growers and charcoal producer associations; introduction of Conservation Agriculture (CA) to 400 households (100 in each district) and covering 400 ha leading to an integrated nutrient management including the proper use of agro-inputs. Subtotal: \$340,000
20	Grants: These will include support to selected Community Based farmer groups to plant 200ha of woody energy crops and 400 households to implement Conservation Agriculture covering 400Ha (\$330,000)
21	Machinery and Equipment. Equipment will be purchased as investments to assist in mapping of boundaries defining land use zones, setting up pilots for monitoring specific indicators of forest health, monitoring of baseline carbonisation technologies, lab equipment for field level testing and monitoring of carbonisation. Subtotal: 640,000
22	Training. Trainings will be utilised to ensure preparation and awareness activities are carried out to achieve the key outputs as defined on the log frame including: training of charcoal producers / woodlot managers on new charcoal regulations and Sustainable Forest Management practices, training a total of 1,112 house-holds (potential private trees owners) in the four pilot districts through awareness creation, demonstrations, training and establishment of support structures for the provision of seedlings for enrichment planting and inputs; training of district Land Use Planning staff in the use of techniques that support community planning, implementation processes and land degradation assessment tools. Subtotal: 120,000

	Budget Notes
23	Professional Services. Legal Specialists will be recruited for formulation and ratification of memoranda of understanding and related articles in formulation of various community and district level collaborative forest management mechanisms in order to ensure the agreements reside in law. Sub Total: \$80,000.
24	Printing and Publications. Funds will be required to ensure adequate stakeholder awareness of sustainable forest management, collaborative forest management approaches, public-private sector partnership guidelines, land use planning guidelines and tools. Sub-Total: \$10,700
25	Travel. Funds will be required for travel for consultants, contractors and project staff to reach landscape sites whether for research, project management or stakeholder meetings as well as to national level meetings. Stakeholders will be required to attend national and / or landscape level meetings and seminars as appropriate to the particular output and activity; Farmer to farmer learning study tours and exchanges. Sub Total \$120,000
26	International consultant External consultants will be hired for midterm (\$30,000) and final evaluations (\$30,000). Sub Total: \$60,000
27	Professional Services. An accountancy firm will be hired at \$3,000 per year for annual audits. Sub Total: \$12,000
28	Contractual services: \$68,000 has been allocated to support the work of the Project Management Unit to be backed up by a full time administrator/accountant, and where management related. Sub Total: \$78,000
29	Travel: A total of \$14,000 has been budgeted for non project specific activities travel by members of the PMU to allow for effective project coordination between the PMU, the different district offices and numerable field sites within them. Sub Total: \$14,000
30	Machinery and Equipment: \$10,000 has been budgeted for computer purchases, upgrades and services. Sub Total: \$10,000

Summary of Report

Currently the charcoal sector is largely informal and unregulated, although there exist a number of relevant regulations scattered among different ministries and government agencies. This makes charcoal production unattractive to many potential investors and is a deterrent to serious investors in the sector. Attracting investment into the sector requires innovative approaches. Both the Energy Policy and Renewable Energy Policy in Uganda highlight increased investment in renewable energy as one of the key policy targets. Carbon finance, the process, by which projects in developing countries or countries in transition can receive funding from industrialized countries or companies to meet the costs for projects that meet certain national and/or sectoral development goals and ultimately help the global reduction of greenhouse gas emissions, is seen as one of these innovative approaches.

This report presents a brief overview of the carbon markets, including a discussion of the concepts of carbon finance and carbon markets and their applicability to the GEF project: “Addressing Barriers to Adoption of Improved Charcoal Production Technologies and Sustainable Land Management Practices through an Integrated Approach in Uganda: Biomass Energy Technology Transfer.” It looks at the key challenges faced to date in making carbon finance work for the charcoal sector in Sub-Saharan Africa, and some of the proposed solutions. It traces the concept and evolution of the Standardized Baseline Approach for Clean Development Mechanism (CDM) projects and how this can be harnessed to simplify the inclusion of the charcoal sector into the carbon markets.

The report concludes that there exist opportunities exist both in the compliance (CDM) and voluntary carbon markets for the charcoal sector. It explores various options for doing this and recommends that the small-scale CDM methodology AMS-III.BG: “Emission reduction through sustainable charcoal production and consumption” is the most suitable methodology as it has all the elements present in the current project:

- Envisages small-scale charcoal production
- Involves shifting from non-renewable to renewable biomass feedstock
- Allow a range of charcoal kilns
- Promotes formation of charcoal associations for easier contracting
- Methane capture may or may not be undertaken as a project activity

This will be used in conjunction with the Standardized Baseline approach to simplify the process, following proposals submitted to the CDM Executive Board in 2012 and currently undergoing the second stage of review pending approval. The project activities will be used to validate existing emission factors as well as to generate missing data. A significant amount of technical support and capacity building will be required if the initiative is to succeed.

Overview of the Carbon Markets

Carbon finance is a branch of environmental finance and refers to the process by which projects in developing countries or countries in transition can receive funding from industrialized countries or companies to meet the costs for projects that not only meet certain national and/or sectoral development goals but also ultimately help the global reduction of greenhouse gas emissions (Disch *et al.*, 2010). This is an opportunity that has not been fully exploited in Africa in general, and East Africa in particular, though Uganda has done well. This process is regulated through **the carbon markets**, which refers to the platform where these emission reductions are traded. The unit of transaction in these markets naturally is the **Carbon Credits**.

The effect of carbon finance is to provide otherwise scarce funding for development projects in poor countries that avoid or reduce GHG emissions typically associated with such activities. Carbon finance must therefore involve at least four major players:

1. **The Project Developer** – the entity interested in setting up a project that is eligible for carbon finance. This can be an organization or an individual.
2. **The Carbon Registry/Standard** – the entity that issues certificates showing that the proposed project has fulfilled certain pre-determined conditions and is thus eligible to be issued with emissions reduction certificates that can then be sold to interested buyers. The entity could be part of the **Compliance** or **Voluntary Market**.
3. **The Independent Verifier** – an accredited independent organization that audits all the activities and procedures undertaken for the proposed carbon finance project and submits a report to the carbon standard under which the project seeks carbon financing showing that the said activities and procedures meet the required conditions.
4. **The Carbon (Emissions Reductions - ERs) Buyers** – the buyers of the Certified or Verified ER certificates issued after the project has fulfilled all the conditions necessary. The buyers could be organizations seeking to comply with statutorily assigned ER amounts by respective governments through the Kyoto Mechanisms hence part of the compliance market, or organizations (and even individuals) wishing to contribute to reduce global GHG emissions as part of their Corporate Social responsibility, although they are not legally required to do it (hence part of the Voluntary Market). Voluntary buyers may also do so in order to market themselves environmentally conscious.

Since the coming into effect of the Kyoto Protocol in 2005, the availability of carbon finance has created opportunities for entrepreneurs who are developing sustainable energy projects. This is crucial because, for small-scale energy projects in developing countries, accessing finance is one of the major constraints to expansion. The innovative nature of creating a commercial value for reducing greenhouse gas emissions is an opportunity through which the carbon markets can provide an additional source of revenue for a sustainable energy project thus increasing the commercial viability of a project, and ultimately play an important role in incentivizing, sustaining and growing the enterprises. This project has all the elements that need to be fulfilled in order to conform from carbon finance.

There are four key elements of carbon finance projects:

- The projects must be able to demonstrate **empirically** that they do reduce GHG emissions.
- They must contribute to the **sustainable development** of the host country.
- Their activities must be **additional** and not a by-product of an already existing or planned activity which would have happened in spite of the carbon finance.
- These emission reductions need to be **measured** and **independently verified** before they can be sold as carbon credits.

General Procedures for Applying Carbon Finance to Projects

The process of proving the project's emissions reductions is fundamentally the same, but varies in complexity, stringency and the time it takes until approval depending on whether the project is to be credited under the '**Compliance Market**' or the '**Voluntary Market**'. The Compliance Market operates under the Clean Development Mechanism (CDM), regulated by the United Nations Framework Convention on Climate Change (UNFCCC) and the modalities and procedures are defined under the Kyoto Protocol of the UNFCCC (Disch *et al.*, 2010). Transactions under the CDM can therefore only be carried out between countries that are party to the Kyoto Protocol. The UN approved CDM route is more difficult for small projects but gives better prices (at a higher cost) than standards in the voluntary market, which are often easier and quicker. The CDM has been faulted for its bureaucracy, including the lack of flexibility and the high costs as well as lengthy durations in

getting through the approval process. Their stringency however gives CDM credits comparatively higher market value since carbon credit buyers perceive their risks to be lower and hence are willing to pay more.

The ‘Voluntary Market’, sometimes loosely called the ‘Offset Market’, typically operates within a framework in which environmentally conscious companies or consumers use the process to improve their environmental and philanthropic credentials. Voluntary carbon projects may use other methodologies than under the CDM and can therefore be implemented in countries that have not ratified the Kyoto Protocol. Credits from such projects cannot be used by industrialized countries to meet targets under the Kyoto Protocol. The projects typically use standards that provide more flexibility on methodologies, which can speed up the validation and verification processes at much lower costs compared to the CDM. Nevertheless, recent developments have seen rigorous voluntary standards such as the Verified Carbon Standard (VCS) developed that apply the same stringent tests to voluntary projects that are applied to CDM projects, reducing reputational risk.

Whether part of the compliance or voluntary market, each project must go through certain conditions as set out in the standard to be used to certify the emissions reductions or avoided emissions before the credits can be available for sale.

The basic steps in implementing a carbon finance project of whatever nature are shown below:

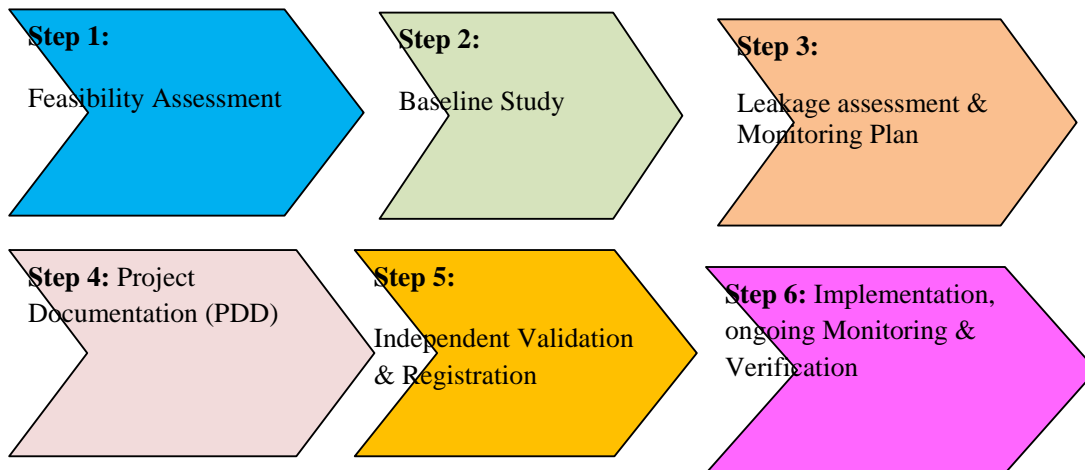


Figure 2: Basic steps in implementing a carbon finance project

Opportunities for Carbon Finance in Sustainable Charcoal (Applicable Standards)

Opportunities exist both in the compliance (CDM) and voluntary carbon markets for sustainable energy projects in general, and the charcoal sector in particular. These projects address either the supply side (charcoal and feedstock production) or the demand side issues (improved cook stoves and efficient charcoal/energy utilization). However, the applicability criteria for many of these existing standards significantly narrow down the options available in this project. The UNFCCC/CDM website has a register of all approved methodologies as well as those submitted and awaiting the CDM Executive Board's (EB) approval for each activity sector that may qualify for CDM financing. There are currently few if any, independently developed and approved methodologies in the voluntary market for qualifying sustainable charcoal projects for carbon finance and any such standard that can be employed in this project must employ a relevant CDM approved methodology. Table 1 below summarizes the key features of existing CDM and voluntary market (VCS and Gold Standard) methodologies that may be used for certain aspects of this project including an assessment of their applicability. The table shows that the Small scale CDM methodology AMS-III.BG: "*Emission reduction through sustainable charcoal production and consumption*" is the most suitable methodology as it has all the elements present in the current project:

- Envisages small-scale charcoal production
- Involves shifting from non-renewable to renewable biomass feedstock
- Allow a range of charcoal kilns
- Promotes formation of charcoal associations for easier contracting
- Methane capture may or may not be undertaken as a project activity

Table9: Examples of existing Carbon Standards for Charcoal and/or Energy Projects

Standard	Type of Market	Project Scope	Comments on Suitability for this Project
6. VM0018 - Energy Efficiency and Solid Waste Diversion Activities within a Sustainable Community	Voluntary Markets using the Verified Carbon Standard (VCS)	This methodology provides a procedure to determine the net CO ₂ , N ₂ O and CH ₄ emissions reductions associated with grouped projects that focus on energy efficiency and solid waste diversion activities for an assortment of facilities within a set territory.	Unsuitable – addresses the demand side only and although efficient charcoal use may be applicable, difficult to identify and set boundaries.
7. Methodology for Improved Cook-stoves and Kitchen Regimes	Voluntary Markets using the Gold Standard	This methodology is applicable to programs or activities introducing improved cook-stoves or water treatment technology (e.g. water filters) and practices to households and institutions that result in improved kitchen regimes within a distinct geographical area.	May be applicable at the demand side but scope for emissions reductions is limited.
8. AM0041 - Mitigation of Methane Emissions in the Wood Carbonization Activity for Charcoal Production	Compliance Market (CDM)	This methodology is based on the project activity "Mitigation of Methane Emissions in the Charcoal Production of Plantar, Brazil". Only methane (CH ₄) emitted directly from charcoal production facilities, in particular the charcoal kilns, is monitored and its emissions calculated for the baseline and project scenarios, except for the provisions on leakage.	Unsuitable: <ul style="list-style-type: none"> • Project activity limited to methane capture and/or flaring • Suitable for large scale industrial plants • Involves use of retorts only
9. ACM0021 - Approved consolidated baseline and monitoring	Compliance Market	This consolidated methodology applies to project activities that reduce methane emissions in the residual gas from the	Unsuitable: <ul style="list-style-type: none"> • Project activity limited to methane

methodology. “Reduction of emissions from charcoal production by improved kiln design and/or abatement of methane”.	(CDM)	carbonization process at existing and/or new charcoal kilns and is based on the AM0041 methodology and proposed new methodology: NM0341 “Mitigation of methane emissions from charcoal production by recovering and burning carbonization gases” prepared by Arcelor Mittal.	capture and/or flaring <ul style="list-style-type: none"> • Suitable for large scale industrial plants • Involves use of retorts only
10. AMS-III.BG: Emission reduction through sustainable charcoal production and consumption	Compliance Market (CDM)	<p>This methodology is applicable to project activities that displace the use of non-renewable biomass in the production of charcoal supplied to identify consumers included in the project boundary.</p> <p>Project activity shall introduce efficient charcoal production technologies using renewable biomass feedstock such as biomass residues to displace the production of charcoal in unimproved traditional kilns by the informal sector thereby leading to emission reductions.</p>	<p>Most suitable as it encompasses activities envisaged under this project.</p> <ul style="list-style-type: none"> • Small scale • End users of charcoal shall be: (i) households; or (ii) small and medium enterprises (SME); or (iii) a group of households served by a charcoal market. • End users do not include large scale industries. • Promotes formation of charcoal associations • Applicable technologies include but not limited to Retorts, Tones, Improved Earth Kilns, etc. • Methane capture may or may not be included as a project activity. <p>NB: Entry into force is the date of the publication of the EB 70 meeting report on the 23 November 2012.</p>

Process for Qualifying the Charcoal Project for Carbon Financing

The first step in developing the carbon finance aspect of the project is to organize the project beneficiaries into associations so that the carbon benefits can be aggregated to make project development feasible. This also makes easier the process of contracting – carbon finance involves a lot of contractual arrangements in order to manage risks associated with permanence of emissions reductions and to ensure their integrity. Once this has been done, the steps outlined in Section 1.1 above will need to be supported following established procedure as elaborated in Table 2 below.

It should be noted that while a CDM methodology will almost certainly be applied, the project itself will not be proposed for carbon financing under CDM as GEF funding may not be utilized for such purposes. This sub-component will therefore identify a suitable and credible voluntary mechanism such as the VCS or Gold Standard that will employ the selected CDM Methodology. However, if a private investor agrees to finance the process, then CDM will also become an option. Selecting the most suitable standard is one of the outputs in Steps 1 and 2 described in the Table 2.

Table 10: Basic steps in implementing a carbon finance project

Step/Activity	Significance	Issues to be Addressed
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Step 1: Feasibility Assessment	To establish the financial viability of the charcoal enterprise from feedstock production to the final product.	<ul style="list-style-type: none"> • Is there a viable market to sell the charcoal and increase sales, is sustainable charcoal a profitable enterprise? • What is the baseline for charcoal demand? • What is the charcoal use patterns including end use technologies? • Is there a sufficient amount of emissions reductions for which the beneficiaries could receive carbon finance? • What is the difference between the present and expected situations?
Step 2: Baseline study and study of methodology	To establish that the baseline scenario (current technologies, feedstock sources, etc.) represent an undesirable outcome in the long run if no remedial action is undertaken.	<ul style="list-style-type: none"> • How much emissions result from unsustainable biomass use? • How much emissions result from inefficient carbonization technologies • What is the outlook in the without-project scenario? • What is the outlook for with-project scenario? • What is the best methodology (carbon standard) to use to account for all these?
Step 3: Leakage Assessment and Development of Monitoring Plan	Develop a framework for monitoring the emissions reductions and the social, economic and environmental benefits of the project. Leakage assessment estimates the displacement of GHG emissions from one place to another due to emission reduction activities introduced by the proposed project. There is a need to put in place mechanisms for monitoring leakage (Henders & Ostwald, 2012).	<ul style="list-style-type: none"> • What system works best? • What data needs to be collected and how will this is done? • How frequent is the data collection? • Who will collect the data?
Step 4: Project Documentation	The data collected will be consolidated into a Project Design Document (PDD) following procedures and formats prescribed in the selected carbon standard, and which includes all calculations and their references. This document is also the basis of independent validation and if	<ul style="list-style-type: none"> • Can all the data required in the PDD be obtained and presented in the correct format? • What is the crediting period? • Is there project Additionality?

	successfully granted registration, subsequent verification before carbon credits can be awarded.	
Step 5: Independent validation of calculations and registration	The Project Design Document (PDD), including the baseline, the estimated CO ₂ savings and the monitoring plan, will need to be checked and approved by an independent validator to establish conformity with the requirements of the selected carbon standard.	The project technical consultant will need to work with the independent validator/verifier, helping clarify issues and effecting changes in design as advised by the validator.
Step 6: Implementation, ongoing monitoring and verifications	Good record keeping is crucial to ensure compliance with the approved PDD and as proof during verification before carbon payments can be made.	<ul style="list-style-type: none"> • Have the projected emissions reductions been achieved? • Is there need to adjust any aspects of the project based on the monitoring data?

Carbon Finance Linkages with activities and Data for Standardized Baseline

Evolution of Standardized Baselines

The Clean Development Mechanism (CDM) has received criticism for its bureaucracy and procedural complexity. Consequently, the Parties to the United Nations Framework Convention on Climate Change (UNFCCC) called for the use of “standardized baselines” at the Cancun conference in 2010 (COP16). The importance of carbon project baselines has been underscored in the preceding chapter, for they form a basis upon which all future assessments are going to be done. Unfortunately, setting baselines for the calculation of greenhouse gas emission reductions under the CDM is an expensive and time-consuming exercise. As a potential solution, the concept of standardization has been proposed.

As far back as 2001, The Marrakech Accords allowed for baselines to be set as the “average emissions of similar project activities undertaken in the previous five years, in similar social, economic, environmental and technological circumstances, and whose performance is among the top 20% of their category.” In subsequent years, standardized approaches, such as performance benchmarks and default values, were increasingly being included in baseline and monitoring methodologies under the CDM. The move towards standardization accelerated in 2010 with the call for the use of “standardized baselines” in the CDM, intended “to reduce transaction costs, enhance transparency, objectivity and predictability, facilitate access to the clean development mechanism, particularly with regard to under-represented project types and regions, and scale up the abatement of greenhouse gas emissions, while ensuring environmental integrity”.

The rationale behind standardized baselines is that baseline technologies, baseline emission factors and additionality criteria are not determined on a project-by-project level but are established for a project type or sector in one or several CDM host countries. The CDM Executive Board has since developed and adopted the first guidelines and procedures for the establishment of standardized baselines. The case for standardization is not limited to the CDM only. According to the VCS, standards provide a cost effective, systematic and easy-to-use criterion that can be ‘localized’ by project developers to fit a desired project.

However, criticisms have been leveled against these guidelines, most notably, that they will not achieve the objectives of standardization and could severely limit the ability of standardized baselines

to contribute to global greenhouse gas abatement efforts (Schneider *et al.*, 2012). They argue that the approaches may be impractical to apply, and could result in significant under-crediting in some cases (thereby removing the incentives from the carbon market) and in significant over-crediting in others (thereby undermining the integrity of the mechanism). The specific objections to the guidelines relate to the following points:

1. **The use of one single methodological approach** for different project types, sectors and locations that may pose various challenges.
2. **Voluntary use of standardized baselines (the other option being a project-specific baseline):** The fear here is the possibility that project developers will only select a standardized baseline if it provides for higher baseline emissions than a project-specific baseline leading to over-crediting (and thus undermining the integrity of CERs).
3. **Use of constant baseline emission factors** which is applied continuously for at least one crediting period (namely up to 10 years, and up to 30 years for afforestation and reforestation project activities). The issue here is that data used to establish these baselines may not be up to date or could be faulty.
4. **Linking additionality assessment and baseline determination**, an approach which reduces the flexibility to select the most suitable approach for the sector and project type concerned.
5. **Data availability:** The guidelines require the collection of a large amount of activity data and information on technologies used in each plant, which in many sectors and countries is not available.
6. Other concerns stem from the issue of “**Prior Consideration**”⁵² and lack of clarity of the framework.

These are genuine concerns that need to be addressed for standardization to function as envisaged. Schneider *et al.*, therefore provide a range of recommendations that could help fix the problem in the proposed framework. They range from avoiding the use of a single baseline for all sectors, project types and locations, making standardized baselines flexible enough to allow them to be changed based on new information and initiating on-the-ground data collection.

The use of standardized baselines brings to the fore the need to have **performance benchmarks**, where projects that meet or exceed a pre-determined level of the metric may be deemed as additional and the same or a different level of the metric may serve as the crediting baseline (Füssler, 2012). As Füssler explains, the benchmark may:

- i. Serve as a **standardized baseline emissions level** that is independent of the specific project and/or
- ii. Serve as an **additionality criteria** in that projects that perform better than the benchmark (e.g. have lower specific emissions in tons of CO₂ per ton of product) are deemed automatically additional.

Furthermore, the concept of **performance comparison**, i.e. a comparison of performance against peers based on a set of criteria, is the key to standardization (Hayashi *et al.*, 2010). A comparison against peers implies that entities have a common output which makes them comparable to each other. According to Hayashi *et al.*, the effectiveness of performance comparison depends on certain Key Performance Indicators (KPIs) that include:

Aggregation level

The grouping of various types of potential projects into a single category with a corresponding single baseline is the defining aspect of performance standards. Four key dimensions of aggregation are: (1)

⁵² The concept of “Prior Consideration” according to the CDM Executive Board in relation to CDM Project Development requires that for project activities for which the PDD has not been published for global stakeholder consultation or the start date is prior to the date of publication of the PDD for global stakeholder consultation, the project participants shall provide information to demonstrate that the CDM was seriously considered in the decision to implement the project activity in accordance with requirements in [the Clean Development Mechanism project standard to the DOE that performs validation of the proposed CDM project activity].

process, (2) product, (3) time and (4) space. First, the process dimension asks whether performance standards are differentiated by technology or process. Second, the product dimension analyzes whether the product or service for performance comparison should be further disaggregated. Third, the temporal dimension assesses the age or vintage of peers for comparison. Lastly, the spatial dimension determines the geographical boundary in which the peers are located.

Data requirements

The data obtained from a cohort of peers for performance comparison could be either empirical or projection-based. If empirical data is used, a performance standard is considered backward looking in that it is based on the actual emission performance of peers in the past. On the other hand, a performance standard can also be forward looking if some elements of projection are applied to the data used.

Stringency level

A key challenge with standardized approaches is striking a balance between over-crediting and under-crediting of mitigation efforts. Performance standards have to be set at a level that ensures a reasonable degree of environmental integrity while providing project developers with sufficient incentives for investment.

Updating frequency

Performance standards need to be updated periodically to reflect changing economic, social, technological, and environmental circumstances. Key issues are the frequency of and procedures for updating. Performance standards can be updated by recollecting the data from the peers, or based on a pre-defined autonomous improvement factor in emission performance.

Following these perspectives, there is need to establish a standardized baseline for the charcoal sector that is up-to-date, sector-specific, and accurate, and then establishes performance benchmarks that will be used to operationalize the standardized baselines for the charcoal sector in Uganda.

Standardized Baseline Development for the Sustainable Charcoal Sector in Uganda

Although approaches to standardization have been piloted in several countries and sectors worldwide to date, Uganda is unique because pioneer efforts towards the development of practical standardized baselines in the charcoal sector are proposed to be tested in Uganda. In 2011, Perspectives GmbH developed a proposed methodology for a new standardized baseline for charcoal projects in Uganda (Müller *et al.*, 2011) and submitted it to the CDM EB on 16 May 2012 and updated on 30 May 2012 of the same month. The proposal has already undergone successful initial assessment according to the UNFCCC/CDM website where all proposals for standardized baselines are listed the proposal has among others, the following objectives which directly address the issues discussed earlier within the charcoal sector:

- To explain why a simplification of CDM projects is required.
- To establish the compliance of the proposal with applicability conditions,
- To establish a standardized baseline to facilitate the calculation of emission reductions leading to the development of a “consolidated GHG database for the informal charcoal sector.”
- To establish ex-ante the additionality in such projects.

The proposal identifies three main sources of GHG emissions in the charcoal sub-sector, namely:

- Unsustainable biomass sources for raw material (non-renewable).
- The prevalent use of inefficient carbonization technologies (typically 10 -20%).
- The use of carbonization technologies that result in high Methane (CH₄) emissions (methane is a very potent greenhouse gas).

Consequently, the document identifies two main opportunities for emissions reductions in the charcoal sub-sector:

1. Carbonization technology improvement to reduce CH₄ emissions as well as improve conversion efficiencies up to 40% (which has the effect of reducing by half the amount of wood required to produce the same amount of charcoal).
2. Decrease in the share of non-renewable biomass through the use of dedicated biomass plantations as a source of charcoal feedstock and as well as briquetting of biomass wastes.

As already pointed out, previously available CDM methodologies within the charcoal sub-sector failed to find any applicability in the African context not only due to their complexity, but also because: 1) They tend to focus only on reducing CH₄ emissions through capture and flaring; 2) they involve the use of large-scale industrial retorts for carbonization none of which is available in Africa; 3) they ignore the carbon benefits of adopting improved carbonization technologies; and 4) they ignore the significant benefits of switching from the carbon-intensive non-renewable biomass (NRB) to the more carbon-neutral renewable biomass (RB).

The proposed standardized approach promises to assist the CDM to overcome the limitations observed in the existing methodologies, such as AM0041 and AMS-III.K, by providing standardized factors for the determination of the baseline. It will also help project developers to substantially reduce the complexity in the determination of baseline emissions.

Approach for Developing Standardized Baseline for Sustainable Charcoal

This section outlines an approach that will be used in order to develop a standardized baseline (SB) for sustainable charcoal in the pilot districts, taking into account the fact that currently there is no consensus on an appropriate approach for developing SBs. Table 3 gives a proposed approach based on practical site-specific input which is expected to put in place a reliable and tested charcoal baseline which is replicable across the districts in Uganda. The **system boundary** within which the project activity takes place has been determined and comprises those emission sources that are significant and measurable and under the control of project participants in the pilot districts. The emissions that would have taken place within the system boundary without the carbon project have been described thus making it possible to determine a baseline scenario and consequently additionality. Justification for **physical boundaries** is based on carbon impact of charcoal activities and relative ease of measuring emission levels. The **aggregation levels** for the standardized baseline have been set for both accuracy and cost-effectiveness and will be based on analysis of *production process*; cross-comparison of efficiencies among different *ecological zones*; *duration* of carbonization and time series analysis with regards to *technology evolution*. To facilitate monitoring and ensure accuracy of the SB, there will be need to identify and establish **performance benchmarks**, which will be carefully tracked using suitably defined Key performance indicators (KPIs). The KPIs will typically comprise easily observable and measurable outcomes resulting from proposed project activities.

Key performance indicators (KPIs) for the SB will be measured and evaluated through the monitoring of:

- Efficient harvesting and conversion technologies
- Change in cultural practice to include better preparation of feedstock prior to carbonization
- Rate of absorption of technology
- Amount of charcoal per unit of feedstock
- Income generated from charcoal sales
- Revenue generated including revenue to the district governments in form of taxes. This may also include revenue from auxiliary activities depending on the system boundary adopted, which in turn is dependent on the practicality as well as cost-effectiveness of data collection.
- Emission reduction levels

Table11: Descriptive Summary of Approaches for Developing Standardized Baselines for the Project

Crucial Elements	Activities	Data Requirements	Remarks/Comments
Establishment of System Boundary	Baseline and situational analysis in the pilot districts	Charcoal production, feedstock, conversion technology, relevant policy, stakeholder analysis etc.	Data updating on-going There is availability of most of the data. Piloting of technology and full value chain will firm up existing data/information
Justification for Physical Boundaries Selected	Relative carbon impact of charcoal related activities	Relative ease of measuring emission levels/impact of the different activities	Detailed analysis of the relationships between different activities to be carried out
Aggregation level: Criteria for identification of peers for the emission performance comparison	Analysis of production process; cross-comparison of efficiencies among different ecological zones; carbonization time; Time series analysis with regards to technology evolution	Data on harvesting; feedstock source and preparation; carbonization method; recovery efficiency ; historical analysis of available technology	Manageable levels of aggregation which are amenable to monitoring will be adopted.
Key Performance Indicators (KPI)	Monitoring of: Efficient harvesting and conversion Change in cultural practice to include better preparation of feedstock Rate of absorption of technology Amount of charcoal per unit of feedstock; Income generated And genera revenue to the district Emission level		

Determining the Stringency Level and Updating Frequency for the project

The significance of both the stringency level and updating frequency has been underscored and thus will require careful consideration.

Stringency Level: to ensure there is no under-crediting that would compromise earnings from the sale of CERs while instilling buyer confidence based on the perceived integrity of the CERs generated, there will be a need not only to perform all required measurements based on global best practices, but most importantly, by the strict application of all tools prescribed under the selected CDM methodology. These will include:

- Additionality calculation tools
- Tools for sample size calculation
- Tools for calculation of leakage
- Monitoring tools
- Any other tools as prescribed

This will, for example, mean that the selected confidence interval during all sampling activities shall not be set below 90% which is considered an acceptable threshold in forestry related work. Similarly, attention will be paid to the **accuracy** of all measurements (i.e., the degree of closeness of measurements of a quantity to that quantity's actual (true) value, such as during determination of recovery efficiency), as well as the **precision** (the degree to which repeated measurements under unchanged conditions show the same results). This will particularly be crucial during validation, verification and future monitoring. These will similarly be set above 90% (typically 95%).

Updating frequency: This will be determined through ongoing monitoring. Initially, monitoring will be done more frequently, perhaps biannually. Based on consistency and accuracy of the data collected, this will gradually be reduced to annually and ultimately every five years or to coincide with every crediting period. During the initial monitoring, it may well be that certain trends will be observed in the parameters being measured and that hence there is need to update the established baseline. Such trends will be carefully logged and any emerging patterns analyzed to arrive at a suitable frequency. Since there is currently no such system, we recommend that the first five years of project implementation should provide a trend from which future updates will be carried out in the long term.

Conclusion

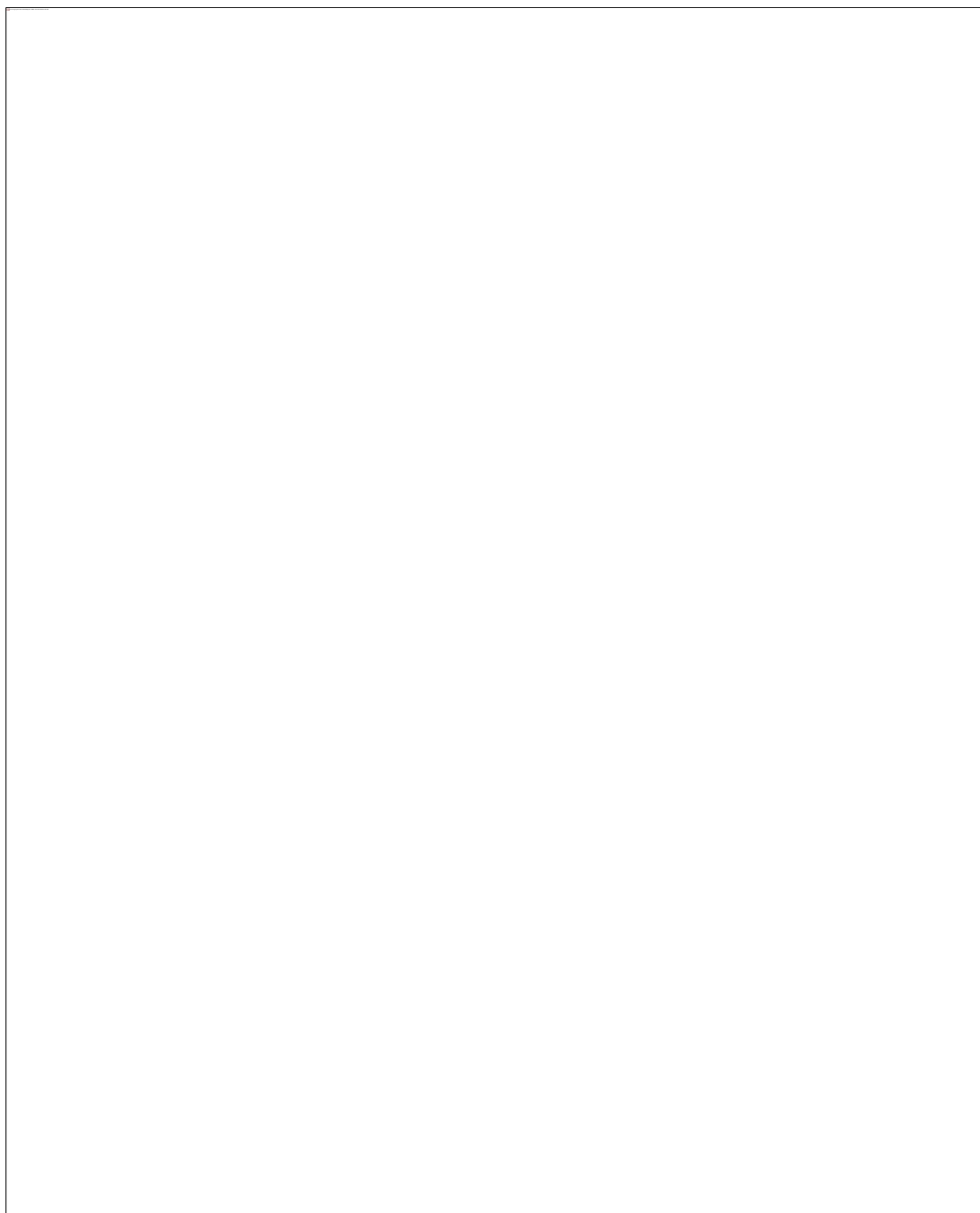
The preceding review has shown that opportunities exist both in the compliance (CDM) and voluntary carbon markets for the charcoal sector. Out of the existing methodologies, the Small scale CDM methodology AMS-III.BG: “Emission reduction through sustainable charcoal production and consumption” is the most applicable. However, the CDM itself is unlikely to be used for developing carbon finance for the project because of the restrictions placed on GEF funds for CDM development. Thus an equally credible standard in the voluntary will be assessed for suitability during project phase.

A project qualifies as a ‘Carbon Project’ when the Project Design Documents and activity reports are in line with the set carbon standards which must be verified by legal relevant authorities. The process of taking a project through the carbon finance cycle is quite technical and involves highly specialized skills. Consequently, a lot of support will be required both in carrying out the project activities as well as in capacity building to ensure long-term sustainability.

A development of Standardized Baselines for the charcoal sector should be pursued alongside other project activities, as this in the long run will both simplify the process and reduce transaction costs. A transparent and credible standardization process will result in an effective and efficient CDM and carbon markets in general.

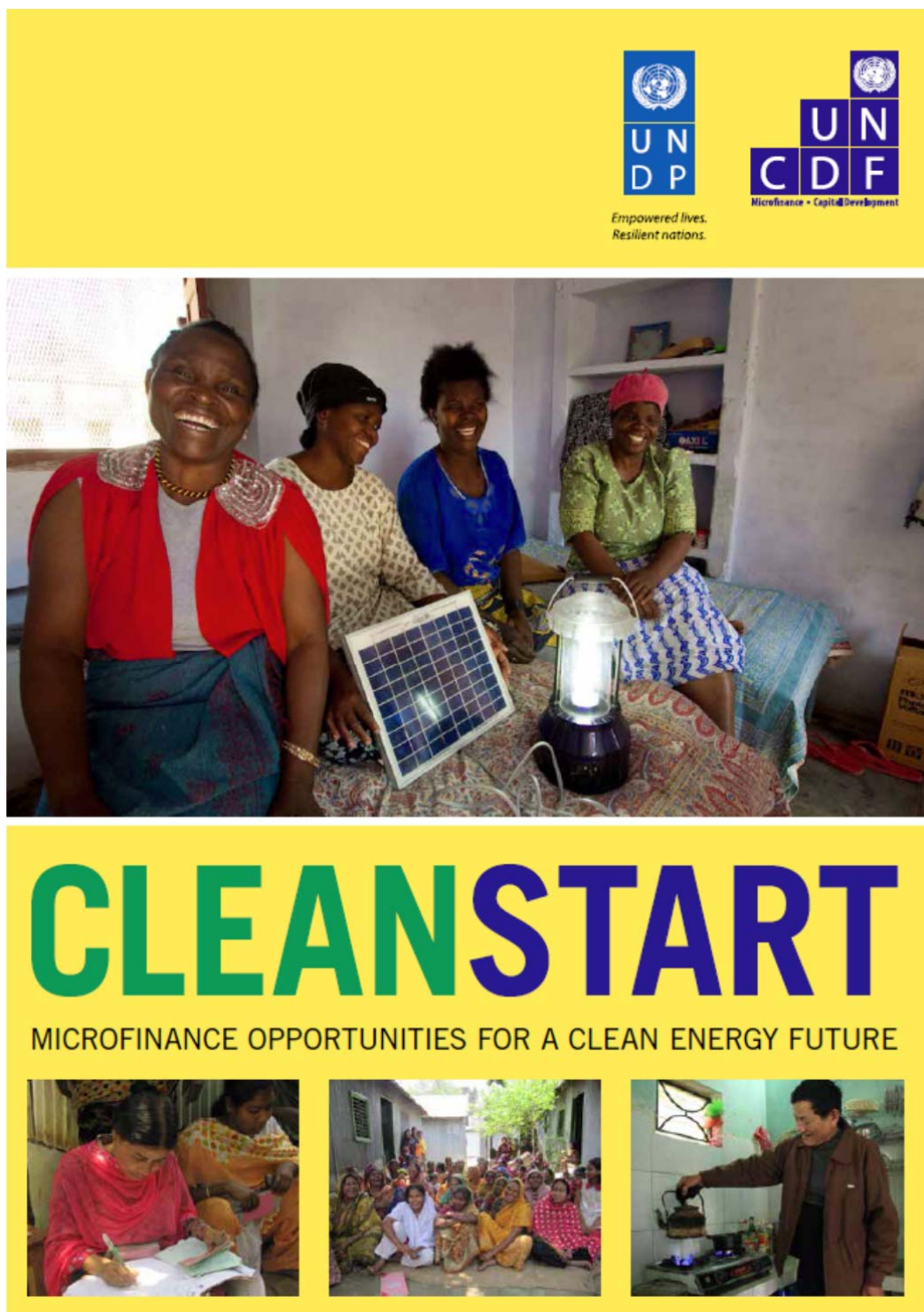
Different approaches to standardization have been tried in various countries worldwide, but Uganda is the first and currently the only country that has proposed a standardized approach to the Charcoal sector. This reinforces the case for integrating the standardized approach into the project development.

Downloadable at http://www.mdgcarbonfacility.org/downloads/CharcoalNAMASTudy_9Jan2013.pdf



ANNEX VIII: CleanStart Methodology Publication

Downloadable at www.uncdf.org/sites/default/files/Download/cleanstart.pdf



Background and Context

Uganda's energy sector is dominated by biomass which contributes over 90% of the total consumable energy, with firewood and charcoal supplying about 84% and 6% of the country's energy balance respectively. In the recent past, the demand for charcoal has been increasing rapidly at an estimated 6% per annum and this trend is expected to continue in the foreseeable future. Besides the main use of biomass energy for cooking and heating either as firewood or charcoal majorly by the household sector, there is a sizeable demand from commercial activities, such as the production of bricks. In many areas, biomass continues to be the energy source of choice due to unavailability or unaffordable prices of alternatives. The high demand for biomass can be partly attributed to the inefficient technologies used for conversion of raw wood into charcoal and final use.

Despite the high demand for biomass, the country's diversity of biomass resources is not exploited to its full potential. Crop and forest residues, animal dung and other forms of biomass wastes are rarely used for energy purposes but have potential to significantly improve energy access of low-income populations, constitute a source of income, and reduce deforestation.

In fulfillment of the objectives of the Energy policy and the Renewable energy policy in particular, the Ministry of Energy and Mineral Development (MEMD) has been implementing a number of interventions in the biomass sub-sector. Emphasis has been on promotion of efficient use of biomass through promotion and dissemination of improved biomass energy technologies and initiatives to promote sustainable production of charcoal and utilization of animal waste. However, the scope of implementation of these activities has been limited.

In 2001, a draft for a National Biomass Energy Demand Strategy was prepared by MEMD, but was never adopted due to lack of stakeholder participation, neglect of the supply side and lack of dedicated resources. The implementation of projects and other interventions in the biomass energy sub-sector has, therefore, been on adhoc basis and haphazard, with no proper strategy and plan in place. In spite of its enormous contribution to the country's energy balance, the sub-sector continues to be one of the least funded and least understood by top policy and decision-makers.

It is against this background that MEMD requested UNDP to support the development of a comprehensive biomass energy strategy that will establish a framework for activities both on the supply and demand side. MEMD herein referred to as the Client in collaboration with UNDP is now seeking the services of a national consultant whose main task will be to develop a national biomass energy strategy.

Objectives

The overall objective of this assignment is to develop a long term national strategy and short term Action Plan for the sustainable biomass energy production and use in Uganda and provide guidance to key stakeholders on their implementation. Other critical issues such as poverty, gender, health, environment and climate change that potentially bear on the strategy will also be incorporated.

Specific Objectives under this assignment include:

- Assess and set the baseline situation on the status of biomass energy production and use, demand, technologies and practices, demand, consumption and marketing of biomass fuels at local/regional and national level;
- Assess the contributions and needs, and challenges encountered by the key actors (Individuals, Institutions, NGOs, private companies and communities) in the biomass energy sector as well as in the biomass energy value chain;
- Evaluate the factors constraining the sustainable supply and utilization of biomass energy in Uganda;
- Identify and propose strategic measures/interventions to improve the access to sustainable biomass energy sources and improve the adoption of efficient technologies for biomass energy production and utilization;

Approach and Methodology

To develop a comprehensive strategy that is widely accepted and duly owned by all the relevant stakeholders, a highly participatory approach involving the different actors will be encouraged during the process of executing the assignment. The process will also rely on the existing institutional capacities and experiences of different stakeholders with the aim of harnessing the synergies among the critical players in the biomass energy sub-sector.

Phase 1: Inception period

During the inception period, under the supervision and in close consultation with MEMD and NRSE in particular, the consultant will be required to:

- a) Develop a vision for the biomass energy strategy, in close collaboration with the relevant ministries;
- b) Carry out a review of all the relevant literature and background material on Uganda's biomass energy sub-sector, and define the scope of data and information requirements for the developing the strategy;
- c) Conduct a stakeholder mapping and analysis (including development partners) to identify relevance, mandates, roles, resources and capacities related to the biomass energy sub-sector; and set the approach and methodology for stakeholder consultations and public involvement in the development of the strategy;
- d) Assess the legal, policy and institutional framework by reviewing the relevant policies and legislation. In order to ensure that the Strategy is consistent with the wider legal and policy environment, the consultant should present an overview of the following:
 - Policy framework: analyze relevant policies at national and local level, their effectiveness and challenges in implementation;
 - Institutional framework: institutional responsibilities, mandate, capacities, as well as inter-institutional coherence, collaboration and communication;
 - Regulatory framework: existing regulations and identify regulatory gaps.

- e) Determine the potential impact of cross-cutting issues (poverty, governance, climate change, gender and HIV/AIDS) on the Strategy and propose approaches to mainstreaming them into the Renewable Energy Policy and other relevant policies, and into the strategy itself;
- f) Estimate the potential savings of biomass resources through adoption of more efficient technologies, fuel substitution and promotion of alternative fuels
- g) Conduct an Inception Workshop and present:
 - Overview of the results of the inception phase
 - Analytical gaps and comprehensive approach and methodology for carrying the assignment in the subsequent phases
 - A plan and time schedule for carrying out activities in the subsequent phases of the project

Phase II: Comprehensive analysis of the supply and demand of biomass energy

Based on the outcomes of the discussions during the inception phase and outcomes of the discussions at the inception workshop, the consultant is expected to contribute to improving the knowledge base on biomass energy in the country by:

- a) Carrying out a comprehensive study of the biomass energy market covering both the demand and supply side, using as much as possible existing data. This study should, include the following elements:
 - Quantitative estimates of the demand trends by sector, fuel, and regional distribution (user groups, technologies, applications, fuel types, consumer preferences);
 - Quantitative estimates of the supply trends by sector, fuel, and regional distribution (prices, cost drivers, biomass producers, technologies, sources of feedstock, access, ownership);
 - Socio-economic information related to biomass energy use and production trends (population, demographic factors, urbanization, land tenure, household income, share of income spent on energy, employment in the production and sale of biomass fuels); and
 - Analysis of the market for biomass energy technologies (types of technologies, manufacturers, efficiencies, research and development organizations, distribution channels, promotion mechanisms).
- b) Stakeholder Consultations
 - Conduct consultations of all key stakeholders and seek their views and opinions on the strategy, and where practicable, incorporate them in the strategy.
- c) Development of scenarios for biomass energy supply and demand;
 - Develop the 'Business as Usual' scenario ('Do Nothing'), and compare this with the more desirable scenario that would ensure sustainable biomass energy supply and demand;
 - Using simulation models for biomass energy planning or other means, develop alternative scenarios (e.g by varying fuel prices, population growth, urbanization rates, economic growth). The alternative scenarios will be chose in consultation with the BEST steering committee;
 - The results analysis will be presented in a standalone report. In consultation with MEMD and the steering committee, the consultant shall present the report to a wider range of stakeholders in a stakeholder meeting.

Phase III: Development of a Biomass Energy Strategy and Action Plan

Using the experiences and results of the analysis above as well as the views and opinions of the stakeholders, the consultant will be expected to develop the Biomass Energy Strategy and present a short-term Action Plan covering the first two years of the implementation of the Strategy:

The consultant shall:

- a) Set realistic intervention options for the biomass energy strategy based on the analysis in Phase 1 and Phase 2. The selected options should be as specific and as practical as possible and propose interventions that can realistically address priority issues in the biomass energy sub-sector. The interventions should be designed in the full context of the financial situation, the socio-economy of the respective target groups and the institutional capacities of the stakeholders.
- b) Seek agreement of the Steering Committee on priority issues and preferred interventions.
- c) Develop a comprehensive two year Action Plan consisting of a list of priority actions with regard to the responsible actors, timeframes, targets and resources required. The Action Plan should contain a funding strategy for the individual actions, including international mechanisms (Nationally Appropriate Mitigation Actions (NAMAs), REDD+ activities, or CDM).
- d) Establish a Monitoring and Evaluation system for the implementation of the Action Plan and the Strategy.
- e) Communicate the results of the strategy development process. Specific approaches for communicating the work and results of the strategy and creating awareness about biomass issues should be developed as part of the strategy.
- f) Present the Strategy in a validation workshop of stakeholders

Biomass energy data collection and collaborating entities

In order to obtain the necessary data and information and conduct the assignment successfully, the consultant should consult and collaborate closely with the following institutions:

- a) Ministry of Energy and Mineral Development (MEMD);
- b) Ministry of Water and Environment (MWE);
- c) Ministry of Agriculture, Animal Industry and Fisheries (MAAIF);
- d) National Forestry Authority (NFA);
- e) National Environment Management Authority (NEMA);
- f) Promotion for Renewable Energy and Energy Efficiency Programme (GIZ PREEEP);
- g) Uganda Bureau of Statistics (UBOS);
- h) Sawlog Production Grant Scheme (SPGS)
- i) Development Partners (UNDP, GIZ, SNV WWF)

It is expected that the consultant shall engage a wide range of stakeholders including biomass users and producers, research institutions, civil society, government and the private sector as necessary.

Key reference documents for the development of the Strategy include:

- a) National Development Plan (2011)
- b) Draft for a National Biomass Energy Demand Strategy (2001)
- c) Plan for development of Uganda's Biomass Energy Strategy (2001)
- d) Energy Policy (2002)
- e) Renewable Energy Policy (2007)

- f) Biomass Chapter of the Energy and Mineral Sector Performance Report 2008/09 - 2010/11 (2011)
- g) National Biomass Study Technical Report of 1996-2002 (2002)
- h) A study on Charcoal Supply in Kampala (2004)
- i) Charcoal production and licensing in selected districts (2006)
- j) Uganda National Adaptation Programmes of Action (NAPA) (2007)
- k) The potential for Biofuel in Uganda (2010)
- l) REDD Readiness Preparation Proposal for Uganda (2011)
- m) Balancing Biofuels and Food Security (2011)
- n) Northern Uganda Energy Study (2011)

Project coordination

To ensure effective stakeholder participation, MEMD/NRSE will establish a BEST Steering Committee composed of senior representatives from the relevant institutions. The Committee will provide overall guidance and oversee the implementation of the Project, and address key implementation challenges and assist in inter-agency coordination and cooperation.

A working level BEST Task Force comprising of one expert from MEMD, MWE, UBOS, NFA and NEMA will be constituted to assist the consultant and also serve as direct counterparts to the consultant in the process of executing the assignment.

ANNEX X: Key Recommendations excerpted from “A Review of Existing Policy and Regulatory Framework for the Charcoal Sub-Sector Regime in Uganda”

This report was funded under the auspice of the UNDP/GEF project entitled “Enabling Environment for Sustainable Land Management (SLM) in the Uganda Cattle Corridor Districts”

Excerpt from Section 8.4 – Key Recommendations

“The following key recommendations will create enabling environment not only for SCP but also for SLM:

1. FSSD in close cooperation with MEMD should formulate a **stand-alone** national regulation on **charcoal** (especially of commercial nature) in close partnership with other institutions like MWE, NEMA, NFA, Local governments, NGOs and representatives from the private sector.
2. Government should in the regulation establish an inter-institutional coordination body for implementation that includes institutions responsible for **supply side** (e.g private landowners, NFA, Local governments, MLUD,MWE) and those for **demand side** (e.g MEMD, private sector, NGOs)
3. Ministry of Local Government should seek to amend the Local Government Act so as to decentralise the function of energy management in accordance with **subsidiarity** principle
4. MEMD should improve staffing and capacity building of the Biomass Division under the Renewable Energy Department just as MWE should also improve staffing and facilitation of FSSD.
5. Government should assign responsibility for charcoal licensing to a single institution like FSSD and/or delegated one which should also annually consolidate the statistics on charcoal production and use and its revenue.
6. NFA and Local governments should designate some of their CFRs & LFRs respectively for planting woody biomass for demonstration to private landowners in the efficient production of charcoal.
7. MEMD should advocate for and lobby Ministry of Finance, Planning and Economic Development to approve **incentives** for SCP, tree planting and production of briquettes from waste or invasive species

8. MEMD should invest in a sensitisation and awareness creation among the players with different interests in the charcoal value chain so that they all appreciate and support the implementation of a charcoal regulatory framework.
9. MEMD should commission additional studies on the use of biomass for firewood, brick making and industries so that it able to implement the recommendations for SCP in a broader picture of biomass energy management.”

ANNEX XI: Project Report / UNDP-funded Promotion of Sustainable Charcoal Production Project

Output 1: Ordinance incorporating charcoal production issues developed.

Several activities were conducted to realize the above output. These included:

- Supporting the district Planning and Technical Committee to prepare and produce a district ordinance regulating charcoal production and trade.
- Conducting stakeholder consultations on issues that had to be regulated and the draft ordinance in general
- Developing guidelines for bye-law formulation

These activities were successfully conducted and the said ordinance was handed over to Luwero District Council for enactment and further management of the process up to gazettelement. The District Environment Office together with the District Forest Office took the lead in completing the process of enacting and later on operationalizing the ordinance on behalf of the district council. Guidelines for bye-law formulation at sub-county level were also developed by a legal consultant in consultation with the local communities in the charcoal –producing areas.

The Luwero district leadership rendered a lot of political will to the process of ordinance preparation.

Output 2: Charcoal production efficiency improved

To realize this output, the following activities were carried out:

- Training of charcoal producers in best practices during the charcoal production process
- Training in assembly and management of portable metallic kilns and modified earth kiln
- Preparation and dissemination of a Charcoal Production Manual illustrating best practices during the charcoal production process
- Preparation and dissemination of Biomass Resource Maps indicating biomass stocks in 8 sub-counties

These activities were successfully carried out in 8 sub-counties that constituted the project area, and over 192 charcoal producers were trained. Biomass Resource maps were given out to the respective local governments to guide charcoal production. Activity implementation was delayed by a few weeks due to delayed disbursement of funds by UNDP. The local leadership in the areas where the training took place exhibited a lot of interest and enthusiasm in the project activities.

Output 3: Charcoal Producer Associations (CPAs) formed

Under this output, the following activities were undertaken:

- Registration of charcoal producers and formation of producer associations
- Monitoring and backstopping of CPAs

There were significant procedural delays in the procurement of the consultancy services for registration of charcoal producers and formation of CPAs. As planned, CPAs were formed and formally registered with the respective District Director of Community Services in the two districts of

Luwero and Nakasongola. A good number of these associations have since become vibrant and self-sustaining.

Output 4: Sub-county and district leaders, and communities sensitized on the dangers of unsustainable charcoal production

The following activities were carried out:

- Sensitization workshops at community, sub-county and district levels

This was the first project activity, and mobilization of stakeholders took longer than had been anticipated. There was also a problem of late planning in the year that resulted in additional delays. However, this activity was successfully accomplished, and more than 330 leaders and other categories of people were sensitized at different levels in the project area.