

UGANDA NATIONAL REDD+ STRATEGY

OCTOBER, 2017

MINISTRY OF WATER AND ENVIRONMENT



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Abbreviations

ACODE	Advocates Coalition for Development and Environment
BAU	Business-as-Usual
BMCT	Bwindi Mgahinga Conservation Trust
BSA	Benefit Sharing Arrangement
CDM	Clean Development Mechanism
CF	Community Forest
CFM	Collaborative Forest Management
CFRs	Central Forest Reserves
CNDPF	Comprehensive National Development Planning Framework
CSO	Civil Society Organization
DD	Deforestation and Forest Degradation
DLG	District Local Government
DRR	Disaster Risk Reduction
DWD	Directorate of Water Development
DWRM	Directorate of Water Resources Management
EA	Environmental Alert
EES	Energy Efficient Stoves
ENR	Environment and Natural Resources
FAO	Food and Agriculture Organization of the United Nations
FCPF	Forest Carbon Partnership Facility
FGRM	Feedback and Grievances Redress Mechanisms
FIP	Forest Investment Programme
FREL/RL	Forest Reference Emissions Levels/ Reference Levels
FSSD	Forestry Sector Support Department
GEF	Global Environment Facility
ICS	Improved Cooking Stoves
INDC	Intended Nationally Determined Contribution
LG	Local Government
LGDP	Local Government Development Plans
MAAIF	Ministry of Agriculture, Animal Industry and Fisheries
MAC	Marginal Abatement Cost
M&E	Monitoring & Evaluation
MEAs	Multilateral Environmental Agreements
MEMD	Ministry of Energy and Mineral Development
MDA	Ministry, Department and/or Agency
MFPEd	Ministry of Finance, Planning and Economic Development
MGLSD	Ministry of Gender, Labour and Social Development
MLHUD	Ministry of Lands, Housing and Urban Development
MoFPED	Ministry of Finance, Planning and Economic Development
MOLG	Ministry of Local Government
MRV	Measurement, Reporting and Verification
MTEF	Medium-Term Expenditure Framework
MTIC	Ministry of Trade, Industry and Cooperatives
MTWH	Ministry of Tourism, Wildlife and Heritage
MWE	Ministry of Water and Environment
NAADS	National Agricultural Advisory Services

NAFORRI	National Forest Research Institute
NARO	National Agricultural Research Organisation
NBSAP	National Biodiversity Strategy and Action Plan
NDP	National Development Plan
NDPII	The National Forest Plan
NEA	National Environmental Act
NEMA	National Environment Management Authority
NCCAC	National Climate Change Advisory Committee
NFA	National Forest Authority
NFI	National Forest Inventory
NFMS	National Forest Monitoring System
NGO	Non-governmental organization
NPA	National Planning Authority
NPV	Net Present Value
OBB	Output-Based Budgeting
PES	Payment for Ecosystem Services
PFM	Participatory Forest management
PLRs	Policies, Laws & Regulations
PS	Permanent Secretaries
REDD+	Reducing emissions from deforestation and forest degradation and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks
R-PP	Readiness Preparation Proposal
SACCO	Savings and Credit Cooperative Organizations
SDG	Sustainable Development Goals
SESA	Strategic Environmental and Social Assessment
SIP	Sector Investment Plans
SIS	Safeguards Information System
SLM	Sustainable Land Management
SWOT	Strengths, Weaknesses, Opportunities, and Threats
TCU	The REDD+ Technical Coordination Unit
UBOS	Uganda Bureau of Statistics
UNCCD	United Nations Convention to Combat Desertification
UNEP	United Nations Environment Programme
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
UTGA	Uganda Timber Growers' Association
UWA	Uganda Wildlife Authority
WB	World Bank

Foreword

REDD+ is an international mechanism for providing result-based payments for reducing emissions from deforestation and forest degradation (REDD+). It offers an opportunity for Uganda to serve the common interest in managing its forests in a balanced way for long-term sustainable economic growth; to support the livelihoods of local, rural and forest dependent communities; and to ensure that its important natural heritage is conserved.

REDD+ Process in Uganda started in 2008, when Uganda became a participant of the FCPF after approval of the Forest Carbon Partnership Readiness Plan Idea Note (R-PIN). The R-PIN provided initial overview of land use patterns and causes of deforestation, the stakeholder consultation process, and potential institutional arrangements for addressing REDD+. Uganda embarked on the R-PP preparation phase in March 2010, submitted an acceptable R-PP in May 2012 and commenced implementation of the R-PP in July 2013.

In Uganda, the REDD+ process is a national undertaking, well positioned within the over-policy framework and is one of the national climate change initiatives. Further, Uganda is among those few FCPF and UN-REDD participating countries in Africa with dedicated budget funds to support REDD+ activities, as REDD+ has been accommodated in her Macro-Economic Investment Plan, Mid-Term Expenditure Framework and Water and Environment Sector Investment Plan.

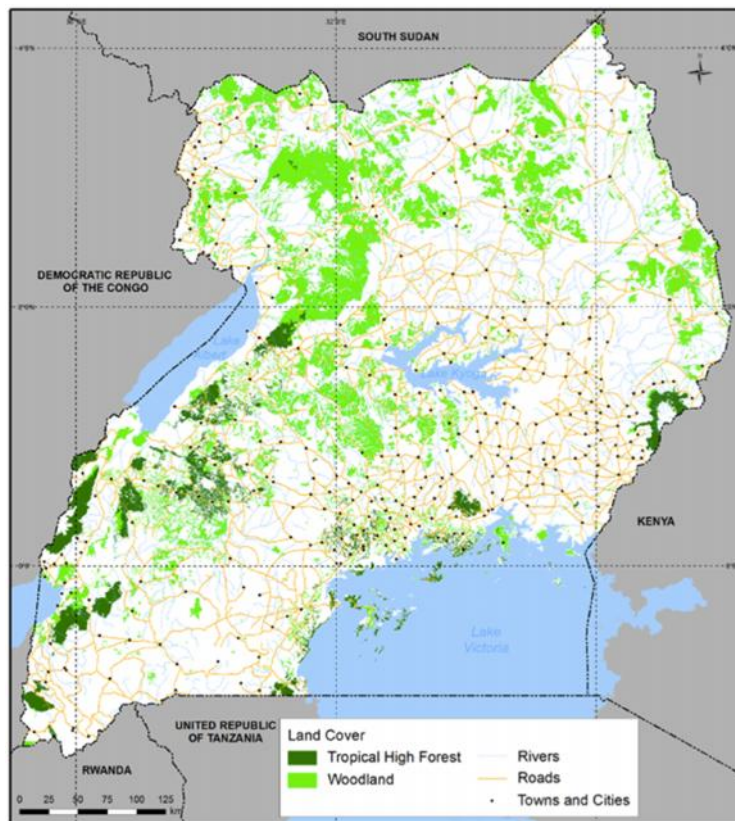
Uganda aspires to have a socially and environmentally viable national strategy for reducing emissions from deforestation and forest degradation, enhancing the role of conservation of biodiversity, promoting sustainable management of forests and enhancing carbon stocks. This REDD+ National Strategy document guides development of the nationally agreed set of policies and programs for addressing the drivers of deforestation and forest degradation.

Executive Summary

Current situation

For 2015, the forest cover of Uganda was estimated at 12 % of the total land area, or 2.42 million ha. Woodlands are the dominant forest type, accounting for about 62 % of the forest area, tropical high forests for 21 % and plantations for 17 % (MWE 2017).

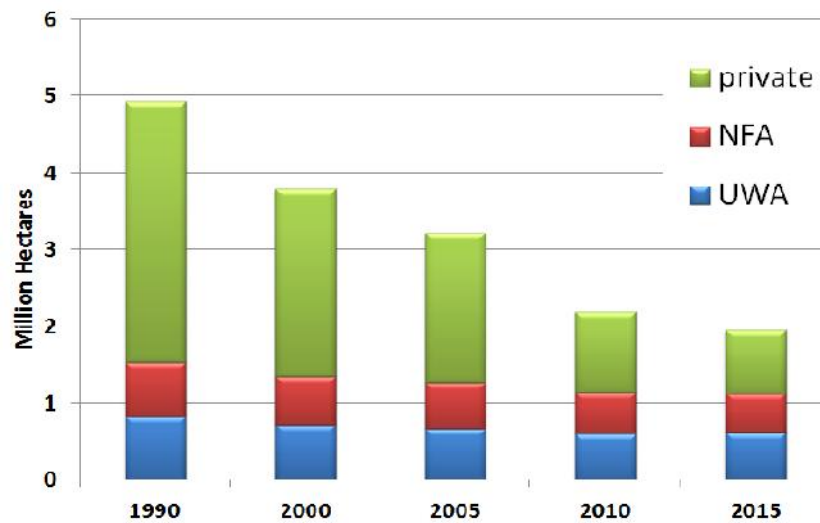
Remaining high forests and woodlands in Uganda



Source: UNEP World Conservation Monitoring Centre

Uganda is among the two countries with the highest deforestation rate globally. The natural forest cover has experienced a strong decline in area in the past decades. In 2000, forests are estimated to have covered 3.12 million hectares, and declined to 2.42 million hectares in 2015, about 11.8 % of the total land area. In 1990, forest cover had been estimated at 24 % of total land area (MWE 2017).

Deforestation rate in Uganda



Source: MWE 2017

Drivers of deforestation and forest degradation

The underlying causes for deforestation and degradation are numerous and the national setting is quite complex. The high human population growth is the overarching starting point and the main underlying cause in Uganda. Both “poverty” and “culture” factors are secondary underlying causes together with “urbanization”, which stems from population growth. Further, numerous concrete underlying causes being linked to institutions, social and human resources, natural resources, energy, land and farming as well as legal regulations type of factors have been listed. (See Figure 1, Chapter 2).

For the actual observed drivers of deforestation and forest degradation, the size and impact have been assessed in terms of carbon and carbon dioxide emissions (see Table 1, Chapter 2). A key finding is the huge amount of carbon emissions resulting from wildfires¹ in Uganda, making it the biggest driver of deforestation and forest degradation in forest areas of Uganda. Natural forest wood extraction for energy (fuelwood and charcoal) is the second largest individual drivers of DD identified, followed by round wood extraction for construction material. Smallholder agricultural expansion is the fourth biggest driver and the Large-scale commercial farmland expansion fifth biggest driver. Livestock free-grazing seems to cause huge emissions both in forest and non-forest areas, but separating its harmful and non-harmful elements for deforestation and degradation poses a challenge.

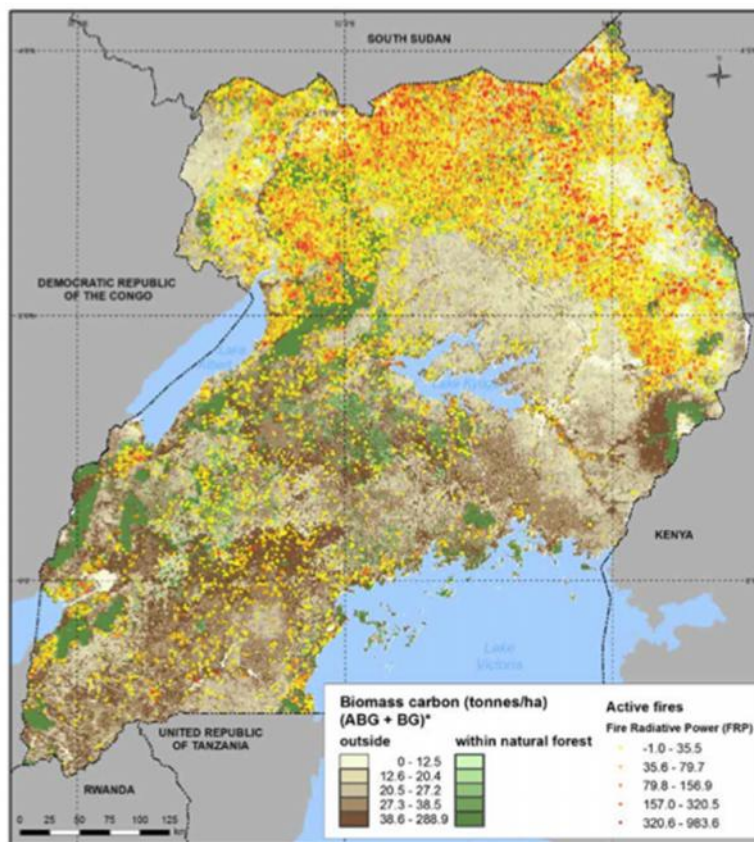
¹ Wildfires is used to mean both fires due to natural causes of ignitions (e.g. lightning sparks from rock falls, spontaneous combustion, volcanic eruption) and human-induced (e.g. arson, discarded cigarettes, hunters and grazers, power-line arcs)



Source: Tradingeconomics.com/World Bank 2017

Assuming that wildfire incidences would remain constant until year 2042, the overall annual carbon emission would increase from an annual 154 million tons of carbon in 2015 to 200.7 million tons of carbon in 2042 (excluding livestock free grazing) when applying 3 % annual increase based on human population growth for other drivers. The overall carbon emission during the next 25 years would then be 4,434 Mt of carbon, which means overall 16,273 MtCO₂eq over the same time period.

Biomass carbon density and fire occurrences in Uganda 2013



Strategic options

The aim of the REDD+ strategic options is to turn current wood and biomass extraction into sustainable abatement activities (i.e. strategic option activities). Each strategic option will add to the mitigation capacity in its own manner, but the main idea is to gradually stop the use of wood coming from natural forests and to replace it with wood coming from planted forests, improve the efficiency of wood use and prevent wildfires.

Many of the proposed strategic options have strong links to watershed management and opportunities for gender activities, involvement of forest dependent and marginalized vulnerable people. Further, numbering the strategic options does not relate to prioritization of the options, which was considered not important due to various cross-linkages between the options implementation.

Validated final strategic options with their sub-options for Uganda are listed as following.

Strategic option 1. *Climate smart agriculture*² has three sub-options, which all aim to reduce the need for agricultural expansion to forest areas by intensifying and increasing agricultural production on existing agricultural land, include

- SLM and agroforestry practices;
- Rainwater harvesting with collection tank and drip irrigation;
- Greenhouse cultivation of vegetables;

Strategic option 2. *Sustainable fuelwood and (commercial) charcoal production* has three sub-options, which aim to reduce need of use of wood sourced from natural forest by providing energy wood, charcoal and construction materials from forest plantation, include

- Commercial small-holder and community bioenergy woodlots;
- Commercial small-holder and community poles and timber plantations;
- Improved charcoal kilns linked to bioenergy woodlots;

Strategic option 3. *Large-scale commercial timber plantations* has three sub-options, which aim to reduce the need of wood sourced from natural forest by providing construction materials and charcoal from forest plantation, include

- Commercial transmission pole and timber plantation;
- Commercial pole and sawlog plantation;
- Improved charcoal kilns linked to plantation sites;

² Deforestation-free agricultural supply chains sub-option was considered to be relevant in future, current options concentrate on small holders.

Strategic option 4. *Restoration of natural forests in the landscape*³ has three sub-options, which aim to restore and maintain the still existing forested areas. Aim is also to involve local people and the forest dependent communities with the activities including

- Designated areas for natural forest regeneration;
- Restoration of degraded protected natural forest (i.e. national parks and forest reserves and forests on privately owned land);
- Devolution of forest management through PFM and similar set-ups;
- Traditional/customary forest management practices;

Strategic option 5. *Energy efficient cooking stoves* has two sub-options aiming at making use of wood more efficient and that way reduce the pressure on natural forests.

- For fuelwood;
- For charcoal;

Strategic option 6. *Integrated wildfire management* aims to reduce the destructive impacts of wildfires on forests.

Strategic option 7. *Livestock rearing in the Cattle Corridor* has three sub-options aiming at improving and intensifying livestock management to reduce the need for clearing up forests for pasture lands.

- Livestock breeding programme;
- Establishment of drinking water dams for livestock;
- Establishment of fodder agroforestry plantations;

Strategic option 8. *Strengthening of policy implementation for REDD+* is an over-arching options, which aims to facilitate the implementation of the other options.

The first six of the final strategic options were developed so that they all have negative marginal abatement cost coefficients, which means that they are cost efficient (see Table 9 in Chapter 3). Ultimately the amount of carbon that will be abated upon implementation of each of the strategic option, for a period of 25 years range from 3.6 to 16,049 MtCO₂eq tons. The maximal abatement potential of the proposed strategic options is 31,284 MtCO₂eq, which is an average 341 Mt carbon per year and/or 1,251 MtCO₂eq per year. This is above the expected BAU scenario for the national carbon emissions. Cost efficient means that these activities will be financially viable and their beneficiaries will generate surplus income from their investment, even in the absence of carbon financing in the investment plans.

Strategic option 7 does not have a set carbon mitigation target as the carbon mitigation target for livestock management has been included in scope of other strategic options.

³ Forest certification and responsible management (to address leakage) was analyzed as sub-option, but considered not relevant options at the moment.

Even the strategic sub-option 7.3 *Establishment of agroforestry fodder plantations* focuses on annual fodder production, which means that most carbon sequestration will be used as fodder for livestock and is therefore not available for carbon trading. Strategic Option 8 is an over-arching option as it strives to increase the efficiency of the others, while it is not bringing additional carbon emission reduction impacts by itself.

Additionally, some of the sub-options have low initial investment needs of below USD 100 per households as indicated in the third column of Table 9, Chapter 3. A few more activities need initial investments between USD 100–1,000, while the most expensive activities would require up to USD 1,500 to establish. Strategically, the activities with the lowest initial investments could potentially be targeted for all rural households, although in some cases also peri-urban and urban households could benefit from them, as is the case with Energy Efficient Stoves (EES) and Improved Cooking Stoves (ICS). Government of Uganda (GoU) considers these options as a visionary ladder where cheap options are for the poorest households who, as they become wealthier (towards Vision 2040), and move up the ladder are able to afford more expensive investment options and thereby become less reliant on the natural forest for wood and biomass extraction.

Institutional arrangement for REDD+ implementation

The Ministry of Water and Environment (MWE) is the lead institution for the over-all implementation and coordination. MWE will function through the Forestry Sector Support Department (FSSD), the National Forest Authority (NFA), the Directorate of Water Development (DWD) and the Directorate of Water Resources Management (DWRM). FSSD will provide technical and coordination responsibility on behalf of the MWE. MWE will collaborate with the Uganda Wildlife Authority (UWA; forests in wildlife conservation areas, wildfires), the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF; CSA and livestock rearing), the Ministry of Energy and Mineral Development (MEMD; sustainable fuel wood utilization, Energy Efficiency technologies), Districts (Local Forest Reserves, forest outside protected areas, CSA, sustainable fuel wood and (commercial) charcoal use, energy efficient cooking stoves, integrated wildfire management). The Office of the Prime Minister (OPM) through department responsible for Disaster Preparedness will supervise the involvement of refugees. The Ministry of Gender Labour and Social Development (MoGLSD) will supervise actions that support ethnic minority and marginalized people. Details of institutional roles are presented in Chapter 4 for both national and district levels.

Institutional arrangements and collaboration by Strategic Options.

<i>Option</i>	<i>Activity</i>	<i>Lead institutions</i>	<i>Collaborating institutions</i>
SO 1. Climate smart agriculture	SLM and agroforestry practices	MAAIF, Districts. NARO, NAFFORI	CSO/NGO
	Rainwater harvesting with collection tank and drip irrigation	MAAIF Districts	DWD CSO/NGO
	Greenhouse cultivation of vegetables	MAAIF Districts, NARO	CSO/NGO
SO 2. Sustainable fuel wood and (commercial) charcoal production	Commercial small-holder and community bioenergy woodlots	MEMD, Districts Private Land Owners	CSO/NGO
	Commercial small-holder and community pole and timber plantations	Districts Private Land Owners	CSO/NGO
	Improved charcoal kilns linked to bioenergy woodlots	MEMD, Districts Private Sector	CSO/NGO
SO 3. Large-scale commercial timber plantations	Commercial transmission pole and timber plantation	Districts Private Land Owners	
	Commercial pole and saw log plantation	NFA Private Land Owners Districts	
	Improved charcoal kilns linked to plantation sites	Private Sector	
SO 4. Restoration of natural forests in the landscape:	Designated areas for natural forest regeneration	NFA, UWA, Districts	CSO/NGO
	Protected natural forest management (i.e. national parks and forest reserves)	NFA, UWA, Districts	CSO/NGO
	Devolution of forest management through Participatory Forest Management and similar set-ups	NFA, UWA, Districts	CSO/NGO
	Traditional/customary forest management practices	District Cultural Institutions, Community	CSO/NGO
SO 5. Energy efficient cooking stoves	For fuel wood	MEMD, FSSD, Districts	CSO/NGO
	For charcoal	MEMD, FSSD, Districts	CSO/NGO
SO 6. Integrated wildfire management	In timber plantations	Private Land owner/ Plantation Owners, NFA	
	On woodlands	Districts, UWA, NFA	
	On bush lands	Districts, UWA, NFA	
	On grasslands	Districts. UWA, NFA	
SO 7. Livestock rearing in Cattle Corridor	Breeding programme	DAR, NGBC, districts	CSO/NGO
	Establishment of fodder agroforestry plantations	Districts, NFA, Uganda Seeds Ltd.	CSO/NGO
	Establishment of water dams	DWD	CWUAs

Financing REDD+ implementation

The REDD+ National Strategy will not be implemented as a stand-alone project but as part of the broader national planning framework and linked to the respective financing frameworks. In 2007, government approved the Comprehensive National Development Planning Framework (CNDPF) policy, which provides a clear perspective vision and long-term plan to articulate the country's strategic development objectives and priorities against which medium and short-term plans are anchored. Based on the CNDPF the government formulates long term plans (Vision), medium term plans (National Development Plan) and short-term plans (annual plans).

The budget is the main tool by which government allocates resources to implement its plans and address emerging policy priorities, now including options that will be approved under this strategy. The government uses the budget Framework Papers and Medium-Term Expenditure Framework (MTEF) to translate policies into implementable plans.

Table 12 of Chapter 5 provides a 5-year costed Action Plan for the REDD+ National Strategy with a total budget of up to 150 million USD. It was deemed necessary to make the financing plan on the basis of each Strategic Option rather than on the basis of Lead Agencies. This is because the Lead Agency can have several departments or service providers collectively implementing the same activity in different locations. Through such an arrangement, the National Accounting Officer can trace the expenditure to planned activities as they relate to REDD+ priorities. Secondly, it is in line with government intention to improve front-line service delivery rather than fund institutions per se. The budgeted allocation for the Ministry of Finance Planning and Economic Development (MoFPED) will support employment of staff personnel to start establishing the Autonomous National Fund at the MoFPED as prescribed under the national Benefit Sharing Arrangement (BSA).

For the 20 years beyond this Five-Year Costed Action Plan, the budget is mainly indicative, although it still gives a good indication on the budget allocations needed to fulfil REDD+ implementation on a national scale in Uganda when all REDD+ operations are integrated in respective sector financing. The 20-year budget for the REDD+ implementation totals over 420 Million USD and is outlined in Table 13 of Chapter 5.

Integration of National REDD+ & Communication Processes

There are several REDD+ readiness processes, such as forest reference emission levels, the national forest monitoring system, and social and environmental safeguard assessment and information systems development that are integral to the REDD+ National Strategy. Table 15 of Chapter 7 serves as a tool and describes the direct means of integration with these readiness process outcomes, greenhouse gas inventory and national processes with the REDD+ National Strategy in a more elaborated manner.

Some key considerations for REDD+ implementation

Land ownership and shared utilization rights are likely to have a serious impact on the speed and progress of REDD+ implementation. MWE will continue and intensify the ongoing and new activities that will be relevant to the REDD+ implementation, including:

- Giving communal land certificates in areas where communal land ownership is practised, free of charge to the communities as already done in parts of Kasese, Karamoja, and Northern Uganda.
- Intensify the project Systematic Land Adjudication and Certification, giving land certificates in all parts of the country. A focus should be on areas where land has not been registered before, accompanied by activities to sensitize people on the need for land registration. So far, Shema, Apac and Lango districts have benefited from this project.
- Carrying out boundary demarcation and land registration, possibly land titling, of all CFRs where this has not been done, in cooperation between the NFA and MLHUD.

Inadequate implementation of existing policies and enforcement of laws is one of the factors that will negatively impact REDD+ implementation. In order to promote policy implementation in all the sectors that are relevant to REDD+ implementation, it is necessary for the Government to ensure that institutions responsible for REDD+ implementation including local governments are adequately resourced both financially and with skilled manpower.

1. Introduction

Uganda's preparation for REDD+ mechanism started with the R-PP preparation phase in March 2010. Uganda submitted an acceptable and updated R-PP in May 2012. As part of its R-PP process, Uganda prepared an indicative list of strategy options for the National REDD+ National Strategy, which were aimed at addressing the initial direct drivers of deforestation and forest degradation; and these were expected to serve as the basis for further dialogue during the REDD+ National Strategy formulation. The final selection of strategy options and the eventual formulation of the REDD+ National Strategy document required further analytical work, consensus building, prioritization and operationalization. A number of existing Policies, Laws, Regulations (PLRs) and Plans related to REDD+ also provided inputs for the development of the REDD+ National Strategy.

The preparation of REDD+ National Strategy process was linked to:

- a. SESA and assessment of REDD+ National Strategy options
- b. Benefit Sharing Mechanism(BSA)
- c. Feedback and Grievances Redress Mechanisms (FGRM)
- d. Forest Reference Emissions Levels/Reference Levels
- e. Monitoring Systems for Forests and Safeguards
- f. Strengthening Participatory Structures, Capacity Building and Communication tools for Uganda's National REDD+ programme.

2. Drivers of deforestation and forest degradation

The underlying causes for deforestation and degradation are many and the national setting therefore, becomes quite complex. The figure 1 below presents the whole set-up in relation to deforestation and degradation taking place on forests and non-forest lands with the underlying causes shown in full complexity. The underlying causes analysis began by considering the high human population growth as the overarching starting point in Uganda. Both “poverty” and “culture” factors have been placed as secondary underlying causes together with “urbanization”, which stems from population growth.

Moving from the left towards the right of the outlined underlying causes, a clear pattern of concrete underlying causes being linked to institutions, social and human resources, natural resources, energy, land and farming as well as legal regulations type of factors is observed. The actual reasons behind wood/biomass use are based on human needs.

In the last column are the actual observed drivers of deforestation and forest degradation, the size/impact of which have been assessed in terms of carbon and carbon dioxides emissions (see Table 1).

In order to understand the level of carbon emissions and later to develop appropriate abatement options, the above drivers were categorised into five main land cover types, namely; forests, non-forest lands, forest plantations, farm lands (covering both small-holder and large-scale commercial farms) as well as areas called ‘rivers and small land areas’ (to be used for renewable energy power stations).

A key finding from the analysis of these drivers as presented in Table 1 is the huge amount of carbon emissions resulting from wildfires in Uganda. When livestock free-grazing is excluded (due the challenge posed when separating its harmful versus non-harmful elements for deforestation and degradation) from the carbon calculations, wildfires constitute around 72% of the annual carbon emissions for 2015.

Natural forest wood and energy extraction are the third and fourth largest individual drivers of DD identified, followed by smallholder agricultural or large-scale commercial farmland expansion.

Assuming that wildfire incidences would remain constant until year 2042, then the overall annual carbon emission would increase from an annual 154 million tons of carbon in 2015 to 200.7 million tons of carbon in 2042 (with a 3 % annual increase based on human population growth for other drivers).

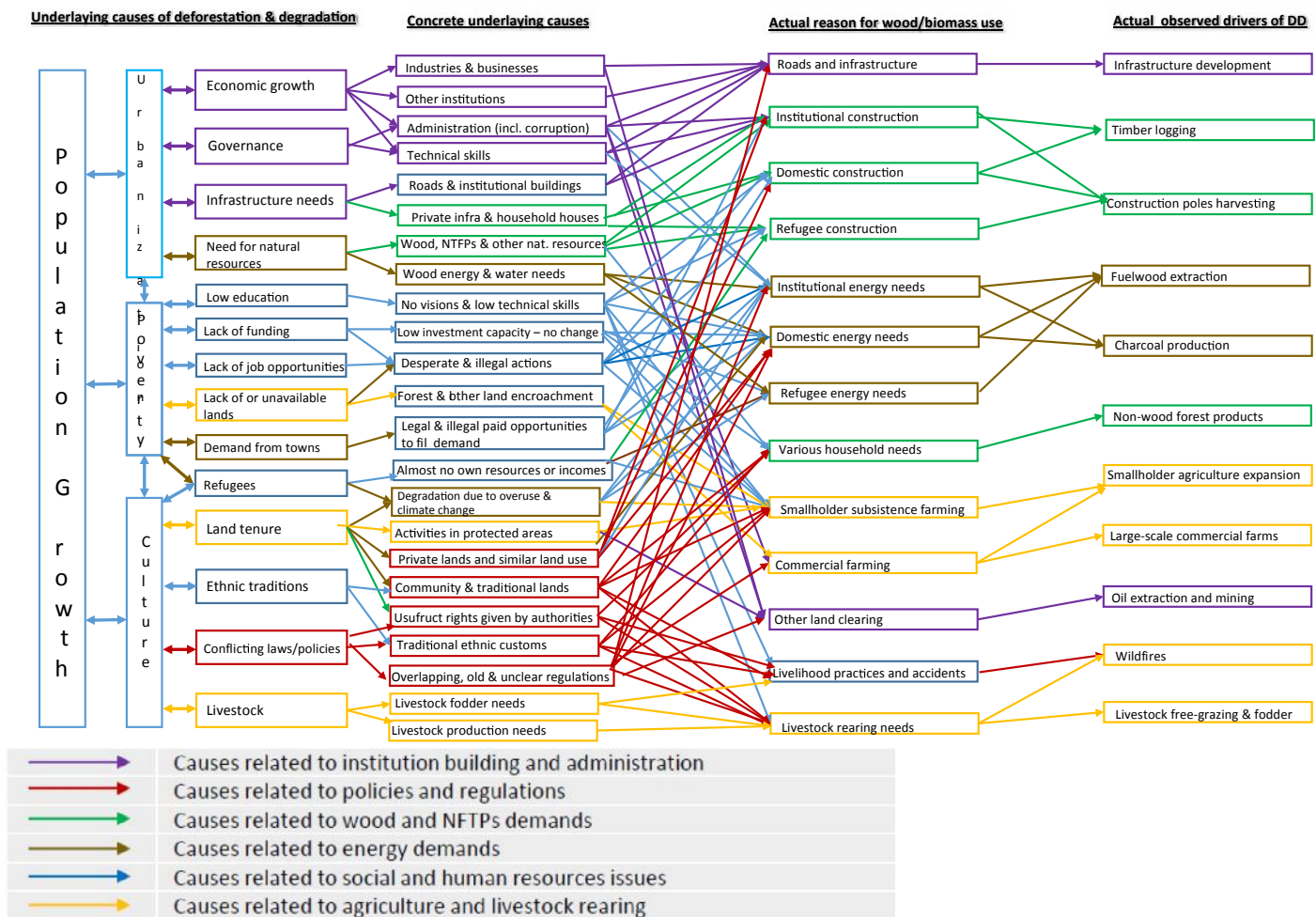


Figure 1. Overview of how underlying causes leads into actually observed drivers of DD in Uganda

The overall carbon emission during the next 25 years would then be 4,434 MT carbon, which means overall 16,273 MTCO₂eq over the same time period. The maximal abatement potential of the proposed strategic options is 31,284 MTCO₂eq, which is an average 341 MT carbon per year and/or 1,251 MTCO₂eq per year. This is above the expected BAU scenario for the national carbon emissions.

The last column in Table 1 indicate the strategic options proposed to tackle each of the drivers. Each strategic option will add to the mitigation capacity in its own manner, but the main idea is to stop the use of wood coming from natural forests and to replace it with wood coming from plantations, improve the efficiency of the wood use and prevent wildfires.

Table 1. Amounts of carbon and CO₂-eq emissions per land area type and by driver in Uganda in 2015 and the proposed strategic options to tackle them.

Land cover type	Driver of DD	Reason for wood use	Current annual emissions C in Mt (X"000,000")	Current annual MtCO ₂ eq. Emission (X"000,000")	Strategic option No.
Forest (including both well-stocked and low-stocked tropical high forests)	Infrastructure	Roads & infrastructure	n.a.		
	Wildfires	Wildfire	111.35	408.65	6
	Large-scale farms Agriculture expansion	Commercial farming	0,026	0.096	
		Smallholder farming	1.33	4.87	1
	Round wood	Domestic construction	1.10	4.05	1 & 2
		Institutional construct.	1.12	4.13	1 & 2
		Refugee construction	0.004	0.013	1 & 2
	Fuelwood	Domestic energy	3.74	13.72	1,2,4 & 5
		Institutional energy	1.64	6.01	1,2,4 & 5
		Refugee energy	0.078	0.285	1 & 2
	Charcoal	Domestic energy	4.95	18.16	1,2,4 & 5
		Institutional energy	8.20	30.10	1,2,4 & 5
	Non-wood products	Household needs	n.a.	n.a.	4
Other land clearing	Oil extraction	Low (ca 10 ha/year)	Low (ca 10 ha/year)		
Non-forest land	Infrastructure	Roads & infrastructure	n.a.	n.a.	
	Wildfires	Wildfire	3.60	13.23	6
	Large-scale farms Agriculture expansion	Commercial farming	n.a.	n.a.	
		Smallholder farming	1.04	3.82	
	Logging	HH & institution constr.	1.10	4.05	1 & 2
		Institutional construct.	1.12	4.13	1 & 2
		Refugee construction	0.004	0.013	1 & 2
	Pole extraction	Refugee construction	0.004	0.013	1 & 2
	Fuelwood	Domestic energy	1.02	3.74	1, 2 & 5
		Institutional energy	0.25	0.91	
		Refugee energy	0.078	0.285	1 & 2
	Charcoal	Domestic energy	1.05	3.85	1,2,4 & 5
		Institutional energy	1.74	6.38	1,2,4 & 5
Non-wood products	Household NWFPs	n.a.	n.a.	4	
Other land clearing	Oil extraction	Low (ca 5 ha/year)	Low (ca 5 ha/year)		
Livestock	Livestock free-grazing	3,614.06	13,263.62	1, 2 & 7	

Land cover type	Driver of DD	Reason for wood use	Current annual Emissions C in Mtons	Current annual MtCO2 eq. Emission	Strategic option No
Forest plantation	Roundwood etc.	Roundwood	1.92	7.06	3
	Fuelwood	Wood energy	0.10	0.35	3
Farm land (smallholder & large scale)	More intense farm.	Commercial farming	n.a.	n.a.	1
	Livestock	Livestock fodder	n.a.	n.a.	1, 2 & 7
	Logging	HH & institution constr.	0.33	1.20	1 & 2
	Pole extraction	Domestic construction	0.51	1.87	1 & 2
	Fuelwood	Domestic energy	2.04	7.48	1, 2 & 5
		Institutional energy	0.60	2.18	
	Charcoal	Domestic energy	1.50	5.50	1, 2 & 5
	Institutional energy	2.48	9.12	1, 2 & 5	
TOTAL 4 land categories above (excl. livestock and oil extract.)			154.02	565.25	
Total C (Mt) and MTCO2eq in 2042 with BAU scenario			200.69	736.54	
(annual increase 3% for all drivers except wildfires that remain stable)					

Note: Land cover types do not correspond to FREL classification due to lack of available information on wood use in Uganda. When new information comes available the table is to be updated.

3. Analysis of the final strategic options

3.1 General overview

Seven final strategic options and one over-arching option are proposed and validated as following for Uganda. Many of the SOs have strong links to watershed management and opportunities for gender activities, involvement of forest dependent and marginalized vulnerable people.

Validated final strategic options with their sub-option for Uganda are listed as following.

Strategic option 1. *Climate smart agriculture*⁴ has three sub-options, which all aim to reduce the need for agricultural expansion to forest areas by intensifying and increasing agricultural production on existing agricultural land, including

- SLM and agroforestry practices;
- Rainwater harvesting with collection tank and drip irrigation;
- Greenhouse cultivation of vegetables;

Strategic option 2. *Sustainable fuelwood and (commercial) charcoal production* has three sub-options, which aim to reduce need of use of wood sourced from natural forest by providing energy wood, charcoal and construction materials from forest plantation, including

- Commercial small-holder and community bioenergy woodlots;
- Commercial small-holder and community poles and timber plantations;
- Improved charcoal kilns linked to bioenergy woodlots;

Strategic option 3. *Large-scale commercial timber plantations* has three sub-options, which aim to reduce the need of wood sourced from natural forest by providing construction materials and charcoal from forest plantation, including

- Commercial transmission pole and timber plantation;
- Commercial pole and sawlog plantation;
- Improved charcoal kilns linked to plantation sites;

Strategic option 4. *Restoration of natural forests in the landscape*⁵ has three sub-options, which aim to restore and maintain the still existing forested areas. Aim is also to involve local people and the forest dependent communities to these activities.

- Designated areas for natural forest regeneration;

⁴ Deforestation-free agricultural supply chains sub-option was considered to be relevant in future, current options concentrate on small holders.

⁵ Forest certification and responsible management (to address leakage) was analyzed as sub-option, but considered not relevant options at the moment.

- Restoration of degraded protected natural forest (i.e. national parks and forest reserves and forests on privately owned land);
- Devolution of forest management through PFM and similar set-ups;
- Traditional/customary forest management practices;

Strategic option 5. *Energy efficient cooking stoves* has two sub-options aiming at making use of wood more efficient and that way reduce the pressure on natural forests.

- For fuelwood;
- For charcoal;

Strategic option 6. *Integrated wildfire management* aims to reduce the destructive impacts of wildfires on forests.

Strategic option 7. *Livestock rearing in the Cattle Corridor* has three sub-options aiming at improving and intensifying livestock management to reduce the need for clearing up forests for pasture lands.

- Livestock breeding programme;
- Establishment of drinking water dams for livestock;
- Establishment of fodder agroforestry plantations;

Strategic option 8. *Strengthening of policy implementation for REDD+* is an over-arching options, which aims to facilitate the implementation of the other options.

3.2 Strategic option 1: Climate-smart agriculture

3.2.1 Approach

The large quantities of carbon in forests per hectare far surpass the carbon stocks that can be sequestered in croplands, hence from the standpoint of quantity of carbon sequestered, avoided deforestation achieves the maximum mitigation per hectare compared to any other intervention in the landscape. The intention of the proposed strategic option is to reduce agricultural expansion to forest through sustainable intensification on already cultivated land and thereby to produce a major mitigation effect. Land productivity will also increase and activities can be implemented by everybody (individuals, families, communities, private sector and even the poorest people jointly by joining their forces). The three major approaches are as follows:

- Sustainable Land Management/Use and Agroforestry Practices
- Rainwater harvesting with collection tank and drip irrigation

- Greenhouse cultivation of vegetables⁶

The Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) has developed Guidelines for Mainstreaming Climate Change Adaptation and Mitigation in Agricultural Sector Policies and Plans (MAAIF 2015). MAAIF and the Ministry of Water and Environment (MWE) have jointly produced a Uganda Climate Smart Agriculture Programme 2015-2025 (ROU 2015a). The Vision of the Uganda CSA Program is a 'Climate resilient and low carbon agricultural and food systems contributing to increased food security, wealth creation and sustainable economic growth in line with the National Vision 2040.'

3.2.2 Potential locations for implementation

The whole country can be considered as potential location for implementation, and drip irrigation is an appropriate option especially for drylands.

3.2.3 Appraisal⁷

The Sustainable Land Management/Use and Agroforestry Practices Sub-option is the cheapest option of all the recommended one and should be adopted by all rural farming households in Uganda. The latest information from Uganda is that approximately 45 % of all farming households are already adopting these practices, which means that this sub-option targets the remaining 65 % of farming households in the country. This means in practice that some 2,382,357 farming households should be incorporated in this activity within this programme. For this work, data and information found in the following reference articles and reports MAAIF (2010), UBOS (2014), Dalipagic and Elepu (2014), EPRC, 2014, MFPED, 2014, UBOS, 2015, UBOS (2016a), and UBOS (2016b) have been incorporated (See Table 2).

According to the assessment of current (i.e. 2015) situation there would be, on average, about 1.12 ha of farmland for each farming household in Uganda and, therefore, target should also be 2,382,357 ha of farmland with this first sub-option. The investment need is small (USD 5 for the purchase of 60 tree seedlings for each farm household). The poorest household should be supported with subsidized seedlings or even free of charge seedlings, so that all households have tree seedlings on their lands.

The tree seedlings should be for fruit trees, fodder trees, fuelwood and construction wood species in order to cover sustainably for all kinds of tree product needs for the

⁶ Promoting deforestation free agricultural supply chains and certified agricultural products were also considered, but left out from final options at this point. Anyhow, these might become viable options in the future.

⁷ Shilling vs USD (May 2016, \$ 3,580)

households, so that these would not need to be collected from either forests or non-forest areas. Fruit trees will support the food situation of the households, while fodder trees will enable the household to keep their cow(s) in stall-feeding on their own land parcel. There are fodder trees (e.g. Leuceana, Sesbania and Calliandra) which can be harvested annually for 25 years if cut at one metre stump height (pollarding). These trees will re-sprout annually to provide sufficient fodder for 1-2 cows or other small livestock. The thicker branches can at the same time be used as fuelwood and if the trees are nitrogen fixing these will fertilize the cropland simultaneously. For example, eucalyptus trees are fast growing and can provide sufficient fuelwood and poles for the household's needs. Agroforestry practices will further enable farmer households to practice apiculture (i.e. beekeeping), which could be an additional source of income not incorporated in the current financial analysis.

Sustainable land management is set in the financial analysis at a value of USD 50 per year in in-kind own labour opportunity cost. The aim is here that each farmer should gradually build up proper sustainable land management practices on their land. The financial analyses conclude that this kind of activities would benefit the household with an additional income of USD 2,817 per hectare at 10 % Net Present Value (NPV) over 25 years. More information is included in the Process Report on how each of the financial analyses has been performed with information on prices and other data used in the calculations. A summary table for all three CSA strategic options can be found on the next page (See table 2.).

Rainwater harvesting with collection tank and drip irrigation sub-option is targeting those 50 % of the wealthier households which this sub-option is affordable for since higher upfront investments are needed. The aim of this sub-option is to enable the utilization of rainwater to prolong the two crop cultivation seasons in Uganda (in Northern Uganda only one long rainy season) by storing rainwater for times when rainfall is not sufficient in crop cultivation season. Rainwater will be collected from the house roof from where it will be piped into a closed storage tank in the ground from where drip irrigation water can be distributed on the crop fields and the vegetable gardens or for providing drinking water for livestock. The expectation is that crop yields can be at least doubled with this arrangement.

The investment needs in sub-option 2 are fairly high (i.e. USD 1,485), but can be somewhat reduced by using own labour (digging of the hole for the tank in the ground and assistance to a mason), providing construction wood and sand for the water tank construction. A mason is needed to construct the water tank and other investment cost include the cost of water pumping and piping systems, a water pump and cement. To an extent the cost can be stretched over three years, if the farmer prepares the water tank hole site and cuts the construction wood beforehand and then constructs the actual tank in the second year, while purchasing the water pump and the field drip irrigation equipment in the third year. In this manner investments can be kept low in each year. On

the other hand, the income generation would increase faster if the whole rainwater tank and drip irrigation can be installed in a short time.

One can expect that the crop income will rise by some USD 1,922 (NPV at 10%) over 25 years and thus the total annual crop income would be around USD 3800.

Greenhouse cultivation of vegetables sub-option is expected to be established by about 15 % of the wealthiest farming households. This kind of greenhouse requires or 160 m² (20 x 8 metres) of space, which means that this investment can still be added to the previous two CSA sub-options. The investment cost is also here USD 1,449 if plastic sheaths are used as cover of the greenhouse. A slightly cheaper option is to use shade nets instead of plastic sheaths. In both cases will the greenhouses need to be renewed every fourth year. However, part of the cover material and iron poles can be used for a much longer period. For this work, data and information has been incorporated from the sources such as The Nation (2013), UBOS (2014), and EPRC (2014).

In all three CSA, sub-options one can expect that these options will reduce farmland expansion as farmer families can intensify their crop cultivation on their own land.

Table 2. Summary for Strategic Option 1: Climate smart agriculture

Indicators/ Components	Sustainable land management & agroforestry practices	Rainwater harvesting with collection tank and drip irrigation	Greenhouse cultivation of vegetables
Area (ha)	2,382,357 ha from start. Each household has got 1/3 ha of their 1 ha land with agroforestry (60 tree seedlings).	1,949,053 ha. This covers the 50 % above average wealthier farm households except those 5 % that already have installed this RWH system & irrigation.	20x8 metres per greenhouse and with replication totally 10.4 ha of green houses.
Potential no. of beneficiaries (households)	2,382,357 HHs from start or the current 55 % of remaining farm households without agroforestry practices.	1,949,053 HHs. This covers the 50 % above average wealthier farm households except those 5 % that already have installed this RWH system & irrigation.	649,684 HHs. This covers the 15 % wealthiest farmer households.
Average yield-increase per hectare	50 %	200 % as compared to the basic pure agricultural cultivation scenario.	500 % from the base scenario with traditional agriculture.

Indicators/ Components	Sustainable land management & agroforestry practices	Rainwater harvesting with collection tank and drip irrigation	Greenhouse cultivation of vegetables
Farm-level investments per hectare	Investments USD 5 additional in years 1, 10 and 20 as compared to pure agriculture with USD 76/year.	USD 1,485 in first year plus USD 30 each year for maintenance. With own construction timber and own labour down to USD 931. Costs can be stretched over 3 years also.	USD 1,449 with plastic sheaths or approx. USD 1121 with shade nets only. The greenhouse needs partly to be renewed every fourth year.
Farm-level in-kind labour cost per hectare	Each year labour opportunity cost of USD 550 for agroforestry & SLM as compared to USD 500 in pure agriculture.	USD 227 own labour in present value	USD 400 own labour opportunity cost during construction and USD 338 annual operational costs.
Overall investment and programmatic level costs (MUSD) covered by the farmers	USD 6.97 / household or totally MUSD 16.6 over 25 years covered by farmers (labour opportunity cost excluded).	USD 1,258/HH and ha when own labour opportunity cost excluded. Totally MUSD 2,451	USD 4,592/HH with plastic sheaths and USD 4,212/HH with shade nets over 25 years. Totally MUSD 2,983
Total project costs	Additional agricultural sector extension and organization costs	Additional agricultural sector extension and organization cost	Additional agricultural sector extension and organization cost
Estimated emission abatement potential (tCO₂) per ha over 25 years	94	69 & an estimated 25 % impact on reduction in annual new farmland expansion which become 82 = total 151 tCO ₂ /ha	An estimated 10 % reduction in annual farm land expansion which become 82 tCO ₂ /ha
Estimated emission abatement potential (MtCO₂) overall	224	294 on top of the previous sub-strategy (i.e. if both SSO 1.1 and 1.2 implemented full scale then total is 518).	53

Indicators/ Components	Sustainable land management & agroforestry practices	Rainwater harvesting with collection tank and drip irrigation	Greenhouse cultivation of vegetables
Hectare-level benefits NPV (USD) (10% discount over 20 years)	USD 2,818/ha when 1.12 ha on average per household. Many HHs have over 2 ha still. Pure agriculture NPV is USD 667/ha.	USD 1,922 (at NPV 10 %)/ha. This figure is on top of the previous sub-strategy for the same household (i.e. the total income would be USD 4,740 or USD 2,589 with pure agriculture)	USD 15,861/HH over 25 years (at NPV 10%).
Average annual employment generated (full time equivalents)	Similar to traditional farming, but much better income generation per household allowing more family members to work	Mainly farmers own labour contribution and RWH tank excavation and skilled labour work opportunities	Farmers become family enterprises providing work opportunities for many family members or several related families.
MAC (10% inflation) USD/tCO2	-30	-12.7	-193.4

The negative MAC-values for this sub-option and all other investigated strategic options means that they are efficient use of money and are over time going to save money for the households or business entities.

3.2.4 Non-carbon benefits

Non-carbon benefits related to the environment include higher biodiversity, reduced soil erosion, improved water holding capacity and microclimate. Increased soil organic carbon and soil fertility promotes increased crop yields (fertilizer trees). Appropriate feed improves ruminant health and reduces methane per unit yield (fodder trees). Avoided deforestation conserves safety foods that local populations collect during the drought periods. Co-benefits related to well-being of population include improved livelihoods, increased income, health and nutrition among rural population. Co-benefits related to gender represent an opportunity to promote gender equality in implementation of agroforestry and other climate-smart agricultural practices; and better education opportunities and wealth among farmer households.

3.2.5 Policy and legal appraisal

Uganda has in place an adequate policy and legal framework to support the implementation of strategic option 1. To increase agricultural production and productivity, Section 6.2 of the National Development Plan II (2015-2020) provides that Sustainable Land Management Practices (SLM) will be enhanced. Furthermore, Section 9.2 of the National Development Plan II (2015-2020) provides for the scaling up of agroforestry-based alternative livelihood systems.

Under Section 3.2 Objective 5 paragraphs 26 (iv) and 26 (vii) of the Agriculture Policy (2013), the Government will promote sustainable land management and conservation agriculture as well as develop capacity to harvest and utilize rain water for agricultural production. Under Section 4.4, paragraph 33 of the Agriculture Policy (2013), the Government notes that there is availability of bulk water supply, which is currently under-developed, and calls upon the responsible ministries to plan jointly for provision of adequate water for agricultural production to cover irrigation for improved crop production, livestock production needs, and aquaculture. The policy provides that the Ministry responsible for water, shall increase investment in off-farm bulk water development, including larger reservoir dam construction, bulk water transfer systems, water diversion systems, and aquifer exploration, in collaboration with the ministry responsible for agriculture.

Uganda has in place the Uganda Strategic Investment Framework for Sustainable Land Management (2010-2020) whose development objective is “to strengthen sector cooperation in order to halt, reverse and prevent land degradation and desertification and mitigate the effects of climate change and variability”. Under Section 3.3, the framework outlines various activities for implementation under five main themes: supporting on – the ground activities for scaling up SLM including the promotion of agro-forestry; strengthening the enabling institutional and policy environment for SLM; strengthening commercial and advisory services and alternative livelihood options; supporting SLM research and dissemination; improving and strengthening SLM knowledge management, monitoring and evaluation; and information dissemination.

Policy statement number 6 of the Uganda Forestry Policy (2001) provides that the government will promote and support farm forestry in order to boost land productivity, increase farm incomes, alleviate pressures on natural forests and improve food security. Furthermore, it is provided that the government will provide extension and advisory services that support farmers, communities, organizations and entrepreneurs in the conservation and sustainable management of forests and in the development of farm forestry.

Under policy statement number 4.1.4 of the Draft Rangeland Management and Pastoralism Policy (2014), rangeland communities will be assisted to adopt range management, pastoral practices and strategies that increase resilience to impacts of

climate variability and change. Specific strategies to achieve the above policy statement include:

- Ensure that communities implement strategies to alleviate effects of land degradation and climate change;
- Ensure that the government prioritizes environment protection and sustainable natural resource management;
- Establish and train rangeland management committees at local government level;
- Conserve wetlands;
- Improve the quality of weather and climate information to rangeland communities;
- Maintain a national early warning system;
- Have a clear contingency emergency drought plan;
- Develop mechanisms to allow rangeland regeneration through fallowing over a long time; designate vital watersheds in the rangelands;
- Conserve water reservoirs as nature and biosphere reserves;
- Establish a Rangeland Management and Training Centre (RMTC) to undertake climate change research and develop adaptation strategies;
- Ensure that NEMA conducts project environmental impact assessments to reduce negative impacts on the rangeland communities;
- Strengthen collaboration with the Climate Change Department and districts; and
- Explore avenues through which the rangeland community can benefit from carbon emissions trading.

Section 7.5.2 of the National Forest Plan (2011-2021) provides that tree growing on farms will be encouraged to optimise the flow of economic, social and environmental benefits from forests and trees to the local communities as well as contribute to improved conservation of forest resources.

Section 26 of the National Forestry and Tree Planting Act (2003) provides that the Government, NFA or the local government may provide technical services to any person involved in forestry activities including agroforestry and the growing of fruit species.

Under Section 6 of the National Physical Planning Act (2010), the National Physical Planning Board has power to advise Government on all aspects relating to physical planning in the country including viability of any proposed sub-division of agricultural land.

Under Section 6 of the National Agricultural Advisory Services Act (2001), NAADS, has the mandate to develop a demand driven, farmer-led agricultural service delivery system targeting the poor subsistence farmers, with emphasis on women, youth and people with disabilities. The role of NAADS is to provide support for advisory and information services to farmers; develop agricultural technologies and link farmers to markets; ensure quality by regulation and technical auditing of service providers;

strengthen private sector institutions to provide quality extension services; and establish a programme management and monitoring system.

Sections 15, 16, 17, 18, 19 and 20 of the National Agricultural Advisory Services Act (2001), provide for the establishment of farmers groups and associations at the village, parish, sub-county and district levels. Section 21 provides for the establishment of the National Farmers Forum with the following key functions: to participate in monitoring and evaluation of the progress of advisory services; to participate in the review of local government plans for agricultural development; to play an advocacy role in the general agricultural development and organisation; and provide feedback at all levels.

Uganda has recently adopted the Agricultural Extension Policy (2016) to further strengthen the existing agricultural extension system in the country.

In order for this strategic option to be effectively implemented, there is a need to implement the following specific measures under the existing policy and legal framework:

- Strengthen implementation and coordination of policy measures for CSA;
- Develop and enforce bylaws and other measures for SLM (by LoG);
- Promote rainwater harvesting technologies for small scale farm holder irrigation;
- Increase access to agriculture financing from different sources both state / government owned / operated and no-state sources;
- Strengthen support to the dairy and meat cooperatives to promote livestock rearing changes.

3.3 Strategic options 2: Sustainable fuelwood and (commercial) charcoal production

3.3.1 Approach

This strategic option aims to address the energy poverty in the context of climate change by promoting sustainable fuelwood and charcoal production. The option provides one of the greatest opportunities to reduce emissions while fostering significant sustainable development benefits. Access to clean energy is an important indicator when analysing poverty as it has a critical and immediate impact on the health and nutrition of households. Scarcity of fuelwood drives people to opt to less nutritious fast cooking foods, instead of beans and peas, for example and drives people to over-exploit biomass including in protected forests. Activities proposed can be implemented by everybody (individuals, families, communities, private sector and even the poorest people jointly by joining their forces).

Three interlinked interventions are proposed⁸:

- Commercial small-holder and community bioenergy woodlots
- Commercial small-holder and community pole and timber plantations (with coffee agroforestry)
- Improved charcoal kilns linked to bioenergy woodlots

3.3.2 Potential locations for implementation

In general, this strategic option can be implemented all over the country in locations where there is sufficient access to water and possibly also elsewhere. Integrating tree planting in farming systems and boundary planting are feasible among the low-income earners and in cases where there is land scarcity, especially in the densely populated Lake Victoria crescent and south-western Uganda. The small-holder and community woodlots have an important role as a source of woodfuel and poles. Tree planting for charcoal requires that tree growers are in fairly close geographical locations in order to share the costs and increase the availability of optimal commercial quantities of raw materials, without having to transport the feedstock over very long distances.

3.3.3 Appraisal

In the first *sub-option on Commercial small-holder and community bioenergy woodlots*; the aim is to foremost produce woodfuel in tree-based bioenergy woodlots all over Uganda. The focus here is on 20 % of the farmer households, which makes 866,246 households and equals with one-hectare size of woodlots to 866,246 hectares. This option will allow use of the one hectare of each household for both energy wood, fodder and crop cultivation, being one of the best strategic sub-options assessed. (See Table 3)

If one uses nitrogen-fixing agroforestry tree species like *Leuceana leucocephala* (selecting genetically non-invasive variety), *Sesbania sesban*, *Markhamia lutea*, *Acacia polyantha* or *Calliandra calothyrsus*, these can be grown in rows or alleys and they will fix nitrogen for the whole one hectare fertilizing also crops such as maize that can be grown between the alleys. Already during the second year one can cut the trees at one metre stump height and harvest between 15-20 tonnes of woody energy wood on annual basis (Christensen 2013).

⁸ Biogas option was also analyzed. This technology is still new and potential for reduced emissions rather minimal at national level. Anyhow individual institutions (hospitals, schools, jails etc) could look into this option and it might become viable option in the future also in large scale.

Table 3. Summary for Strategic Option 2: Sustainable fuelwood and charcoal production.

Indicators/ Components	Commercial small- holder and community bioenergy woodlots	Commercial small- holder and community poles and timber plantations (with coffee agroforestry)	Improved charcoal burning kilns
Area (ha)	866,246 ha	108,281 ha	Totally some 100,000 charcoal kilns for Uganda
Potential no. of beneficiaries (households)	866,246 HHs or 20 % of farming households. A good alternative for poor households.	108,281 HH or 2.5 % of all farming HHs.	A Casamance, Adam Retort or similar retort charcoal kiln should be based with a cluster of ca 6 small-holder bioenergy woodlots.
Average yield-increase per hectare	Approx. 350 % as compared to traditional agriculture.	Approx. 1600 % income increase over 25 years	With Casamance kiln 18-25 % and with Adam Retort up to 35 % charcoal efficiency, when traditional earth kiln only 11 % maximum.
Farm-level investments per hectare	Initial 1 st year tree plantation investment USD 162 plus annual USD 60 farming expenses	USD 1,235/ha over 25 years	An Adam or Sam 1 retort may cost ca. USD 1,400 while a Casamance may cost USD 160. Charcoal production tax permit USD 60. These costs can be shared among cluster members.
Farm-level labour opportunity cost per hectare	Annually USD 389-847 for bioenergy and USD 400 for farming operations	USD 5,617 over 25 years or 68.9 % of all farm-level costs	Annually USD 333 for charcoal kiln operation (2 persons).
Overall investment and programmatic	USD 6,723/HH in energy plantations and USD 4,175/HH for crops. Totally MUSD	USD 6,852.5/ha or totally MUSD 742	Totally USD 150 million for payment of improved charcoal kilns and permits

Indicators/ Components	Commercial small-holder and community bioenergy woodlots	Commercial small-holder and community poles and timber plantations (with coffee agroforestry)	Improved charcoal burning kilns
level costs (MUSD) covered by the farmers	9,440.5 overall of which 84 % relates to labour opportunity costs.		
Total project costs	Additional energy & agricultural sector extension and organization costs	Additional energy & agricultural sector extension and organization costs	Governmental supervision and registration to make this sustainable
Estimated emission abatement potential (tCO2) per ha over 25 years	In itself it constitutes 700.6 tCO2, but when it is substituting traditional charcoal making from natural forests it become 1504 tCO2/ha	443 from tree crop only	With Adam or Sam 1 Retort kilns the efficiency is 2.86 kg fuelwood to 1 kg charcoal instead of 9:1 with traditional kiln. One Adam kiln that burn 415 ton of wood/25 years (as based on SSO 2.1.) thus produce 99 t more char-coal than traditional kiln.
Estimated emission abatement potential (MtCO2) overall	606 MtCO2 (See also its impact as charcoal in SSO 2.3.	47 MtCO2	The SSO 2.1. wood will as charcoal additionally save 695 MtCO2 when it is produced sustainably with an improved kiln
Hectare-level benefits NPV (USD) (10% discount over 25 years)	Simultaneous bioenergy USD 7,165/ha and crop USD 3,086/ha or totally USD 10,252/ha	Simultaneous tree crop USD 4,832/ha and crop USD 9,815/ha and totally USD 14,647/ha	6,820 USD/ha at 10% discount rate.

Indicators/ Components	Commercial small-holder and community bioenergy woodlots	Commercial small-holder and community poles and timber plantations (with coffee agroforestry)	Improved charcoal burning kilns
Average annual employment generated (full time equivalents)	Approx. 4 workers/ha/yr, so increase from traditional agriculture is 2, so in total 1,732,492 persons.	Approx. 2.5 workers/ha/yr and thus increase from traditional agriculture is 1.5, so in total 162,421 persons.	Two labourers to operate each kiln. Thus 200,000 persons/year.
MAC (10% inflation) USD/tCO2	-16.9	-33.1	-277.8 per kiln

From the annually harvested bioenergy trees (i.e. *S. sesban*, *M. lutea*, *A. polycantha* or *C. calothyrsus*) one can also get 2-4 tonnes of fodder each year, which can either be used for own livestock or sold on the local market. The market price for the fodder could be around USD 50 per ton of fodder biomass (i.e. leafs and smaller branches) despite the fact that higher prices up to USD 100 may be achieved in some areas (Baltenweck et al. 2007 and Technoserve-Uganda 2008).

The initial investment need is around USD 162 for tree seedlings in the first year, while the normal agricultural investment of USD 60 would be invested annually in crop cultivation. The operations can be performed with own farm labour or unskilled paid labour from the neighbourhood. Calculated return on investment for NPV is USD 7,165 for the bioenergy and fodder component over 25 years at 10 % interest rate and investment benefit in NPV of USD 3,086 for the crop component at the same 10 % interest rate. Totally the investment benefit would be around USD 10252 over 25 years. The bioenergy arrangement has got many very useful co-benefits, which will further increase the overall benefits substantially.

The second sub-option on Commercial small-holder and community pole and timber plantations (with coffee agroforestry) also has a high focus on trees, although the investing farmer household can choose by itself whether to focus on the pole or timber incomes or on agricultural crops growing in the shade of the trees. It is envisaged that for the first three years, the focus is on planting of tree seedlings such as *Maesopsis eminii* or other similar fast-growing timber trees in a taungya system with agricultural crops, which enables the household to get an income while the trees are small (Buchauchholz et al. 2004). Besides the main agricultural crop under these three years there should then also be planted coffee bushes, cocoa, papaya or some shade thriving spices which will start producing coffee beans or other yields in the fifth or sixth year,

while the other agricultural crop cultivation would end in the third year (Ecotrust personal communication in 2016). In between in year 4 or 5 there should take the first harvesting of tree poles place from the plantation. Another pole or timber harvesting should be performed in year 10 after which the tree stand is ready to grow volume until final clear felling. This can happen in year 20-25, but it is then up to the farmer whether to choose timber rather than coffee or vice versa.

In the financial analysis for this report it was chosen to grow coffee under the trees and keep the trees longer (i.e. until 25 years) in which case the trees act as shade for the coffee production. In this manner, the pole or timber income over 25 years was calculated to be at NPV of 10 % a USD 4,832.4/ha, while the coffee production yielded over 25 years USD 9,815/ha simultaneously. What is more the coffee production brings in income annually, while the timber income comes only in years 4, 10 and 25. The overall NPV investment benefit for the household was thus USD 14,648/ha over 25 years. This option is one of the cheapest to establish and although there are several investments to make over the years there is income during almost all years, which should be very attractive for farming households. Also, the MAC-value is highly negative, which means that the investment is highly economical in order to reduce carbon emissions while getting good return on investments.

The third *sub-option on Improved charcoal kilns linked to bioenergy woodlots* is even a better investment, but one of the two previous sub-options (particularly the energy woodlot in sub-option 1) is needed to supply the improved charcoal kiln with a sufficient amount of sustainable wood to make this efficient and sustainable. It is estimated that in principle there could be one improved charcoal kiln per each energy wood woodlot if the farmer chose charcoal instead of just fuelwood production. An improved charcoal kiln would either be a Casemance kiln purchased at USD 160 or an Adam retort or a Sam 1 retort kiln purchased at USD 1,400 per kiln. The good thing with all of these three kiln types is that one can construct them of locally available materials (i.e. bricks, cement in the retort case and an iron chimney in the Casemance case). When it comes to wood use efficiency and charcoal quality the two retort kilns are much better than the Casemance, although also the latter one doubles the efficiency as compared to traditional earth mounds (Kakuru 2014, SPGS 2014, Bagabo et al. 2014, CIRCDU 2014).

It is calculated that an Adam or Sam 1 retort kiln would benefit the charcoal-maker by a NPV USD 5821 to USD 6914 over 25 years. The range is dependent on what tree species one uses in the energy woodlot. It was calculated that one would get annually on average 17 tonnes of energy wood from one woodlot hectare starting from end of year 2 or 3 (i.e. extend the overall plantation cycle to 26 years if the first harvest is late).

3.3.4 Non-carbon benefits

Sustainable wood fuel production improves household energy supply, which has a large health and nutritional impact. Community woodlots and tree planting in farm forestry provide livelihood and income benefits in the form of food, fibre and energy. Higher charcoal volumes with an improved pricing structure will allow better financial returns to the producers of charcoal. Diversification of livelihood options improves the resilience of households. Tree planting contributes to landscape restoration in degraded areas. This strategic option has got a huge impact on women's and children's daily workload as these family members would no longer need to walk long distances to collect fuelwood from forests and thereby would save some hours of work time on a daily or weekly basis.

3.3.5 Policy and legal appraisal

Under this strategic option, three interlinked interventions are proposed: commercial small-holder tree planting and community bioenergy woodlots; commercial small-holder and community pole and timber plantations; and improved charcoal kilns linked to bioenergy woodlots.

Section 5.5 paragraph 269 of Uganda Vision 2040 notes that 95 % of households in Uganda still use wood fuels (wood and charcoal) as a main source of energy, with 86 per cent of the rural households using firewood while 70 % of urban households use charcoal. Despite this, Uganda Vision 2040 does not articulate strategies for ensuring sustainable charcoal production.

Under Section 2.2.2.1 of National Development Plan II (2015-2020), it is noted that Uganda's current energy balance comprises 92 % biomass, 7 % fossil fuels and 1 % electricity, with most of the biomass energy coming from wood, which is consumed in the form of charcoal and firewood. Under paragraph 82 Section 2.2.2.1 of NDP II, among others, the Government's strategy is to promote the use of renewable energy, including the strengthening of the institutional, policy and legal framework.

Section 2.2.1 of the Renewable Energy Policy for Uganda (2007) notes 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, and commercial buildings. The most of the traditional biomass energy technologies such as wood and charcoal stoves, ovens and kilns used in Uganda are inefficient.

Section 2.3 of the Renewable Energy Policy for Uganda (2007) notes that among the barriers to renewable energy development is inadequate legal and institutional framework such as lack of a standard procedure and legal instruments for new

renewable energy investments as well as several scattered institutions involved in renewable energy and ambiguous procedural requirements. Section 3.5.1 outlines several strategies for dealing with the legal and institutional barriers to renewable energy development including putting in place legislation and regulations to promote the use of renewable energy.

Section 3.5.6 of the Renewable Energy Policy for Uganda (2007) outlines various strategies for ensuring sustainable management of the biomass resource base including the following: in collaboration with NFA and MAAIF, promote the growing of energy crops; provide incentives for farmers to establish commercial woodlot plantations; integrate biomass energy production and efficient utilization and its impact on climate and health, into the formal education system; license charcoal production and transportation and encourage its commercial production in an efficient and sustainable manner; increase the rate of adoption of efficient charcoal stoves from 20,000 in 2007 to 2,500,000 by 2017 in urban areas; increase the rate of adoption of efficient fuel wood stoves from 170,000 in 2007, to 500,000 by 2012 and 4,000,000 by 2017; promote inter-fuel substitution in households and industry by creating and maintaining appropriate taxation system; promote efficiency in the intensive wood burning industries, such as tea factories, brick kilns, bakeries; promote biomass fired cogeneration in industries and institutions; offer training opportunities for local artisans at the village level for the manufacture, installation and maintenance of efficient cooking stoves.

Section 1.2.3 of the Uganda Forestry Policy (2001) provides that over 90 % of the national energy demand is met from wood fuels, with about 18 million tonnes of firewood, and nearly 500,000 tonnes of charcoal consumed annually.

Policy statement number 6 of the Uganda Forestry Policy (2001) provides that the Government will promote on farm forestry to among other things, meet the demand for firewood and charcoal.

Recognizing that the biomass energy sector in Uganda is generally flawed, Section 3.2 of the Biomass Energy Strategy (2013) outlines several strategies for reversing the current negative trend including those relevant to fuel wood and charcoal use: develop a communication strategy tailored to various audiences such as end users, policy makers and technocrats; create an interlinked biomass resource database and information centre with representatives from key line Government agencies; adopt laws and regulations to govern the harvesting of wood from private and public land; ensure that a percentage of royalties and taxes collected from the industry are remitted to the districts to facilitate sustainable biomass management; provide technical assistance for both woodlots and natural wood formations on private land; develop a better charcoal transportation and distribution system; increase awareness of indoor pollution and associated health risks; increase awareness of benefits in using energy saving stoves and cooking appliances in urban areas; develop a nationwide plan for multipurpose trees

and shrubs; implement government plans to invest in energy crops; and aggressively promote use of improved charcoal kilns.

Section 14 of the National Forestry and Tree Planting Act (2003) prohibits certain activities in forest reserves – in this section, it is provided that – ‘no person shall, in a forest reserve, cut, disturb, damage, burn or destroy any forest produce, or remove or receive any forest produce except in accordance with regulations or guidelines made for the proper management of the forest reserve; in the course of the management of the forest reserve by the responsible body; in terms of the exercise of a right or interest in the forest reserve; or in accordance with a licence issued under this Act.’

Section 28 of the National Forestry and Tree Planting Act (2003) empowers the Government authorities to prepare management plans for forests, to regulate aspects such as type of activities to be carried out in the forest; and measures to be taken for the sustainable management of the forest. Under Section 28(4) of the said Act, a management plan made under this section is binding on all persons having dealings with or interests in the forest.

Section 32(1) of the National Forestry and Tree Planting Act (2003), regulates activities on forests, and provides that no person shall, except, for forestry purposes and in accordance with a management plan, or in accordance with a licence granted under this Act, cut, take, work or remove forest produce; clear, use or occupy any land; collect biotic and abiotic specimens; or construct or re-open a road, track, bridge, airstrip, or landing site. Under Section 32(2) of the Act, a person who contravenes this section commits an offence and is liable, on conviction, to a fine not exceeding thirty currency points or to imprisonment for a term not exceeding three years, or both.

Sections 21, 22, 23, 24, 25, 26, and 27 of the National Forestry and Tree Planting Act (2003) regulate forests on private lands. The legal framework is largely supportive of establishment of private forests (including bioenergy woodlots). In particular, Section 26 of the said Act specifies various technical services that the Central government or local government may extend to private forest owners, including the following: providing information, training and advice on the management of forests; the establishment and maintenance of nurseries and other facilities necessary for seeds and plants; material or financial assistance; the collection and dissemination of information, the provision of technical guidance and promotion of public awareness about forestry and the conservation and utilisation of forestry resources; the promotion of seed production, agroforestry and tree growing, and in particular, growing of fruit species; assisting local councils in conservation and management of local forest reserves; promoting conservation of forest biological diversity and ecosystems; and co-operating and liaising with other lead agencies in the management of forests and forest produce.

It should however, be noted that under the current legal framework, the Government and local governments have very limited control of activities on private forests, and yet about 70 % of forests is on private land.

While Sections 21(3), 22(3) and 27(2) of the National Forestry and Tree Planting Act (2003) give power to a District Forest Officer to issue directions to the owner of a private forest to manage the forest in a professional and sustainable manner, this is not strong enough to enable Government or local governments control activities on private forests in a manner that would effectively realize this strategic option. Moreover, under Sections 21(2) and 22(2) of the National Forestry and Tree Planting Act (2003), all forest produce in a private forest belongs to the owner of the forest and may be used in any manner that the owner may determine. It is further emphasized that under Section 27(1) of the National Forestry and Tree Planting Act (2003), the Government or a local government has no ownership over trees or forest produce situated on private land.

Regarding to the proposal to prohibit charcoal or fuel wood production from indigenous tree species, and produce it from exotic tree species, a review of the following legal provisions is necessary. Section 30(1) of the National Forestry and Tree Planting Act (2003) provides that 'the Minister may, in the case of a tree species of international or national importance that is endangered, rare or threatened, declare, by statutory order, that tree species to be a reserved species which shall be subject to such controls as the Minister may specify in the order.' Further under Section 30(2) of the said Act, a 'District Council may, in the case of a tree species of local importance that is endangered, rare or threatened, declare, by statutory order, that tree species to be a reserved species which shall be subject to such controls as the District Council may specify in the order.' Furthermore, Section 31(1) of the National Forestry and Tree Planting Act (2003) empowers the Government (Minister) or local government (District Council) to declare a particular tree, or group of trees on private land to be a protected through a Statutory Order.

Under Section 31(4) of the National Forestry and Tree Planting Act (2003), any person who, without the written consent of the Minister or the District Council, cuts, damages, destroys, disturbs or removes any protected tree; or collects, removes, transports, exports, purchases, sells, donates or in any other manner acquires or disposes of any part of a protected tree, commits an offence and is liable, on conviction, to imprisonment for a term not exceeding three years or a fine not exceeding thirty currency points or both.

Regulation 3 of the Forests Rules S.I No. 146-2 (saved by Section 92(2) of the National Forestry and Tree Planting Act, 2003) sets out a list of reserved tree species under Part B of the First Schedule to the Rules, including Mvule, Mugavu, African blackwood, Mahogany, etc.

Regulation 30(2) of the Draft Forestry and Tree Planting Regulations (2013) sets out a list of reserved tree species (Schedule 6 to the Regulations), including - Mvule, Mahogany, Elgon Olive, Musizi, Abura, etc.). Under Regulation 30(3), NFA and local governments are empowered to generate new lists of reserved tree species and under Regulation 31, the list of reserved tree species may be reviewed after every 5 years or

even shorter period as the Minister may determine. Regulation 34 empowers the District Forestry Officer to use his or her discretion to temporarily declare a tree or group of trees to be protected, which may later be confirmed by the District Council. Regulation 35 prohibits harvesting protected or reserved tree species without a licence issued by the Minister or District Council.

Regulation 37(1) of the Draft Forestry and Tree Planting Regulations (2013) prohibits the introduction of alien or exotic tree species into Uganda unless he or she has a license issued by the Minister, and under Regulation 37(3). A person who contravenes this Regulation commits an offence and shall on conviction be liable to a fine not exceeding thirty currency points or imprisonment for a term not exceeding two years, or both.

Overall, it is noted that to large extent, the current legal framework empowers the Government or local government, to prohibit the production of charcoal/fuel wood from indigenous tree species. With regard to the proposal to switch to exotic tree species for the production of charcoal/fuel wood, it is observed that Regulation 37(1) of the Forestry and Tree Planting Regulations (2014) appears to be counter-productive to the promotion of the growing of exotic tree species as a substitute to indigenous tree species in the production of charcoal/fuel wood, to the extent that it prohibits the introduction of alien or exotic tree species into Uganda unless the person has a license issued by the Minister.

In order realize this strategic option the following measures under the existing law (National Forestry and Tree Planting Act, 2003 and Forestry and Tree Planting Regulations, 2014) should be implemented:

- Promote fast-growing exotic tree energy woodlots
- Strengthen regulation of commercial production of charcoal from indigenous trees/ natural forests
- Increase opportunities for financing (accessing finance/incentives) for established of energy woodlots and plantations

3.4 Strategic options 3: Large-scale commercial timber plantations

3.4.1 Approach

This strategic option contributes to an Inclusive Green Economy (IGE) through promoting responsible investments in large-scale commercial transmission pole and timber plantations. The option for commercial pole and timber growers and has got no agroforestry practices incorporated. The activities can be implemented by many kinds of entities (i.e. private sector, communities, households and by individuals alone or by joining their forces). The three sub-options are the following:

- Commercial transmission pole and timber plantation;
- Commercial pole and sawlog plantation;
- Improved charcoal kilns linked to plantation sites;

The Rio+20 summit's (2012) outcome document 'The Future We Want' recognized Green Economy (GE) as an important tool for achieving sustainable development and poverty eradication. An Inclusive Green Economy (IGE) is based on sharing, circularity, collaboration, solidarity, resilience, opportunity, and interdependence (UNEP 2015). An Inclusive Green Economy sees that there is a need for more equitable income and employment benefits from investments that reduce carbon emissions and pollution.

The strategic option is in tune with the Uganda National Green Growth Strategy (UGGS), which describes how the country can promote the use of natural resources in a sustainable manner to achieve economic growth, and development, while at the same time combating climate change.

3.4.2 Potential locations for implementation

Potential locations for responsible investments in large-scale tree plantations can be found nation-wide, but the activity depends on availability of land (e.g. NFA lands) and suitability of soils and climate. Large-scale tree plantations provide raw material for nearby industries. Smaller tree plantations should be in clusters in consideration of future sawmills and other wood industries.

3.4.3 Appraisal

The first sub-option concerns the *Commercial transmission pole and timber plantation*, which actually have during the tree rotation cycle of 25 years several wood products to sell that are fuelwood, charcoal, small poles, transmission poles and sawn timber. In current timber plantations, owned by Uganda Timber Growers' Association (UTGA) members, NFA and other individual plantation owners, there are normally only small poles, transmission poles and timber sold, but from 2016 the first agreements for industrial fuelwood production are also done (UTGA News 2016). This can be developed

even further (in all three sub-options of Strategic Option 4) by selling out all small pieces of harvested wood as either fuelwood or charcoal if not even poles. Information has been incorporated from the following main sources: AFF (2011), SPGS (2016), UTGA (2016), UTGA News (2016).

One can estimate an expansion of commercial transmission pole/timber plantations of 40,000 ha and the initial investment in year 1 to be around USD 892/ha, which is followed by some further investments over the first 5 years. The overall investment and harvesting costs would be NPV USD 4,819/ha over the 25-year period, while the NPV income benefit is 10,890/ha at 10 % interest over 25 years (See Table 4).

The second sub-option for Commercial pole and sawlog plantations will also produce more wood products than is current practice in Uganda. The new products will again stem from selling even small pieces of wood as small poles, fuelwood or charcoal. It is foreseen that this sub-option could be carried out on around 30,000 ha besides already established sawlog timber plantations. In this manner both the previous sub-options would cover totally around 150,000 ha of private commercial timber plantations. On top of this will then be the timber plantations owned by the government and those by small-holder farmers, which means that there would totally be 300,000 ha of timber plantations in Uganda besides small-holder farmers' other small home garden woodlots. Information has been incorporated from the following main sources: AFF (2011), SPGS (2016), UTGA (2016), UTGA News (2016).

The first-year investment needed to establish a plantation is around USD 934/ha with some more investments over 5 first years. Total investment need is around NPV USD 6,470/ha over 25 years at 10 % interest rate. The foreseen income over 25 years NPV is USD 13,201/ha. The MAC-value of this sub-option is almost -30 USD/tCO₂, which means that it is efficient use of money and able to reduce carbon emissions substantially by sequestering carbon into the large standing wood volume per each hectare.

The third sub-option on Improved charcoal kilns linked to timber plantation sites is similar to the small-holder farmers' improved charcoal kiln sub-option under the Strategic Option 3 above. The main difference is that in this case there will not be annual wood supply, which means that each improved charcoal kiln would serve about 10 ha of plantations. With already existing timber plantations there could be 15,000 improved kilns for 150,000 ha of timber plantations and one should strive to harvest timber plantations each year instead of large amounts of hectares in one go. The kiln types to purchase would be either Adam or Sam 1 retort kilns at USD 1,400 per kiln plus a USD 60 for the charcoal production permit and about USD 333 as salary for two kiln operators. The NPV benefitting income could be estimated either USD 17,000 if all wood has to be purchased by the charcoal kiln owner or if the wood is available free of charge from the timber plantations the NPV income benefit would be even USD 32,000/kiln. The MAC-value is high for this sub-option, which means that this is an extremely good

investment for a businessman. Information for calculations has been incorporated from the following main sources: Kakuru (2014), SPGS (2014), Bagabo et al. (2014), and CIRCDU (2014).

If one further wants to balance production of sufficient wood for each charcoal kiln near to timber plantations, it would be possible to establish a sawmill close where one could get waste wood of the sawing process from. Currently, only about 45 % of the timber is included in the ready sawn wood material reaching the market, while the rest is either sold as fuelwood or rot in the sawmill yard. All this waste wood needs be taken into full use as raw material for charcoal, fuelwood or briquettes (i.e. saw dust).

Table 4. Summary for Strategic Option 3: Large-scale commercial timber plantations

Indicators/ Components	Commercial transmission pole and timber plantation	Commercial pole and sawlog plantation	Improved charcoal kiln working next to timber plantations
Area (ha)	Additional 40,000 ha	Additional 30,000 ha	15,000 kilns per 150,000 ha of plantations
Potential no. of beneficiaries (households)	Uganda Timber Growers' Association members and other private land owners (not members of SPGS)	Uganda Timber Growers' Association members and other private land owners (not members of SPGS)	Uganda Timber Growers' Association members & sub- contractors and other private land owners (not members of SPGS)
Forest-level investments per hectare	USD 892 is the initial investment in the first year	USD 934 is the initial investment in the first year	An Adam or Sam 1 retort may cost ca. USD 1,400, while a Casamance may cost USD 160. Charcoal production tax permit USD 60.
Forest-level operation & harvesting cost per hectare	USD 4,820 over 25 years in NPV 10%.	USD 5,536 over 25 years in NPV 10%.	Annually USD 333 for charcoal kiln operation (2 persons).
Overall	USD 5,711/ha and	USD 6,470/ha and	Totally MUS\$ 22.5

Indicators/ Components	Commercial transmission pole and timber plantation	Commercial pole and sawlog plantation	Improved charcoal kiln working next to timber plantations
investment and programmatic level costs (MUSD) covered by the UTGA members	totally MUSD 228	totally MUSD 194	for payment of improved charcoal kilns and permits
Total project costs	UTGA and NFA administration expenses & potential infrastructures	UTGA and NFA administration expenses & potential infrastructures	UTGA and NFA administration expenses & potential infrastructures
Estimated emission abatement potential (tCO₂) per ha over 25 years	729	445	Annual average fuelwood amount per ha estimated to 17 t and thus 5.9 t charcoal/ha/yr. As fuelwood has been unused so far 548 tCO ₂ eq/ha over 24 yrs.
Estimated emission abatement potential (MtCO₂) overall	18.2	13.4	8.2 The Sub-option 4.3 is alternative solution to Sub-option 4.1. and 4.2. visavi fuelwood sales/ consumption
Hectare-level benefits NPV (USD) (10% discount over 25 years)	USD 10,890/ha	USD 13,201/ha	Each kiln for about 10 ha of plantations and annual net income of USD 12,516 or USD 23,236 depending on charcoal sales price (USD 147.6 - USD 227.1 per ton) charcoal)
Average	Approximately 4,848	Approximately 5,135	Two labourers to

Indicators/ Components	Commercial transmission pole and timber plantation	Commercial pole and sawlog plantation	Improved charcoal kiln working next to timber plantations
annual employment generated (full time equivalents)	days/ha over 25 years or 17.12 man-years (at 300 days/ha/year). Thus totally 646,397 man years.	days/ha over 25 years or 16.16 man-years (at 300 days/ha/year). Thus totally 513,528 man years.	operate each kiln. Thus 30000 persons/year.
MAC (10% inflation) USD/tCO2	-14.9	-29.6	-12.3 to -22.8 Depending on charcoal price.

3.4.4 Non-carbon benefits

Plantation forestry contributes to improvement of rural livelihoods by creating employment through fuelwood, charcoal, pole and sawn timber production business. It will reduce erosion on large areas and support biodiversity restoration. Many benefits depend on the large-scale rural electrification initiatives, i.e. need of electricity poles. More skilled labour and technicians are needed in the future forest industry.

3.4.5 Policy and legal appraisal

Under this strategic option, three sub-options are proposed: commercial transmission pole and timber plantation; commercial pole and sawlog plantation; and improved charcoal kilns linked to plantation sites.

Under Section 9.2 of the National Development Plan II (2015-2020), Government will promote sustainable development of commercial forest plantations and industry including value addition.

The current legal framework in Uganda is largely supportive to the establishment of large-scale commercial timber plantations – Sections 21, 22, 23, 24, 25, 26, and 27 of the National Forestry and Tree Planting Act (2003). Furthermore, under Section 39(1) of the said Act, the Government/local governments are empowered to issue directions for the planting and growing of trees. Section 40 of the said Act establishes a Tree Fund, and under Section 40(4) of the Act, the Tree Fund may be used to, promote tree planting and growing at national and local level; and support tree planting and growing efforts of a non-commercial nature but which are of benefit to the public. Under Section 41(1) of the said Act, Government/local governments are empowered to grant licences to any interested persons for harvest of forest produce; and the sustainable utilization and management of a forest reserve or community forest. Under Section 44 of the said Act,

authorized persons may export timber. Under Section 49(1) of the said Act, the central Government is obligated to prepare a National Forest Plan – a public document with a framework for the implementation of the forestry policy and programmes by Government and stakeholders in the forest sector.

Large-scale commercial timber plantations are further enabled under Regulations 61 to 75; and 80 to 87 of the Forestry and Tree Planting Regulations (2014).

Furthermore, Government's policy is largely supportive of large-scale commercial timber plantations. Under policy statement number 3 of the Uganda Forestry Policy (2001), it is the Government's policy to promote profitable and productive forest plantation businesses. Policy statement number 3 provides that the private sector will play a major role in developing and managing commercial forest plantations, either through large-scale industrial plantations on government or private land, or through small-scale plantations on farms.

It is possible to implement strategic option 3 under the current legal framework through implementing various measures that promote large-scale commercial timber plantations.

3.5 Strategic option 4: Restoration of natural forests in the landscape

3.5.1 Approach

Numerous initiatives are recognizing that the landscape scale is appropriate for balancing the multiple interests of people with diverse livelihoods and interests in sequestering carbon and adapting to climate change (Minang 2015). The aim of the proposed strategic option is to restore or rehabilitate natural forests within the context of climate-smart landscape. The interventions also contribute directly to the Uganda's commitment of 2.5 million ha forests by 2020. The means are as follows:

- Designated areas for natural forest regeneration;
- Restoration of degraded protected natural forest (i.e. national parks and forest reserves and forests on privately owned land);
- Devolution of forest management through PFM and similar set-ups;
- Traditional/customary forest management practices;

The restoration does not necessarily aim to return forest landscapes to their original state but rather to optimize their carbon sequestration capacity and the delivery of other forest-related goods and services at the landscape level. The approach is community driven (bottom-up) with appropriate technologies and land management practices. The

communities are encouraged to share their knowledge about practices that can improve livelihoods and income generation whilst conserving and protecting natural resources.

3.5.2 Potential locations for implementation

The interventions need to be targeted to:

- All the natural forests managed as CFR and LFRs;
- All the natural forests managed under the Wildlife sector (Forested NPs and Wildlife Reserves);
- Priority locations for forest restoration (IUCN/MWE Publication on Forests and landscape restoration) on public and private lands;
- Other areas if locally well justified.

3.5.3 Appraisal

The first sub-option on *Designated areas for natural forest regeneration*, focuses on forest areas that may be possible to rehabilitate back into almost primary forests and therefore very important to rehabilitate. It was estimated that some 100,000 ha of such forests should be included under this sub-option. The idea is to rehabilitate these forests with the assistance of forest adjacent communities and therefore 100,000 households are incorporated in this sub-option. The sub-option should be combined with the PFM sub-option. In order for these households to be included they should all have their private woodlots on their own lands from where they can harvest their wood products. The households should be allowed to harvest NTFPs so that each household has got their one hectare of forest to harvest from. In this manner, the households can get forest income, while the natural forests are able to grow back to full forest cover over time. Some few poor landless households, should be given opportunity to extract a few cubic metres of fuelwood annually from forest and this should be written into CFM/PFM agreements. Information has been incorporated from the following main sources: Jagger (2012), FAO (2013), Jiren 2013, Tugume et al. (2014) and NFA (2016).

The investment costs relate to boundary demarcation, annual supervision (by NFA) and fire protection expenses and over 25 years the NPV for these expenses may reach USD 133/ha with a 10 % inflation. The economic benefit for the NTFPs for the individual households would be USD 4785 per household (Tugume et al. 2015 and FAO 2013) over 25 years. This is an important sub-option for forest adjacent communities and their full participation in the tree protection is vital for the success of rehabilitating natural forests (See Table 5).

The second *sub-option on Restoration of degraded protected natural forest (i.e. national parks and forest reserves and forests on privately owned land)* would allow natural forest to evolve over time in forest areas in forest reserves and protected areas that have

already lost most of their forest cover. It is foreseen that there would be 100,000 ha of these lands, which need enrichment planting with indigenous tree species to mimic natural forests. The planting work should be conducted by adjacent communities, which is a way to allow forest adjacent communities some forest income as payment for enrichment planting, some sustainable wood and NTFPs. The investment costs in tropical high forests (THFs) is initially USD 51/ha and totally over 25 years USD 236/ha. On woodlands, the initial investment cost would be USD 33/ha and totally over 25 years USD 214/ha. The forest level harvesting costs of NTFPs and some small amounts of fuelwood (3m³/ha/year) and poles (3m³/ha/year) on THFs after a few initial years when the enrichment planted seedlings have grown to harvestable size. On woodlands, no wood would be harvested, but NTFPS would be allowed to harvest at a little lower level than in THFs. The estimated benefits for the households would be about USD 6067/household in THFs and USD 1892/household on woodlands. This kind of sub-option has got many valuable co-benefits, which are listed in the strategic option table below.

The third *sub-option concerns Devolution of forest management through PFM and similar set-ups*, which should be linked to either or both the previously presented sub-options. The aim should be here that almost all wood products should come from small-holder woodlots or plantations, while the forest adjacent communities should be able to collect non-timber forest products (NTFPs) from forest areas near their homes. In this manner communities will take care of the forests near their villages, while simultaneously be mandated to protect those natural forests near their homes. The arrangement needs to be supervised by the NFA, Local Governments and UWA Wardens/Rangers and steered so that each household harvest their needed NTFPs from different hectares in the PFM or Collaborative managed forests. The rural households in such a PFM arrangement would benefit tremendously from it (Jagger 2012, FAO 2013, Jiren 2013, Tugume et al. 2014 and NFA 2016).

The fourth *sub-option focusing on Traditional/customary forest management practices* should be turned into similar arrangements as the PFM and Collaborative Forest Management arrangements discussed in previous sub-option. This will need some revision of legislation and policies and mutual understanding between government official and concerned communities. The aim should again be that the natural forests are handled sustainably with only minor exploitation of wood and sustainable use of NTFPs. In order to settle for these kinds of new-signed agreements there must be as pre-condition existing or newly established woodlots in the partner communities from where all wood products are derived (Jiren 2013, and FAO 2013).

Table 5. Summary for Strategic Option 4: Restoration of natural forests in the landscape

Indicators/ Components	<u>Designated areas for natural forest regeneration</u>	<u>Restoration of degraded protected natural forest (i.e. national parks and forest reserves)</u>	<u>Devolution of forest management through PFM and similar set-ups & Traditional/ customary forest management practices</u>
Area (ha)	100,000 ha	100,000 ha	PFM and traditional/customary forest management only implemented together with tree plantations or small-holder/ community woodlots.
Potential no. of beneficiaries (households)	Approx. 100,000 HHs living closely adjacent to these forest areas	Approx. 100,000 HHs living closely adjacent to these forest areas	Size of PFM and traditional forest management must balance with local plantations/ woodlots.
Forest-level investments per hectare	Initially USD 7 for boundary lineation, & annual supervision and fire protection USD 14. Totally USD 132.53 over 25 years at NPV 10 %. To be combined with PFM or traditional for. mgt.	Initially USD 51 on THF forest and USD 33 on woodlands. Totally USD 236 in THF and USD 214 on woodlands over 25 years at NPV 10 %. To be combined with PFM or traditional for. mgt. Cost accruing mainly to NFA.	Ideally forest adjacent HHs could get their NTFPs from forest land, while timber, poles and fuelwood from woodlot or plantation.
Forest-level harvesting cost per hectare	USD 7 annually for NFTP harvesting – no fuelwood and totally USD 64 over 25 years NPV at 10%	USD 434 from harvesting NTFPs and some fuelwood and poles in THF. USD 51.4 from harvesting NTFPs on woodlands. The figures in NPV over 25 years at 10%	Only NTFPs and small amounts of wood from natural forest. The rest from plantations and woodlots.
Overall investment	USD 196 over 25 years at 10%. Totally	NPV USD 676 in THF over 25 years at 10 %.	Mainly covered by the other two sub-

Indicators/ Components	<u>Designated areas for natural forest regeneration</u>	<u>Restoration of degraded protected natural forest (i.e. national parks and forest reserves)</u>	Devolution of forest management through PFM and similar set-ups & Traditional/ customary forest management practices
and programmatic level costs (MUSD) covered by the farmers	MUSD 19.6	Totally for THF in MUSD 67.5 NPV USD 266 on woodlands over 25 years at 10 %. Totally for woodlands in MUSD 26.5	strategic options.
Total project costs	Additional forest sector extension and organization costs	Additional forest sector extension and organization costs	Additional forest sector extension and organization costs
Estimated emission abatement potential (tCO2) per ha over 25 years	300	581 in tropical high forests and 26.2 on woodlands	Almost none if implemented as described above.
Estimated emission abatement potential (MtCO2) overall	3	58.2 in tropical high forests and 2.6 on woodlands	Almost none if implemented as described above.
Hectare-level benefits NPV USD (10% discount over 25 years)	USD 4,785/ha	USD 6,067 in tropical high forests and USD 1,892 on woodlands	Incorporated in the two other sub- strategic options.
Average annual employment generated (full time equivalents)	The arrangement would allow one household/ha annually a chance to collect NTFPs from forest land. Thus, it	The arrangements would allow one household/ha annually a chance to collect NTFPs from forest land. Thus, it would	The main impact is to support poor forest adjacent communities/ households with NTFPs

Indicators/ Components	<u>Designated areas for natural forest regeneration</u>	<u>Restoration of degraded protected natural forest (i.e. national parks and forest reserves)</u>	Devolution of forest management through PFM and similar set-ups & Traditional/ customary forest management practices
	would fully support 100,000 forest adjacent HHs overall.	fully support 200,000 forest adjacent HHs overall.	
MAC (10% inflation) USD/tCO2	-15.9	-10.4 (for THFs) and -722.3 (for woodlands)	Calculated as part of the two other sub-strategic options

3.5.4 Non-carbon benefits

Landscapes yield multiple benefits, they support biodiversity, mitigate natural disasters, reduce soil erosion, sequester carbon, and provide other environmental services such as NTFPs and clean water as well as opportunities for responsible commercial activity (Minang 2015). The landscape approach considers how interconnected components of the landscape can be managed to reap multiple benefits (ecotourism and medical plants) and balance commercial, social and environmental concerns.

3.5.5 Policy and legal appraisal

Under strategic option 4, various measures will be implemented including: designated areas for natural forest regeneration; protected natural forest management (i.e. national parks and forest reserves); devolution of forest management through participatory fire management and similar set-ups; and traditional/customary forest management practices.

Under Section 9.2 of the National Development Plan II (2015-2020), the Government will promote implementation of sustainable management of forests through restoration of natural forests on protected and private land.

Section 15 of the National Forestry and Tree Planting Act (2003) provides for collaborative forest management – NFA and the local government may enter into a collaborative forest management arrangement with a forest user group for the purpose of managing a central or local forest reserve or part of it in accordance with regulations or guidelines issued by the Minister.

Regulations 16 to 29 of the Forestry and Tree Planting Regulations (2014) set out detailed guidelines under which a collaborative forest management agreement may be concluded between NFA/local governments and forest adjacent communities.

Section 28 of the National Forestry and Tree Planting Act (2003) empowers the Government authorities to prepare management plans for forests, to regulate aspects such as type of activities to be carried out in the forest; and measures to be taken for the sustainable management of the forest. Under Section 28(4) of the said Act, a management plan made under this section is binding on all persons having dealings with or interests in the forest.

Section 32(1) of the National Forestry and Tree Planting Act (2003), regulates activities on forests, and provides that no person shall, except, for forestry purposes and in accordance with a management plan, or in accordance with a licence granted under this Act, cut, take, work or remove forest produce; clear, use or occupy any land; collect biotic and abiotic specimens; or construct or re-open a road, track, bridge, airstrip, or landing site. Under Section 32(2) of the Act, a person who contravenes this section commits an offence and is liable, on conviction, to a fine not exceeding thirty currency points or to imprisonment for a term not exceeding three years, or both.

In addition, policy statement number 5 of the Uganda Forestry Policy (2001) provides for collaborative forest management under which collaborative partnerships with rural communities can be developed for the sustainable management of forests. The said policy statement further provides that the development of collaborative forest management will define the rights, roles and responsibilities of partners and the basis for sharing benefits from improved forest management, with a specific focus on wide stakeholder participation, collective responsibility and equity, and on improving the livelihoods of forest-dependent communities.

The current legal framework (National Forestry and Tree Planting Act, 2003; the Forestry and Tree Planting Regulations, 2014; and the Uganda Forestry Policy, 2001; Wildlife Policy and Act; Local Government Act; and Land Act) have adequate provisions to enable the implementation of measures to realize strategic option 4.

3.6 Strategy Option 5: Energy efficient cooking stoves

3.6.1 Approach

This strategic option promotes clean cooking solutions. The means are as follows⁹:

- Energy efficient fuelwood stoves (EES)
- Improved charcoal stoves (ICS)

The Global Alliance for Clean Cookstoves, a public-private partnership hosted by the United Nations (UN) Foundation, addresses the global problems associated with traditional cooking methods. The Alliance advocates for the prioritization of clean cooking as an effective intervention that delivers cross-cutting gains and boosts progress on the Sustainable Development Goals (SDGs) and the Paris Agreement to combat climate change. Inefficient cookstoves and biomass burning produces a high amount of greenhouse gases such as carbon dioxide and other short-lived climate forcing agents such as methane, and black carbon (BC) aerosols.

World Health Organization (WHO) has reported that the exposure to household air pollution (HAP) from cooking contributes to 4.3 million premature deaths in the World annually, and 13,000 deaths in Uganda (GACC 2016). Women and young children receive the highest exposure because they spend the most time in or near the kitchen when the stove is alight. More than 30 million people in Uganda still rely on traditional biomass fuels and stoves for their cooking.

⁹ The *biogas stoves* were also analysed, but not included to the proposed options. The reason is that biogas stoves are rather difficult in operation and require frequent maintenance. Those entities that are best suited for using biogas stoves are cattle and pig farms (with lots of cow dung and pig manure), municipal dumping sites (with lots of organic household waste), jails and schools. The operator of larger biogas power stations should be well-educated technicians with good professional knowledge on how to handle the biogas unit. MEMD (2014) estimates that these kinds of biogas stoves will even in the future be less than 1 % in total household cooking energy solutions. Municipal dumping sites, however, are good places for establishing biogas power stations as these are large and can be operated professionally.

almost all institutions purchase all their annual fuelwood with some exceptions (i.e. some tea processing factories that own their own energy wood plantations).

According to MEMD (2016) 40-42 % of all fuelwood-using households in Uganda purchase at least half of their annually consumed amount of fuelwood. In the next five years additional 10 % of households are likely to have to start to purchase fuelwood due to scarcity of un-purchased fuelwood, which makes a total of 2,807,882 households. On top of this come the new households established within the following 25 years (1,195,486 households for 12 years), which are also included in the calculations. The similar figures for institutions are; starting point is 15,586 institutions and later additional 6,636 institutions (for 12 years). The information for the actual financial analyses comes from the following main sources: GVEP International (2012), FirstClimate (2013), WWF (2015), and MEMD (2016) (See Table 6).

The household level investment need would be USD 22.4 every third year for an EES stove or totally NPV at 10 % is USD 75.64 for 25 years. The corresponding NPV savings would be USD 1,085.8 over 25 years at 10% inflation as traditional stove use (stove and fuelwood purchased) costs are annually USD 2002/household, while with an EES stove they would have paid only USD 916.6 over 25 years. The institutions now pay with a traditional stove USD 30,615/institution over 25 years, while they would pay only USD 10,320/institution with an EES stove so a saving of USD 20,296/institution would be possible. An EES stove for institutions costs only around USD 150 on average, which means that it would not make sense to save on the purchase cost for such an EES stove. The marginal abatement cost is also highly negative or -48.9 for households and -134.8 for institutions, which means that purchasing EES stoves is a very economical solution. An EES stove is not making any saving only for the very poor households, which collect all their fuelwood.

The second *sub-option focusing on Improved charcoal stoves* is very similar to the EES stoves for fuelwood. In this case it makes almost always sense to purchase ICS stoves as almost all end-user households purchase their charcoal. The ICS stoves are even cheaper than EES stoves (USD 10 for households), which need to be purchased again every third year. For institutions, the ICS stoves cost on average around USD 150 and last also about three years. It has been calculated that a traditional stove and its needed charcoal amount over 25 years would cost USD 1,123, while an ICS for households would cost for the same period USD 758.4 (a saving of USD 374/household). For institutions the traditional scenario costs USD 16,848, while ICS would cost USD 9,773/institution (a saving of USD 7,075). Here the marginal abatement cost (MAC) is -10.4 for households and -10.6 for institutions. In both sub-option 1 and 2 the reduced use of wood fuel is also seen in co-benefits such as better indoor air quality in kitchens.

The *biogas stoves* are not emphasized. The reason is that biogas stoves are rather difficult in operation and require frequent maintenance. Those entities that are best

suitable for using biogas stoves are cattle and pig farms (with lots of cow dung and pig manure) and municipal dumping sites (with lots of organic household waste). The operator of larger biogas power stations should be well-educated technicians with good professional knowledge on how to handle the biogas unit. MEMD (2014) estimates that these kinds of biogas stoves will even in the future be less than 1 % in total household cooking energy solutions. Municipal dumping sites, however, are good places for establishing biogas power stations as these are large and can be operated professionally.

Table 6. Summary for Strategic Option 5: Energy efficient cooking stoves

Indicators/ Components	Energy efficient fuelwood stoves	Improved charcoal stoves
Actual wood use reduction potential	Some 58 % savings in households and approx. 45 % savings in institutions	Some 36 % savings in households and approx. 45 % savings in institutions
Potential no. of beneficiaries (households)	From start potentially 2,807,882 households and further 1,195,486 HHs for 12 years on average.	From start potentially 1,867,096 households and further 794,936 HHs for 12 years on average.
Potential no. of institutional beneficiaries	From start potentially 15,586 institutions and later 6,636 institutions for 12 years on average	From start potentially 33,866 institutions and later 14,419 institutions for 12 years on average
Household-level investment needs	USD 22.4 every third year or totally NPV at 10 % is USD 76 for 25 years	USD 10 every third year or totally NPV at 10 % is USD 34 for 25 years
Institution-level investment needs	USD 200 every third year or totally NPV at 10 % is USD 675.35 for 25 years	USD 150 every third year or totally NPV at 10 % is USD 506.51 for 25 years
Overall investment and programmatic level costs (MUSD) covered by the HHs	MUSD 253.6 for households and MUSD 12.6 for institutions	MUSD 253.6 for households and MUSD 12.6 for institutions
Total project costs	115 energy experts at national and district levels at USD 119,748/expert or MUSD 13.8	The same energy experts as for fuelwood EES stoves can be shared here.
Estimated emission abatement potential (tCO₂) per HH and institution over	22.2 for each HH and 150.6 for each institution	35.8 for each HH and 668.1 for each institution

Indicators/ Components	Energy efficient fuelwood stoves	Improved charcoal stoves
25 years		
Estimated emission abatement potential for HHs and institutions (MtCO₂) overall	11,405 for HHs and 403 for institutions	1,324 for HHs and 448 for institutions
Household-level benefits NPV (USD) (10% discount over 25 years)	Traditional wood stove fuelwood expense is USD 2,002 while EES stove has USD 917 or a saving of USD 1,086/HH	Traditional wood stove fuelwood expense is USD 1,132 while EES stove has USD 758 or a saving of USD 374/HH
Institution-level benefits NPV (USD) (10% discount over 25 years)	Traditional wood stove fuelwood expense is USD 30,615 while EES stove has USD 10,320 or a saving of USD 20,296/Institution	Traditional wood stove fuelwood expense is USD 16,848 while EES stove has USD 9,773 or a saving of USD 7,075/Institution
Average annual employment generated (full time equivalents)	EES stove production business of MUSD 735 over 25 years or MUSD 29.4 per year	ICS stove production business of MUSD 264.3 over 25 years or MUSD 10.6 per year
MAC (10% inflation) USD/tCO₂	-48.9 (for HHs) and -134.7 (for institutions)	-10.4 (for HHs) and -10.5 (for institutions)

3.6.4 Non-carbon benefits

A wider access to clean, safe and efficient household energy secure additional benefits to society, which are related to health, gender and livelihood. Health benefits are huge since household air pollution (HAP) from traditional cooking is a major problem contributing to premature deaths. Improved firewood and charcoal stoves save time, which is used in fuelwood gathering, and thereby allows more time for productive activities and schooling. Accordingly, the risk for injury and violence during fuel collection, especially among women and children, is reduced.

3.6.5 Policy and legal appraisal

Strategic option 5 will promote clean cooking solutions through improved fuel wood stoves and charcoal stoves. Under Section 2.2.3.8 of National Development Plan II (2015-2020), it is noted that 95 per cent of households still use wood fuels – wood and charcoal – as a main source of fuel. Section 2.2.2.1 of NDP II, underscores the need for the reform of the institutional, policy and legal framework to promote the use of renewable and clean energy.

Under Section 3.5.6 of the Renewable Energy Policy for Uganda (2007), the Government's policy is to promote the use of energy efficient cooking stoves through various measures including; increasing the rate of adoption of efficient charcoal stoves from 20,000 in 2007 to 2,500,000 by 2017 in urban areas; increasing the rate of adoption of efficient fuel wood stoves from 170,000 in 2007, to 500,000 by 2012 and 4,000,000 by 2017; and offering training opportunities for local artisans at the village level for the manufacture, installation and maintenance of energy efficient cooking stoves.

Section 3.5.6 of the Renewable Energy Policy for Uganda (2007) provides for the promotion of biogas production and use for small and large-scale applications, with a target of increasing the number of household/institutional biogas plants from around 500 in 2007 to 100,000 by 2017.

Uganda does not have a law to facilitate the adoption of improved fuel wood stoves and charcoal stoves. There is need for an enabling legislation to support the implementation of policy statements under the Renewable Energy Policy for Uganda (2007), in particular, those relating to improved fuel wood stoves and charcoal stoves.

Therefore, in order to realize strategic option 5, some monetary and non-monetary incentives will be required to support the implementation of the following measures:

1. Mandatory switch by the public to energy efficient fuel wood stoves and charcoal stoves;
2. The sales prohibition of inefficient fuel wood stoves and charcoal stoves;
3. The provision of incentives by the Government for switching to energy efficient stoves;
4. The standardization of upfront investment for energy efficient stoves with banks and SACCOs etc., to make it easy to install such stoves in all households with cash incomes;
5. The prohibition of three stone stoves with a limited grace period for poor and marginalized households; and

6. The promotion of biogas solutions, although this is unlikely to become the mainstream type of energy efficient stove in Uganda due inherent technological challenges.

3.7 Strategic option 6: Integrated wildfire management

3.7.1 Approach

This strategic option aims to address wildfires¹⁰ through integrated community-based fire management. The option is also supported by the Ugandan policy and legislation, including the Second National Development Plan (NDPII) and the National Biodiversity Strategy and Action Plan (NBSAP) 2015-2025. Many of the other SOs contribute to reduce wildfires (Climate smart agriculture, Restoration of natural forests in the landscape, etc.) and SOs should be implemented together to reduce wildfires most effectively.

Wildfire is a general term for any unplanned and uncontrolled fire in vegetation, which may require suppression response, or other action. Integrated fire management (IFM) includes the integration of science and fire management approaches with socio-economic elements at multiple level (FAO 2016). As such, it implies a holistic approach to addressing fire issues that consider biological, environmental, cultural, social, economic and political interactions.

The role of fire in the World's vegetation is ambivalent (FAO 2016). In some ecosystems, natural fires are essential to maintain ecosystem dynamics, biodiversity and productivity. Fire is also an important and widely used tool to meet land management goals. However, every year, wildfires destroy millions of hectares of forest woodlands and other vegetation, causing the loss of many human and animal lives and an immense economic damage, both in terms of resources destroyed and the costs of suppression. There are also impacts on society and the environment – for example, damage to human health from smoke, loss of biological diversity, release of carbon dioxide and other greenhouse gasses, damage to recreational values and much more. The land degradation caused by wildfires affects forage availability and has implications for the viability of livestock production and therefore the overall security of livelihoods of pastoral communities (IGAD 2015). The current and projected impacts of climate change, including rising temperatures and increasingly unpredictable precipitation patterns, further increase the risks of uncontrolled wildfires (WBG 2016).

¹⁰ Wildfires is used to mean both fires due to natural causes of ignitions (e.g. lightning sparks from rock falls, spontaneous combustion, volcanic eruption) and human-induced (e.g. arson, discarded cigarettes, hunters and grazers, power-line arcs)

3.7.2 Potential locations for implementation

- Drylands in the Northern region: fire management to improve pastures.
- Tree plantations in CFRs and on private land: fire protection.
- Traditional communities: traditional use of fire may remain but needs continuous monitoring.

3.7.3 Appraisal

The Strategic Option 6 comprises only one option, which is Integrated wildfire management. This calculation is conducted as a national level assessment that is focused on state and private timber and pole plantations, woodlands and bushlands. Grasslands have been omitted from the calculations as the financial analysis is conducted for the woody biomass only. Wood-related income figures are taken from strategic options 2, 3 and 4 assessed above (See Tables 6 and 7).

The timber plantations figures used are based on AFF (2011), NFA (2016), UTGA (2016) forest land inventory results on young forest stands where the average above ground biomass is 47.9 tons per hectare in hardwood plantations and 65 tons per hectare in softwood plantations. It was estimated that an average tree stand is about five years of age and it is likely that in case of wildfire around 80 % of the wood volume will either die or be burnt to ash. The investment costs and income were then assessed and it was concluded that given the loss in investments and the time period in the tree rotation the economic loss from wild fire would be between about USD 5,000-10,000/ha depending on the wood volume standing and whether the first thinning already had been performed. As an average figure for the financial calculations USD 7,000/ha loss was used for timber plantations.

For woodlands and bushlands (compiled by MAAIF 2015) the grass biomass was first subtracted away before conducting the financial calculations. For the tree volume on woodlands a value of USD 2,000/ha was calculated for the timber and poles lost. Here it was further calculated that 80 % of the trees would be dead, destroyed or even burnt to ash. For bushlands, the wood value was calculated based on a USD 70 per each fuelwood cubic meter and that 80 % would have been burnt to ash. For all forest lands, it was further calculated that this strategic option could have prevented 70 % of all wildfires on these forest and non-forest lands.

The district level investment needs would according to this financial analysis be around USD 119,748 while the national level programmatic cost for 25 years would be around USD 12 million. These sums are very low compared to the financial benefit of integrated wildfire management, which according to this analysis would be around USD 170.3 Billion. The marginal abatement costs for reducing wildfires by 70 % in Uganda are -27.2

and the MAC value when including also grasslands would be -24.9, which means highly efficient use of funds.

Table 7. Summary for Strategic Option 6: Integrated wildfire management

Indicators/ Components	Integrated wildfire management sub-option
Area (ha)	11,864,873 ha of plantations, woodlands and bushlands
Potential no. of beneficiaries	Calculation is for national level
District-level investments over 25 years	USD 119,747
Overall investment and programmatic level costs (MUSD) covered by the farmers	MUSD 13.8
Total project costs	Additionally, MWE and sectoral organization administration cost
Estimated emission abatement potential (tCO ₂) per ha over 25 years	368.6/ha (on average) over 25 years
Estimated emission abatement potential (MtCO ₂) overall	16,049 MtCO ₂
Hectare-level benefits NPV (USD) (10% discount over 25 years)	Approx. USD 7,000/ha in timber plantations; USD 2,200/ha on woodlands and some USD 70/m ³ of wood destroyed on various bushlands. Total benefit over 25 years USD Billion 170.3 for 70 % reduction of plantation fires, woodlands and bushlands where 80 % of woody vegetation is burnt. Grasslands excluded from calculation.
Average annual employment generated (full time equivalents)	115 wildfire experts on national and district level
MAC (10% inflation) USD/tCO ₂	-27.2 (when grasslands are excluded) and -24.9 (when grasslands also included)

3.7.4 Non-carbon benefits

Integrated wildfire management contributes to social benefits such as pastoral livelihood resilience, public respiratory health and security, and employment. Economic benefits are related to protection of assets, including properties, natural forests and tree plantations. Multiple environmental benefits, including contribution to biodiversity, are delivered and risks reduced.

3.7.5 Policy and legal appraisal

This strategic option aims to address wildfires through integrated community-based fire management. Section 2.2.5.1 paragraph 164 and Section 2.4.3 paragraph 292 of the National Development Plan II (2015-2020) single out wild fires as one of the major natural and human-induced disasters. Under Section 9.2 of the National Development Plan II (2015-2020) one of the Government strategies in dealing with wild fires is to support the decentralized environment management function at the Local Government level including enforcement of the bye-laws on wild fires.

Sections 35(1) and (2) of the National Forestry and Tree Planting Act (2003) provide that no person shall light or cause to be lit a fire in a forest, and that a person who contravenes this subsection commits an offence and is liable, on conviction, to imprisonment for a term not exceeding seven years.

Under Section 92 of the National Forestry and Tree Planting Act (2003), the Minister may make regulations for, among other things, the prohibition, control and management of fires.

Regulation 40(1) of the Forestry and Tree Planting Regulations (2014) prohibit the bringing into a forest, any articles or materials of inflammable or combustible nature. Under Regulation 40(3), a person shall not light a fire which may spread, damage or destroy a forest or part of it, and a person who contravenes this regulation commits an offence and is liable, on conviction, to imprisonment for a term not exceeding seven years.

Under Regulation 41(1) & (2) of the Forestry and Tree Planting Regulations (2014), the District Council is responsible for management of forest fires in the district, and shall appoint a District Forest Fire Management Committee for management of forest fires.

Under Regulation 42(1) of the Forestry and Tree Planting Regulations (2014), the functions of the District Forest Fire Management Committee, include the following: preventing and fighting forest fires; mobilising the people to fight a forest fire;

developing and implementing a fire drill exercise and sensitization; compilation of a list of potential fire fighters; and budgeting for prevention and fighting of forest fires.

Under Regulation 42(2) of the Forestry and Tree Planting Regulations (2014), the District Forest Fire Management Committee shall each year calculate forest fire indices and by notice declare a state of danger on the basis of the index in respect of an area within its jurisdiction and where there is a likelihood of a forest fire.

Under Regulation 42(5) of the Forestry and Tree Planting Regulations (2014), agencies in charge of managing forest reserves are still obligated to control and manage fire outbreaks.

Regulation 43(2) of the Forestry and Tree Planting Regulations (2014) provide for the establishment of forest fire management committee by a lower local government, with an obligation of each council to develop a forest fire management plan and budget.

Under Regulation 44 of the Forestry and Tree Planting Regulations (2014), District Fire Management Committee is mandated to regulate the burning of grass season.

Under Regulation 73(b) of the Forestry and Tree Planting Regulations (2014), owners of private forests are required to carry out fire-prevention plans as well as inform the District Fire Management Committee about forest fires.

The other relevant law in wildfire management is the Prohibition of Burning of Grass Act (Cap 33 Laws of Uganda). The Act prohibits the burning of grass by any person in all areas of Uganda. Under Section 3(1) of the Act, the burning of grass can only be carried out with the permission of a sub-county chief, and under the supervision of a parish or sub-parish chief. Under Section 3(2) of the Act in the case of the burning of grass in a forest reserve, the burning shall be carried out, or authorised in writing, by an officer of the forest authority not below the rank of a forest ranger. Section 5 of the Act creates exceptions to the general prohibition by allowing the burning of grass for purposes of: clearing a compound; clearing land for farming; cleaning a town or city; or making a fire break for protecting life or property.

In order for this strategic option to be realized, Government must implement the following measures under the current policy and legal framework:

- The strict enforcement of legal provisions relating to wildfire management, as set out in National Forestry and Tree Planting Act (2003); Forestry and Tree Planting Regulations (2014); and Prohibition of Burning of Grass Act (Cap 33 Laws of Uganda);

- Relevant government authorities in each district, county and sub-county must have required fire-fighting skills training and these persons must train as part of their work their lower level personnel and community members for fire-fighting;
- Fire towers and fire-fighting equipment must be established or located in core areas for fast access when needed;
- Penalties and fines must be enforced all over Uganda to raise awareness of wildfire hazards.

3.8. Strategic options 7: Livestock rearing in the Cattle Corridor

3.8.1. Approach

Figure 3 presents a picture for how livestock management has been incorporated into this national REDD+ programme. Five of the eight strategic options tackle issues related to livestock management in one way or another. The Strategic Option 7 *Livestock rearing in the Cattle Corridor* includes three sub-options:

- Sub-option 7.1. Change to exotic cattle varieties and crossbreeding
- Sub-option 7.2. Establishment of drinking water dams for livestock;
- Sub-option 7.3. Establishment of fodder agroforestry plantations.

The approach is cross-sectoral and contributes to several objectives of the National Agricultural Policy (2013).

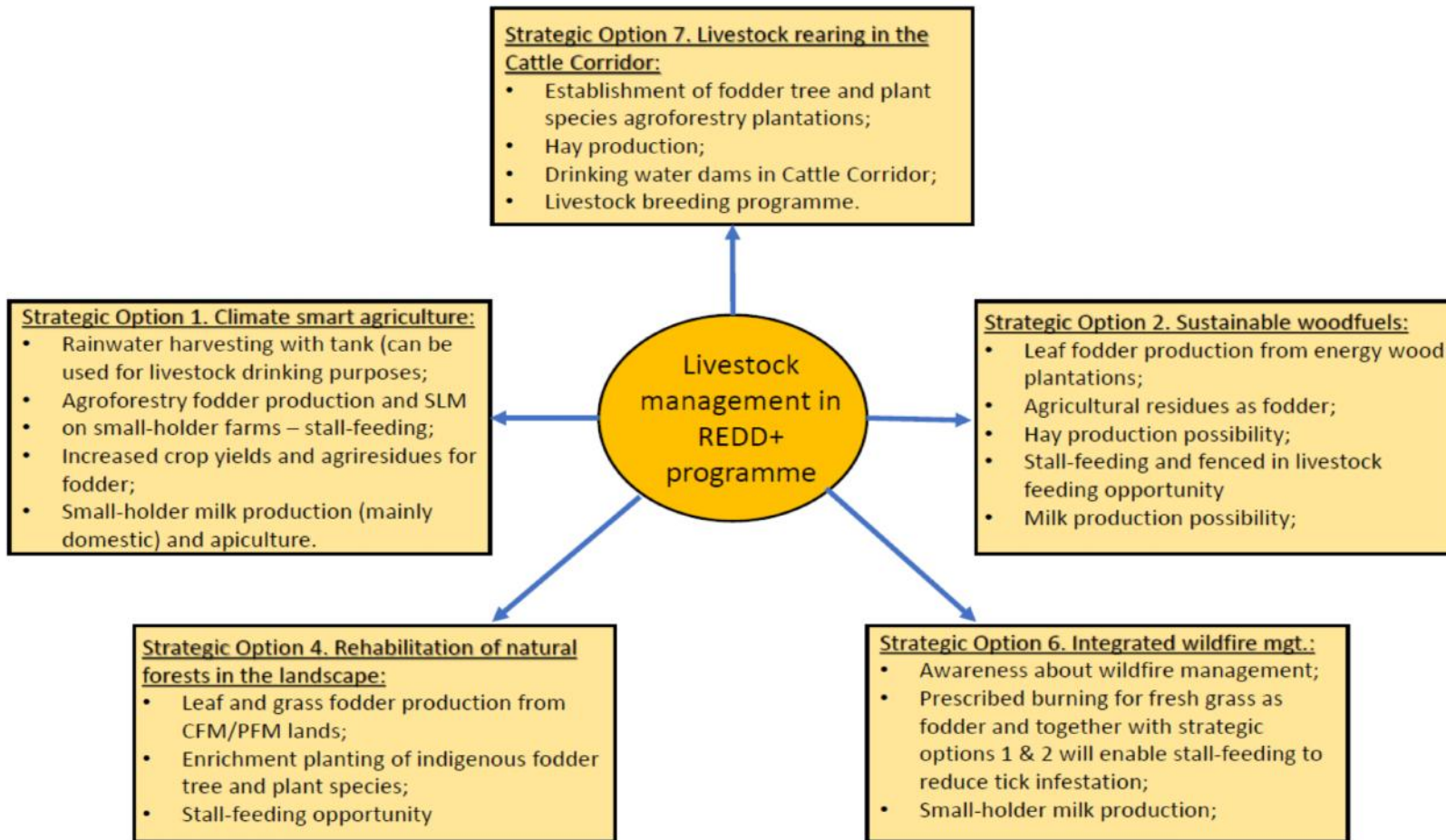


Figure 3. Overview of how livestock management issues are incorporated into the REDD+ programme.

3.8.2. Potential locations for implementation

The Strategic Option 7 on Livestock can be deployed all over in rural Uganda and to a certain degree also in peri-urban areas, but it has been decided to focus in this strategic option to the Cattle Corridor. Introducing fodder trees and stall-feeding practices requires that suitable tree species are selected according to the agro-ecological zones, considering issues such as altitude, mean annual rainfall, tolerance to frost, drainage and acidity of soil and feed quality.

Central and South-Western milk sheds together contribute 50 % of the total national production (DDA 2016). The other milk sheds or regions (particularly Eastern and Northern) experience a deficit of marketable milk almost throughout the year and are referred to as milk deficit areas while South-Western and Central regions continue to experience a surplus of marketable milk particularly in the wet season. Milk surplus and deficit milk sheds present differences in market opportunities for poor dairy farmers as well as service delivery to dairy farmers.

Reduction of extensive free-grazing of traditional livestock is needed in semi-humid and semi-arid areas. This area is commonly referred to as Cattle Corridor, which stretches across the country from the South-West (Ankole sub-region) to the northeast (Karamoja sub-region) encompassing 8.4 million ha (Stark 2011, p. 8). The characteristics of the Cattle Corridor include i) high rainfall variability; ii) periodic late onset rains/droughts; and iii) historical reliance on mobile pastoralism as an important strategy to cope with resource variability. The reduced availability of leguminous forage plants in the rangelands is limiting livestock growth, meat and milk yield from cattle.

In Karamoja sub-region, the ongoing conversion of rangelands to croplands has contributed to the shortage of forage (Egeru et al. 2014) which has caused a declining pastoral production system in addition to a complex range of other problems. These include historical injustices and marginalization, three and half decades of civil unrest, poor infrastructure, and a high climate variability with frequent drought periods (Egeru et al. 2015). Karamoja sub-region is estimated to have up to 2.7 million cattle representing one fifth of the national cattle herd.

3.8.3. Appraisal

Two of the three sub-options chosen for *Strategic Option 7 Livestock rearing in the Cattle Corridor* are completely non-carbon based and the third sub-option based on establishment of fodder agroforestry plantations which have by definition got huge leakage (i.e. most of it will be used immediately as fodder) and thus carbon emission reduction targets for Strategic Option 7 are not advisable. Further, as the envisioned operations are not targeting specific household's own lands specifically would

household financial analysis calculations be somewhat theoretical and therefore have only the budget costs accumulating from this strategic option been estimated (See Table 8).

The livestock population in Uganda is on one hand divided into a more modern livestock rearing system with stall-feeding or organized grazing in fenced in compounds, exotic breeds for milk and meat production (found in more developed districts in all regions of Uganda). On the other hand, there is also traditional free-grazing and pastoralism (the main livestock rearing system in the Cattle Corridor in all regions of Uganda and in Karamoja area of Northern Region). The main challenges for Uganda are excessive carbon and nitrogen emissions from cattle that stem from the traditional free-grazing livestock population in the Cattle Corridor including Karamoja.

Strategic Sub-option 7.1. "Change to exotic cattle varieties and cross-breeding: The change of traditional cattle to exotics and cross-breeding cattle is important as such cattle will produce substantially more milk and meat per animal, which makes a huge difference for the owners' own economy, while smaller herds may produce more than the previous traditional herds. With less animals, also the carrying capacity of the landscape will improve (Raymond 2013).

For the Strategic sub-option 7.1. there is a need to start up the programme with 40,000 indigenous cows and 775 improved bulls. As there already exists a population of exotic half-breed cows and exotic bulls in Uganda it should be explored whether these can be used first in the breeding operations before MAAIF start to import new ones. What this will cost depends on the quality of exotic bull semen, costs of importing exotic bulls and the artificial insemination costs that occur in Uganda. An estimate could perhaps be around 12 MUS\$.

Strategic Sub-option 7.2. Establishment of drinking water dams: A major problem in the Cattle Corridor is the availability of drinking water for the livestock population during the dry season. Several rivers running through the Cattle Corridor are seasonal. In order to arrange better availability of water for livestock and partly also for human consumption interventions such as building dams to trap surface water and drilling to utilize underground water are recommended. Through the years there have been inappropriate engineering and hydrological investigations which have led to badly designed dams and this has resulted in dam failures and excessive silting problems. A large majority of the over 900 dams and valley tanks which were built in the 1940s-1970s have outlived their usefulness mainly due to lack of maintenance (characteristic of the period of civil unrest of 1976-86). Destruction of the old livestock watering facilities has also been enhanced by the over-dense livestock populations at the few remaining facilities, which aggravates local soil erosion and eventual unwarranted silting of reservoirs.

It is estimated that the majority of the pastoral households are lacking water for domestic and livestock use. As a result, livestock have to cover long distances in search of water with all the associated health and productivity risks. The thirsty and weak animals therefore often even die without producing milk or meat for the livestock owner.

To alleviate the water shortage, it is envisaged that the REDD+ programme could support the construction and restoration of 12 drinking water dams and 60 valley tanks to hold a total of 2 million m³ of water. It is envisaged that water dams are the first priority to construct in locations where there is seasonal water available, while water tanks will be constructed in places without potential for water dams. Additionally, there is a need to provide 150 animal scoops for dam and tank maintenance and to train livestock keeping community persons how to manufacture and operate such animal scoops. The total costs for these operations are estimated to be around 14 MUSD.

Strategic Sub-option 7.3. Establishment of fodder agroforestry plantations. Zero-grazing and stall-feeding is an appropriate management system especially in Uganda where farmers own very small plots of land. Stall-feeding is especially suitable for dairy cattle. Milk may be used at home or dairy products are sold. Zero-grazing farms are reported to feed dairy cattle on elephant grass, forage legumes, fodder trees and agro-industrial by-products. Potential fodder tree species include several indigenous acacia species, *Faidherbia albida* and introduced species such as *Calliandra calothyrsus*, *Gliricidia sepium* and *Sesbania sesban*. Many of the fodder species are multipurpose trees like *Borassus aethiopum* which is reported also to increase the grain yield of finger millet (Egeru et al. 2015).

Another appropriate tree species is *Leucaena leucocephala*, native to meso-America but now naturalized throughout the tropics (Dinesh 2016a). Care must be taken not to choose an invasive and obscure variety of the species, though. The leaves of *Leucaena* are highly nutritious, and when fed as a supplement can increase meat and milk yield substantially, when compared with a low-quality baseline diet. *Leucaena* can increase productivity per animal considerably as well as resilience, with substantial impacts on income. At the same time, because the leaves improve the diet of ruminant livestock, the amount of methane produced by the animal per kg of meat and milk produced is substantially reduced. In addition, having trees such as *Leucaena* on the farm increases carbon sequestration in the soil.

Besides fodder trees there are tens of species of other woody or non-woody plants distributed in 31 genera that are commonly fed on by cattle in Kaliro District. The majority of these fodder species are grasses (19), but also herbs (10), shrubs including lianas (6), and one sedge are often being foraged on.

During the last years there have been seasonal variations in fodder availability in the Cattle Corridor. Fodder is abundant in the wet season, while it becomes scarce in the dry

season. The cattle can obtain a healthy look and gain weight in the wet season, while in the dry season, farmers have to herd their cattle, goats, and sheep to distant communal grazing fields or to lakeshore swamps. Even those farmers who normally rear animals by tethering turn to herding, while others feed their livestock on browse, i.e. branches and leaves of trees and shrubs, notably of the *Ficus* spp. Overall, it has become hard to find fodder for cattle because of reductions in grazing areas. Farmers have attributed the decline in pastoral area to several causes: (1) conversion of communal grazing lands to agricultural use, (2) shortening of fallow periods or absence of fallowing, and (3) weed invasion. The allocation of more land to crop agriculture to increase agricultural production and the shortening of fallow periods by farmers has made animal herding difficult, because animals stray into crop fields to eat cultivated grass crops, and this results in prosecution of the animal owners.

During the last years cows have been tethered by most cattle owners, and the other farmers herd their livestock in communal grazing fields or practice both tethering and grazing. In the past, cattle almost exclusively grazed. Tethering is a new phenomenon that has arisen as a response to pasture scarcity. Cattle are kept in fenced enclosures at night. The common grazing routine is to take cattle out to pasture early in the morning around 6 a.m. and bring them in at about 10 a.m. for milking, while the herdsman/farmer eats breakfast. Two hours later, they are returned to pasture until late evening around 7 p.m. They are milked once more in the evening.

This REDD+ sub-option aims at the establishment of agroforestry plantations with fodder tree species (in rows or in clusters) and seeding of the above-mentioned fodder grasses in between. It is foreseen that at least some 100,000 ha of such fodder agroforestry plantations should be established in the Cattle Corridor. The area can later be expanded as is seen needed. In order to keep the costs low it is recommended that MAAIF, DAR, NFA and other government authority organizations involved would provide various fodder grass seeds and fodder tree seedlings to livestock herding households in the Cattle Corridor. They would eventually plant and seed in those fodder plantations for their own benefit. The established agroforestry plantations can be both on state lands and on private farmer lands. Some kinds of grazing agreements for communities will be needed to secure that those who plant and seed the plantations will benefit from the grazing opportunity.

As 200 fast-growing fodder tree seedlings would cost maximum around 20 USD and a portion of grass seeds sufficient for one hectare would cost perhaps 5 USD or less the total establishment cost could be around 25 USD/ha with additional labour cost of the involved livestock herding households. Thereby, the overall concrete cost involved would be 2.5 MUSD in seeds and seedling costs, some supervision, training and transportation costs combined with livestock owner households' own labour inputs and a total of 3 MUSD could possibly be sufficient (see Table 28).

The established fodder agroforestry plantations must be closed from livestock free-grazing during at least two years, but the livestock herders can harvest it as hay after the grasses have matured (i.e. after the grasses have matured and reseeded themselves), which can be then collected for the livestock in dry season. Also, some branches of fodder trees may be cut and used as stall-feeding fodder.

It is further worth to remember that other fodder production opportunities are envisaged to be integrated with Strategic Option 1 (Climate Smart Agriculture) and Strategic Option 2 (Sustainable Fuelwood and Charcoal Use) which both have incorporated livestock fodder cultivation alongside both crop cultivation and bioenergy tree plantations. There can also be fodder production also under Strategic Option 4. Data and information has been incorporated for the analysis from the following main sources: ADF, 2002, USAID (2011), Raymond (2013), and MAAIF (2015).

Table 8. Summary for Strategic Option 7: Livestock management

Indicators/ Components	Change to exotic cattle varieties and crossbreeding	Establishment of fodder agroforestry plantations	Establishment of drinking water dams
Production efficiency increase in livestock rearing	Milk production may be 300-1000 % higher than with local cattle races. Meat production 200-300 % higher as well.	Large number of livestock would be starving in the dry season without such plantations	Large number of livestock are in serious thirst in the dry season without such dams
Farm-level investments per cow	Cost of artificial insemination in Kenya is around USD 104.	Approximately 25 USD per hectare plus own labour cost	The water dams will serve larger areas
Overall investment and programmatic level costs (MUSD) covered by the farmers	Initial investment in artificial insemination of 40,000 cows would be around 4.2 MUSD	Approximately 2.5 MUSD for 75,000 ha if livestock owners conduct seeding and planting as own labour cost.	The costs will mainly be covered by government authority organizations.
Total project costs	Initial investment in artificial insemination programme will be 12 MUSD over 10 years, but the programme should be expanded later.	Approximately 3 MUSD over ten years	Approximately 14 MUSD over ten years
Estimated emission abatement potential (tCO₂) per ha over 25 years	Good cattle races have also efficient digestive functions and produces therefore also lower emissions per feed intake.	As both seeded grasses and planted fodder tree seedlings will be used as fodder almost instantly is carbon not calculated.	Difficult to calculate as there are no direct carbon emission reduction aims with this sub-option.

Household-level benefits NPV (USD) (10% discount over 25 years)	Several 100% higher.	High importance for drought affected households.	High importance for drought affected households.
Average annual employment generated (full time equivalents)	New jobs around 1,000 or so in AI business. In Kenya this mainly private business is a USD 11 million annual turnover.	This sub-option will boost livestock meat and milk production thus expanding the sector creating new jobs.	This sub-option will boost livestock meat and milk production thus expanding the sector creating new jobs.
MAC (10% inflation) USD/tCO2	not calculated	not calculated	not calculated

3.8.4 Non-carbon benefits

The livestock intensification improves grazing, feed and manure management (Dinesh 2016). Improving efficiency through direct breeding for better performance is also a co-benefit opportunity. Increasing the number of trees on farms and in the landscape not only provides important ecosystem services but also leads to a direct increase in income through diversification of products and greater resilience to climate shocks. Fodder trees not only increase soil carbon pool, but also improve soil fertility and contribute to higher biodiversity. In drylands, increased tree canopy protects crops from harsh sunshine and winds. Zero-grazing and stall-feeding decreases crop damage of livestock, and lowers the potential for conflicts. Compared to extensive free grazing, stall-feeding allows more youth to engage in schooling, which is crucial when transforming the Ugandan society from a peasant society to a modern and prosperous country.

3.8.5 Policy and legal appraisal

The National Development Plan II (2015-2020) (NDP II) recognizes the importance of livestock farming to agricultural production. In order to promote livestock farming, NDP II makes provision for several investments, including; water systems for livestock consumption; livestock diseases control; improvement in the quality and stock of storage facilities for livestock; and value addition for livestock products (milk, yogurt, and cheese) (see Section 6.2).

Under Section 3.2 Objective 2 paragraphs 23 (v) of the Agriculture Policy (2013), the Government will encourage and promote dry season livestock feeding through pasture preservation and other feeding practices. Under Section 3.2 Objective 4 paragraphs 25 (ii) of the Agriculture Policy (2013), the Government will ensure the development,

maintenance and improvement of physical agricultural market infrastructure at strategic locations, including livestock markets and abattoirs.

Under policy statement number 4.1.1 of the Draft Rangeland Management and Pastoralism Policy (2014), several strategies for improving livestock feed and water resources development are set out, including: identifying livestock corridors to facilitate the right of entry to designated pastoral resources especially where access would support optimal stocking rates and prevent conflicts; regulating cross-border pastoral migration by supervising international corridors; allowing livestock access to grazing in seasonal wetlands in rangelands without conflicts with the users and community authorities; introducing technologies to enable agro-pastoralists produce and store rain-fed fodder; popularizing the utilization of alternative feed resources; supporting studies to understand pastoralists' breeding and selection strategies; and documenting and increasing the awareness about indigenous knowledge related to human and ethno-vet medicinal plants. Under policy statement number 4.1.9 of the Draft Rangeland Management and Pastoralism Policy (2014), the Government will encourage pastoralist and agro-pastoralist livestock keepers to rear genetically adapted but better yielding animals to reduce overstocking.

Under Section 3.3.1 1 of the Uganda Strategic Investment Framework for Sustainable Land Management (2010-2020), the Government will promote water supply to pastoral communities by promoting construction of rainwater harvesting ferro-cement tanks for homes and institutions. Valley tanks and check dams will be constructed to harvest runoff from roads, large rocks, etc. to provide water for domestic and livestock use. Small scale irrigation practices will be promoted through demonstrations on water / run-off harvested and harnessing of water from permanent and semi-permanent sources.

Since this strategic option is closely linked to 'Strategic Option 1: Climate-smart agriculture', the implementation measures outlined in SO1 are adopted for its effective implementation. In addition to the measures outlined in SO1, it will be necessary for the Government to adopt the Draft Rangeland Management and Pastoralism Policy (2014) and implement strategies therein. The policies and strategies outlined in the above policies and laws must be enforced in order for this strategic option to be realized.

3.9 Strategic Option 8: Strengthen Policy Implementation for REDD+

3.9.1 Approach

Inadequate implementation of policies and enforcement of laws are some of the factors that will negatively impact REDD+ implementation. This strategic option outlines a number of activities through which REDD+ policy implementation can be improved. In order to promote policy implementation in all the sectors that are relevant to REDD+

implementation, it will be necessary for Government to adopt the following key measures:

- The Policy Implementation Monitoring Unit under the Office of the Prime Minister (OPM) shall identify REDD+ implementation as one of the focus areas, and ensure that REDD+ related policies and laws are implemented by the responsible Ministries, Departments and Agencies (MDAs) including the local governments. To this end, the Unit shall put in place a monitoring and evaluation strategy tailored for REDD+ implementation through which relevant policies and laws will be periodically monitored, and implementation bottlenecks regularly addressed;
- The Policy Implementation Monitoring Unit under the Office of the Prime Minister (OPM) shall ensure that all Ministries, Departments and Agencies (MDAs) and local governments draft implementation plans of the various REDD+ policies and laws. Such plans shall identify priority programmes and their budgets as well as the sources of funding to facilitate the implementation of REDD+ policies and laws (Tumushabe, G., Muhumuza, T., Natamba, E., Bird, N., Welham, B., and Jones, L., 2013). These plans shall also identify the required subsidiary legislation such as ordinances and by-laws and plan for their formulation to facilitate implementation of REDD+ policies and laws at the local level;
- The Government through the Ministry of Finance, Planning and Economic Development shall provide financing for REDD+ policy implementation. Most of the REDD+ policies and laws are not implemented due to lack of adequate finance. The starting point is to ensure that adequate finance is provided to enable REDD+ policy implementation across all the relevant sectors by the responsible Ministries, Departments and Agencies (MDAs) including local governments. The already existing sector working groups (SWGs) shall identify and cost REDD+ policy implementation as an expenditure priority. In order to ensure that this done, there must be concerted advocacy to this effect, from a wide range of actors including the line Ministry, civil society, and the private sector. Since REDD+ implementation must compete for resources with other national priorities and plans, there must be a clear articulation why the Government should inject financial resources into REDD+ implementation; and
- The Government shall ensure that institutions responsible for REDD+ implementation including local governments are adequately staffed.
- To strengthen the implementation of relevant policies it is further recommended that each civil servant in the government authorities involved in REDD+ implementation will attend some training courses. For the training events at the

national level, the teachers/trainers of the courses could preferably be external or even international specialists, while for subnational levels the teachers/trainers could be civil servants from the national level, who have first attended these training events themselves. Recommended topics for training are at least the following ones:

- Good governance and efficient anti-corruption practices;
 - Administration skills needed in enhancing competences of civil servants;
 - Monitoring and evaluation of government operated projects and programmes;
 - Social skills in dealing with rural communities and various other external stakeholders.
- Government shall further strengthen and support civil society organizations and engage private sector to promote responsible forest management, develop new forest investment opportunities.

Even though a part of SO8 is best coordinated by OPM it is still recommended that the leader organization for this strategic option is FSSD as this strategic option concerns the strengthening of all strategic options through capacity building and best practices to be used throughout the REDD+ programme.

To ensure best possible outcome in SO8 it is proposed that outside consultants (international or national) would be contracted to train core ministerial personnel and local and/or intra-ministerial trainers on some of the core topics (i.e. anti-corruption measures and enforcement, good governance and policy enforcement). This could be incorporated in the provided budget.

3.9.2 Potential locations for implementation

Cross the country from the national to the county level including all relevant ministries and institutions.

3.9.3. Appraisal

Budget: 2 Million USD for first 5 years and 3 Million USD for the following 20 years.

3.9.4 Non-carbon benefits

Reduced poverty, improved livelihoods, good health and well-being, gender equality, clean water, affordable and clean energy, decent work and economic growth, sustainable industrialization, reduced inequalities, sustainable cities and communities, sustainable production and consumption patterns, prevented desertification, reversed land degradation, stopped diversity losses, effective, accountable and inclusive institutions, and stronger global partnerships for sustainable development.

3.9.5 Policy and legal appraisal

The complete list of analysed policies and laws with proposals for changes can be found in Annex2.

3.10 Discussion on strategic options

All the final strategic options with their respective sub-options have been summarized in Table 9 below. The first six of the final strategic options were developed so that they all have negative marginal carbon abatement cost coefficients, which means that they are cost efficient. Ultimately the amount of carbon that will be abated upon implementation of the respective strategic option, for the period of 25 years ranged from 3.6 to 16,049 MtCO₂eq tons depending on the content and aim of each strategic option. Cost efficiency means that these activities will be financially viable and their beneficiaries will generate surplus income from their investment, even in the absence of carbon financing in the investment plans.

Strategic option 7 does not have a set carbon mitigation target as the carbon mitigation target for livestock management has been included in scope of other strategic options. Even the strategic sub-option 7.3 *Establishment of agroforestry fodder plantations* focus on annual fodder production, which means that most carbon sequestration will be used as fodder for livestock and is therefore not available for carbon trading. The Strategic Option 8 is an over-arching option as it strives to increase the efficiency of the others, while it is not bringing additional direct carbon emission reduction impacts by itself.

The respective beneficiaries for each strategic option and its sub-options are described in the text for each strategic option separately, but the governmental bodies involved in

these strategic options may not directly benefit from their investments in cash. However, indirectly they will get forest lands and their biodiversity restored, higher yields from agriculture, reduced energy demand gap, and so forth.

Some of the sub-options have low initial investment needs of below USD 100 per households as indicated in the third column of Table 9. A few more activities need initial investments between USD 100 –1,000 while the most expensive activities would require up to USD 1,500. Strategically, the activities with the lowest initial investments could potentially be targeted by all rural households, although in some cases also peri-urban and urban households could benefit from them, as is the case with Energy Efficient Stoves (EES) and Improved Cooking Stoves (ICS). Government of Uganda (GoU) shall consider these options as a visionary ladder where cheap options are for the poorest households which, as they become wealthier (towards Vision 2040) and move up the ladder, are able to afford more expensive investment options and thereby less reliant on the natural forest for wood/biomass extraction.

To ensure that implementation of the strategic options and activities does not trigger any negative environmental or social impacts or consequences, SESA has recommended the measures for integrating social and environmental issues in the design and implementation of the REDD+ Strategy action. The environmental- and social impacts, and related risks of the proposed strategic options have been presented in Annexes 3 and 4. These tables can be applied during the appraisal of strategic option related project design and during monitoring the implementation of the projects.

Table 9. Financial analysis results for the 8 strategic options

Strategic option action:	NPV gain 10% for 25 yrs/unit	Cash upfront investment need	tCO2/ha tCO2/hh	Total no. of HHs	Total Ha or units	Total MtCO2	MAC 10% USD/tCO2e
<i>Strategic option 1: Climate smart agriculture:</i>							
SSO 1.1: SLM & agroforestry practices * traditional agriculture	USD 2,817.7 USD 667.2	USD 5 (+76/yr) USD 76/year	94	2,382,357	2,382,357	224	-30
SSO 1.2: RWH with collection tank & drip irrigation	USD 4,740	USD 1,485 or USD 931	151	1,949,053	1,949,053	294 on top of previous	-25.2
SSO1.3: Green house cult. Plastic sheet * or with shade net	USD 15,861.3	USD 1,449 USD 1,121		100,000 HHs to benefit	649,684	53	-193.4
<i>Strategic option 2: Sust. Fuelwood & charcoal prod.</i>							
SSO 2.1: Commercial small-holder & community bioenergy woodlots	USD 10,252	USD 162+60	700	866,246	866,246	607	-16.9
SSO2.2: Commercial small-holder and community poles and timber plantations	USD 14,648	USD 1,235.9	443	108,281	108,281	479	-33.1
SSO 2.3: Improved charcoal kilns linked to bioenergy woodlots	USD 10,000	USD 1,400 or USD 160	802		100,000 kilns	695	-277.8
<i>Strategic option 3: Large-scale commercial plantations</i>							
SSO 3.1: Pole/timber plantation	USD 10,890	USD 892	729.3		40,000	18.2	-14.9
SSO3.2: Pole/sawlog plantation	USD 13,201	USD 934	445.7		30,000	13.4	-29.6
SSO3.3: Improved charcoal kiln linked to plantation sites	USD 17,000 or USD 32,000	USD 1,400	548.7		15,000 kilns	8.2	-31.0 -58.3
<i>Strategic option 4:</i>							

Restoration of nat. Forest landscape							
SSO 4.1: Designated areas for natural forest regeneration	USD 4,784.5	USD 7 &over-all USD 132.5	300.0	100,000 HHs to benefit 100,000 HHs	100,000	3,0	-16.0
SSO4.2: Restoration of degraded protected natural forest	USD 6,067.3	USD 51 &over all USD 214.3	581.6	26.2 to benefit	100,000	58,1	THFs at -10.4 Woodlands at -722
SSO4.3: Devolution through PFM and similar	Linked to	above options				2,6	
SSO 4.4: Traditional for. Mgt. Practices	Linked to	above options					
Strategic option 5: Energy efficient cooking stoves							
SSO 5.1: Fuelwood energy eff. stoves	USD 1,086	USD 22,4/3yrs	22.2	3,405,625		11,405	-48.9
and per institutions	USD 20,296	USD 200/3yrs	150.6		18,904 inst.	403	-134.8
SSO 5.2: Improved charcoal stoves	USD 374	USD 10/3yrs	35.8	2,264,564		1,324	-10.4
and per institutions	USD 7,075	USD 150/3yrs	668.1		41,076 inst.	448	-106
Strategic option 6: Integrated wildfire management							
SSO 6.1: Integrated wildfire mgt. Overall and without grasslands	USD 170 Billion	MUSD 12	368.6		11,864,873	16,049	-24.9 -27.3
Strategic option 7: Livestock rearing in the Cattle Corridor							
SSO 7.1. to 7.3.	n.a.	MUSD 29	n.a.	n.a.	n.a.	n.a.	n.a.
Strategic option 8: Strengthening policy enforcement for REDD+							
	n.a.	MUSD 2	n.a.	n.a.	n.a.	n.a.	n.a.
Total CO₂eq emissions in MTCO₂eq in 25 years						31,654	

4. Institutional arrangements for REDD+ programme implementation

4.1 Overall implementation strategy

The REDD+ Strategy implementation is a multiyear undertaking with long-term commitments to programmes and investments at national and subnational levels, within and outside protected areas.

The over-all implementation strategy for the Uganda's REDD+ Strategy emphasizes institutionalizing the implementation into national institutions responsible for the respective options of tackling drivers and underlying causes of deforestation and forest degradation, and other arrangements that render the implementation integrated into other conservation and land use policies and practices encompassing, agriculture, energy, livestock, rural development programmes and activities within the country. One additional strategic component is emphasizing capacity and skills transfer to ensure sustainability of the REDD+ investments. Uganda's implementation strategies take into account the international guidelines and best practices that are suitable to Uganda's policy environment and other national circumstances such as institutional arrangements for decentralization, natural resources management and socio-economic development. International as well national policies and safeguards will be fully complied and measures for mitigating possible social, economic negative impacts will be designed and implemented concurrently (See Annexes 3 and 4). Lastly, implementation will promote cost-effective measures to realize optimal and equitable benefits from the REDD+ investments (refer to BSA study 2017 by Indufor).

4.2 National level arrangements for REDD+ implementation

The Strategic Options 1-8 cut across several economic sectors (forestry, environment, energy, agriculture, wildlife, land), and therefore a strong mechanism of sectoral coordination and provision of incentives need to be put in place. MWE is the lead institution for the overall implementation and coordination. MWE will function through FSSD, NFA, DWD and DWRM. FSSD will provide technical and coordination responsibility on behalf of MWE. MWE will collaborate with UWA (forests in wildlife conservation areas, wildfires), MAAIF (CSA and livestock rearing), MEMD (Sustainable fuel wood utilization, Energy Efficiency technologies), the MOLG District Departments (Local Forest Reserves, Forest outside protected areas, CSA, Sustainable fuel wood and commercial charcoal production, Energy efficient cooking stoves, Integrated wildfire management).

The detailed institutional roles are outlined in Table 10. In accordance with this institutional outline the Lead implementer for the Ugandan national REDD+ programme will be the Ministry for Water and Environment (MWE) and more specifically its Forest Sector Support Department (FSSD). The REDD+ Technical Coordination Unit will be hosted at MWE/FSSD and the overall implementation responsibility for all eight strategic options will be held there. The general national institution responsibilities are outlined in Table 11. Table 12 further elaborates involvement of the core organizations in the Ugandan REDD+ programme and each over-arching coordination role for the strategic options is highlighted.

4.2.1 Ministry of Water and Environment (MWE)

The overall mandate of MWE/FSSD is management of forest resources in the country. In the REDD+ implementation its role will be to be responsible for sustainable forest and woodland management interventions and activities; implementation of National Forestry Policy and National Forest Plan; provide advice and support to define policies, standards and regulations for the forestry sector; oversees NFA and NEMA activities.

4.2.2 Ministry of Agriculture Animal Industry and Fisheries (MAAIF)

The overall mandate of MAAIF is to support, promote and guide the production of crops, livestock and fish, while ensuring sustainable use of ecosystem services. In the REDD+ context its role will be to lead the implementation of national policies on agriculture, livestock and rangeland management; provide technical assistance to districts on sustainable agricultural management; promote sustainable utilization of NRs for agricultural production; National Focal Point for UN Convention to Combat Desertification (UNCCD); collaborate with other sector institutions and programs in implementation of NAP to combat desertification; oversee NAADS and NARO - semi autonomous bodies.

4.2.3 Ministry of Energy and Mineral Development (MEMD)

The overall mandate of MEMD will be 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. In the REDD+ context its role will be to implement a National Energy Policy; and formulate appropriate energy policies; develop and disseminate energy conservation technologies; provide technical support in activities related to renewable energy; provide data in renewable energy development, use and trends; coordination of plans and activities of LGs in relation to energy; and provide necessary technical assistance.

4.2.4 The Office of the Prime Minister (OPM)

In a REDD+ context the OPM's role will be to supervise the implementation of the eight main REDD+ strategic options involving refugees in REDD+ activities with a special grant funded budget earmarked for this purpose. However, the actual field operations will be conducted by the respective national strategic option coordinators and the districts.

4.2.5 Ministry of Gender, Labour and Social Development (MoGLSD)

In the REDD+ context the MOGLSD's role will supervise the implementation of the eight main REDD+ strategic options vis-à-vis gender issues and ethnic minority group involvement in REDD+ activities at national level while the actual field operations will be conducted by the respective national strategic option coordinators and the districts.

4.2.6 Ministry of Tourism, Wildlife and Antiquities (MTWA)

This Ministry is supervising Uganda Wildlife Authority (UWA) that is responsible for the management and ecotourism of national parks and protected areas. In the REDD+ context the UWA will be responsible for implementation of Strategic Option 4 (Restoration of natural forests) and Strategic Option 6 (Integrated wildfire management) in national parks and protected areas under its mandate.

4.2.7 Ministry of Local Governance (MOLG)

This Ministry operates only at district and lower levels of government administration. There are several departments of importance at lower governance levels: Department of Forest Services/Department of Natural Resources; Department of Production; Department of Animal Resources; and Department of Social Development.

In the REDD+ context MOLG and its districts are of crucial importance in all the Strategic Options 1-8. The districts manage local Forest Reserves, supervises forests on private land and conduct both forest and renewable energy extension. The Department of Production coordinates all agricultural operations while the Department of Animal Resources coordinates livestock issues. The Department of Social Development with its county level Community Development Officers are particularly important in coordinating the involvement of refugees, ethnic minorities and marginalized people in Strategic Options 1-8.

4.2.8 State service provider bodies

Besides the above mentioned main REDD+ strategic option coordination bodies, there are five state service provider bodies in the national scope. One of these is a carbon trading body to be identified, which will be trying to develop and support carbon trading operations based on Strategic Option 3 (on large-scale pole and timber plantations). The other governmental service provider is the Uganda Bureau of Statistics (UBOS), which should be up-scaling its national survey operations to support the annual monitoring of the strategic options and, in particular, the non-carbon related operations of the strategic option activities.

All the three remaining bodies are research related bodies – namely the National Agriculture Research Organization (NARO), the National Forestry Research Institute (NAFORRI) as its special entity and lastly the Ugandan academia. Their research topics are indicated in Table 12. Additionally, these three research bodies can also support REDD+ operations at ground level but without earmarked funding. However, funding can be found/taken, for instance, in/from the service provider budget.

Table 10. Lead institutions and collaborator for the strategic option implementation.

Option	Activity	Lead institutions	Collaborating institutions
<i>SO1. Climate smart agriculture</i>	<i>SLM and agroforestry practices</i>	<i>MAAIF, Districts (DP, DFS/DNR & DSD). NARO, NAFFORI</i>	<i>CSO/NGO</i>
	<i>Rainwater harvesting with collection tank and drip irrigation</i>	<i>MAAIF, Districts (DP & DSD)</i>	<i>DWD CSO/NGO</i>
	<i>Greenhouse cultivation of vegetables</i>	<i>MAAIF, Districts (DP & DSD), NARO</i>	<i>CSO/NGO</i>
<i>SO 2. Sustainable fuel wood and (commercial) charcoal production</i>	<i>Commercial small-holder and community bioenergy woodlots</i>	<i>MEMD, Districts (DP, DFS/DNR & DSD), Private Land Owners</i>	<i>CSO/NGO</i>
	<i>Commercial small-holder and community pole and timber plantations</i>	<i>Districts (DP, DFS/DNR & DSD), Private Land Owners</i>	<i>CSO/NGO</i>
	<i>Improved charcoal kilns linked to bioenergy woodlots</i>	<i>MEMD, Districts (DFS/DNR & DSD), Private Sector</i>	<i>CSO/NGO</i>
<i>SO 3. Large-scale commercial timber plantations</i>	<i>Commercial fast-growing transmission pole and timber plantation</i>	<i>NFA, Districts (DFS/DNR & DSD), Private Land Owners</i>	
	<i>Commercial fast-growing pole and saw log plantation</i>	<i>NFA, Districts (DFS/DNR & DSD), Private Land Owners</i>	
	<i>Improved charcoal kilns linked to plantation sites</i>	<i>Private Sector</i>	
<i>SO 4. Restoration of natural forests in the landscape:</i>	<i>Designated areas for natural forest regeneration</i>	<i>NFA, UWA, Districts (DFS/DNR & DSD), Private large land owners</i>	<i>CSO/NGO</i>
	<i>Protected natural forest management (i.e. national parks and forest reserves)</i>	<i>NFA, UWA, Districts (DFS/DNR & DSD)</i>	<i>CSO/NGO</i>
	<i>Devolution of forest management through Participatory Forest Management and similar set-ups</i>	<i>NFA, UWA, Districts (DFS/DNR & DSD)</i>	<i>CSO/NGO</i>

	<i>Traditional/customary forest management practices</i>	<i>District (DFS/DNR & DSD)</i> <i>Cultural Institutions, Community</i>	<i>CSO/NGO</i>
<i>SO 5. Energy efficient cooking stoves</i>	<i>For fuel wood</i>	<i>MEMD, FSSD, Districts (DFS/DNR & DSD)</i>	<i>CSO/NGO</i>
	<i>For charcoal</i>	<i>MEMD, FSSD, Districts (DFS/DNR & DSD)</i>	<i>CSO/NGO</i>
<i>SO 6. Integrated wildfire management</i>	<i>In timber plantations</i>	<i>Private Land owner/Plantation Owners, NFA</i>	
	<i>On woodlands</i>	<i>Districts (DFS/DNR & DSD), UWA, NFA</i>	
	<i>On bush lands</i>	<i>Districts (DFS/DNR & CDO), UWA, NFA</i>	
	<i>On grasslands</i>	<i>Districts (DFS/DNR & DSD). UWA, NFA</i>	
<i>SO 7. Livestock rearing in Cattle Corridor</i>	<i>Breeding programme</i>	<i>MAAIF/DAR, NGBC, districts</i> <i>Commercial livestock farmers</i>	<i>CSO/NGO</i>
	<i>Establishment of fodder agroforestry plantations</i>	<i>Districts (DFS/DNR & DSD), NFA, Uganda Seeds Ltd. Commercial livestock farmers</i>	<i>CSO/NGO</i>
	<i>Establishment of water dams</i>	<i>DWD</i>	<i>CWUAs</i>
<i>SO 8. Strengthening of policy implementation for REDD+:</i>	<i>Strengthening of policy enforcement in REDD+ implementation</i>	<i>MWE, NFA, UWA, FSSD, Districts</i>	<i>CSO/NGO, Private Sector</i>
	<i>Strengthening civil society organizations and engage private sector to promote responsible forest management, develop new forest investment opportunities</i>	<i>NFA, UWA, FSSD, Districts</i>	
	<i>Good governance of natural resources/ forests (community-based institutions and strengthening of government agencies</i>	<i>MWE, NFA, UWA, FSSD, Districts</i>	<i>CSO/NGO</i>

Table 11. Roles and responsibilities of the core implementing organizations.

Organizations	Responsibility
<i>NCCAC (National Climate Change Advisory Committee)</i>	<i>Policy Coordination and Harmonisation</i>
<i>WESWG (Water and Environment Sector Working Group)</i>	<i>Coordination within the Sector Budgeting and resources allocation Reporting and information sharing Mobilizing donor support</i>
<i>MWE</i>	<i>Over-all implementation and coordination Budgeting and resource mobilization Monitoring and Evaluation Reporting Policy standards, regulation</i>
<i>NFA</i>	<i>Management of Central Forest Reserves Forest monitoring and data management GHG monitoring and reporting Technical support to Districts Plantation development Provision of quality seed and planting materials</i>
<i>UWA</i>	<i>Management of Wildlife Conservation Areas Wild fire management Promote scientific research and knowledge of wildlife and wildlife conservation areas</i>
<i>FSSD</i>	<i>REDD+ Strategy implementation coordination Mobilizing technical support Monitoring forest policy implementation Forest regulation and standards setting Stakeholder coordination Technical support to Districts</i>
<i>MAAIF</i>	<i>Agriculture and land use Irrigation Trees on Farm Livestock development</i>
<i>MEMD</i>	<i>Energy development Energy efficient technologies</i>
<i>OPM (Office of the Prime Minister)</i>	<i>Coordination of refugee involvement in all strategic option activities at national level</i>
<i>MoGLSD (Ministry of Gender, Labour and Social Development)</i>	<i>Coordination of ethnic minority and marginalized group involvement in all strategic option activities at national level</i>
<i>NARO/NaFFORI/Academia</i>	<i>Research Technology Development and dissemination</i>
<i>MOLG/ District Local Governance</i>	<i>Local Forest Reserves protection Climate Smart Agriculture Irrigation</i>

	<p><i>Energy development</i></p> <p><i>Energy efficient technologies</i></p> <p><i>Wild fire management</i></p> <p><i>Extension services</i></p> <p><i>Community development / mobilisation</i></p> <p><i>Gender</i></p> <p><i>Formulation of bylaws</i></p>
<i>CSO</i>	<p><i>Stakeholder mobilization and engagement</i></p> <p><i>CSA extension and activities</i></p> <p><i>Community agroforestry extension and activities</i></p> <p><i>Energy development and energy use efficiency</i></p> <p><i>Participatory forestry management</i></p> <p><i>Livestock management</i></p> <p><i>Policy implementation (watch dog) and reporting</i></p>
<i>Private Sector</i>	<p><i>Forest utilization, value addition</i></p> <p><i>Plantation development</i></p> <p><i>Restoration of natural forest (land owners)</i></p>

Table 12. National institutional responsibilities explicitly for the REDD+ National Strategy activities.

Institution	Strategic Option 1	Strategic Option 2	Strategic Option 3	Strategic Option 4	Strategic Option 5	Strategic Option 6	Strategic Option 7	Strategic Option 8
Overall and national coordinators of REDD+ strategic option activities								
MWE /FSSD	Overall nat. coordination & communication = crosscutting issues	Overall nat. coordination & communication	Overall nat. coordination & communication; National forestry policy formulation & development; Overseeing NFA, NEMA and District Forest Departments Reporting to UNFCCC and other international obligations	Overall nat. coordination & communication; National forestry policy formulation & development; Overseeing NFA, FSSD, District Forest Departments	Overall nat. coordination & communication	Overall nat. coordination & communication; National forestry policy formulation & development; Overseeing NFA, NEMA and District Forest Departments + Districts/local governments	Overall nat. coordination & communication	Overall nat. coordination & communication National coordination of SO 8;
NFA	District tree nursery supervision and mgt.; Distribution of quality tree seeds and seedlings;	District tree nursery supervision and mgt.; Distribution of quality tree seeds and seedlings; Supervision of pole and timber markets;	National coordination of SO 3; Use of national forest data & inventories in validating strategic options in junction with FREL over 25 years National seed	National coordination of SO 4; Use of national forest data & inventories in validating strategic options in junction with FREL over 25 years CFM & PFM		National coordination & district and local coordination of SO 6 National satellite survey of wildfires to validate strategic option 6 in junction		Law enforcement Monitoring Private sector engagement

Institution	Strategic Option 1	Strategic Option 2	Strategic Option 3	Strategic Option 4	Strategic Option 5	Strategic Option 6	Strategic Option 7	Strategic Option 8
			imports; National & district and private tree nursery supervision and mgt; Supervision of pole and timber markets;	agreements, their supervision and boundaries demarcation		with FREL. More extensive than currently conducted		
UWA				Management of natural forest in wildlife conservation areas		In national parks and protected areas under its mandate		Enforcement in forests in Wildlife conservation areas
Districts	District level coordination /implementation	District level coordination /implementation	District level coordination /implementation	Local Forest Reserve and natural forest on private/communal land	District level coordination /implementation	District level coordination /implementation	District level coordination /implementation	District level coordination /implementation
MAAIF (and DAR)	National coordination of SO 1; Distribution of quality crop seeds and seedlings;	National coordination of SO 2; Distribution of quality crop seeds and seedlings;					National coordination of SO 7; National breeding programme	
MEMD		Supervision of energy wood commercial production and	Supervision of energy wood commercial production and		National coordination of SO 3; Partner at			

Institution	Strategic Option 1	Strategic Option 2	Strategic Option 3	Strategic Option 4	Strategic Option 5	Strategic Option 6	Strategic Option 7	Strategic Option 8
		markets; Supervision of charcoal producers' association;	markets; Supervision of charcoal producers' association;		District and local level operations;			
Other national level service providers								
A carbon trading partner organization (to be identified)			Partner in SO 3 at national, district and local levels; Expertise on carbon trading issues; Supervision of SO 3 carbon trading;					
UBOS	Annual national surveys of SO 1 – SO 7	Annual national surveys of SO 1 – SO 7	Annual national surveys of SO 1 – SO 7	Annual national surveys of SO 1 – SO 7	Annual national surveys of SO 1 – SO 7	Annual national surveys of SO 1 – SO 7	Annual national surveys of SO 1 – SO 7	
NARO	Research on CSA and suitable CSA crop varieties, SLM, agroforestry and policies	Research on suitable CSA crop varieties, SLM, and agroforestry and policies				Research on wildfire impact on farming and wildfire management and policies	Research on livestock rearing issues	
NAFORRI	Research on agroforestry	Research on agroforestry, energy wood and fast-growing	Research on plantation forestry, pole and timber production,	Research on natural forests, non-timber forest products, carbon		Research on wildfire impact on forests and tree plantations	Research on fodder agroforestry plantations	

Institution	Strategic Option 1	Strategic Option 2	Strategic Option 3	Strategic Option 4	Strategic Option 5	Strategic Option 6	Strategic Option 7	Strategic Option 8
		indigenous tree species and policies	harvesting, carbon sequestration, trading & policies	sequestration, forest restoration & policies		and policies		
Academia	Research on same topics as NARO and NAFORRI above	Research on same topics as NARO and NAFORRI above	Research on same topics as NAFORRI above	Research on same topics are NARO and as NAFORRI above	Research on relevant renewable energy topics	Research on same topics are NARO and NAFORRI above	Research on same topics are NARO and NAFORRI above	

4.2.9 Mechanisms for supervision, coordination and stakeholder participation

The National REDD+ programme has got the National Climate Change Advisory Committee (NCCAC) that comprises representatives of all ministries with climate change related issues on their respective mandates. NCCAC is the national coordinating and advisory body to MWE in REDD+ implementation. Furthermore, NCCAC is technically overseeing a National Technical Committee (NTC), which has a more technical coordinative and supporting role in REDD+ implementation. Closely linked to NTC there are further Taskforces for MRV, FRGM, BSA, SESA/Safeguards and REDD+ Policy/Strategy. The overall national level organogram is presented in Figure 4.

NCCAC will provide the platform for policy coordination and harmonization among the targeted sectors, while the NTC will leverage the linkage between REDD+ options and the sector development priorities and programmes. REDD+ implementation will prioritize generating and disseminating forestry data that informs other sectors on the relationship between the drivers of deforestation and sector mandates and actions. The Water and Environment Sector Working Group will provide platforms for various stakeholders to enhance coordination and synergies within the sector, including providing platforms for engagement with Civil Society and Private Sector.

MWE/FSSD is coordinating the National REDD+ Technical Coordination Unit (TCU) and will have its own two technical persons (i.e. head of the unit and assistant) dealing with forest-based REDD+ issues and the TCU secretary. FSSD further supports districts in forest policy implementation, and law enforcement and regulation of forest utilization.

NFA will coordinate the strategic options (i.e. SO 3, 6 and 4 jointly with UWA) at the national level and within central forest reserves and wildlife conservation areas respectively, as well as it will be in charge of the annual national satellite surveillance of wildfires all over Uganda. NFA will also provide technical advisory services at the district and lower levels. FSSD will support districts in forest policy implementation, and law enforcement and regulation of forest utilization.

MAAIF and MEMD have been allocated with sectoral support funding, which is meant to be used for establishment of some relevant sectoral projects to support the four strategic options (i.e. SO 1, 2, 5 and 7), which these two ministries will be coordinating. The funds can be used for reforming of the Ministries to be able to adopt REDD+ activities, for promoting the adoption of REDD+ activities in districts, or some other relevant use. However, before any funds can be used for this support there must be prepared a proper project plan and document for these activities.

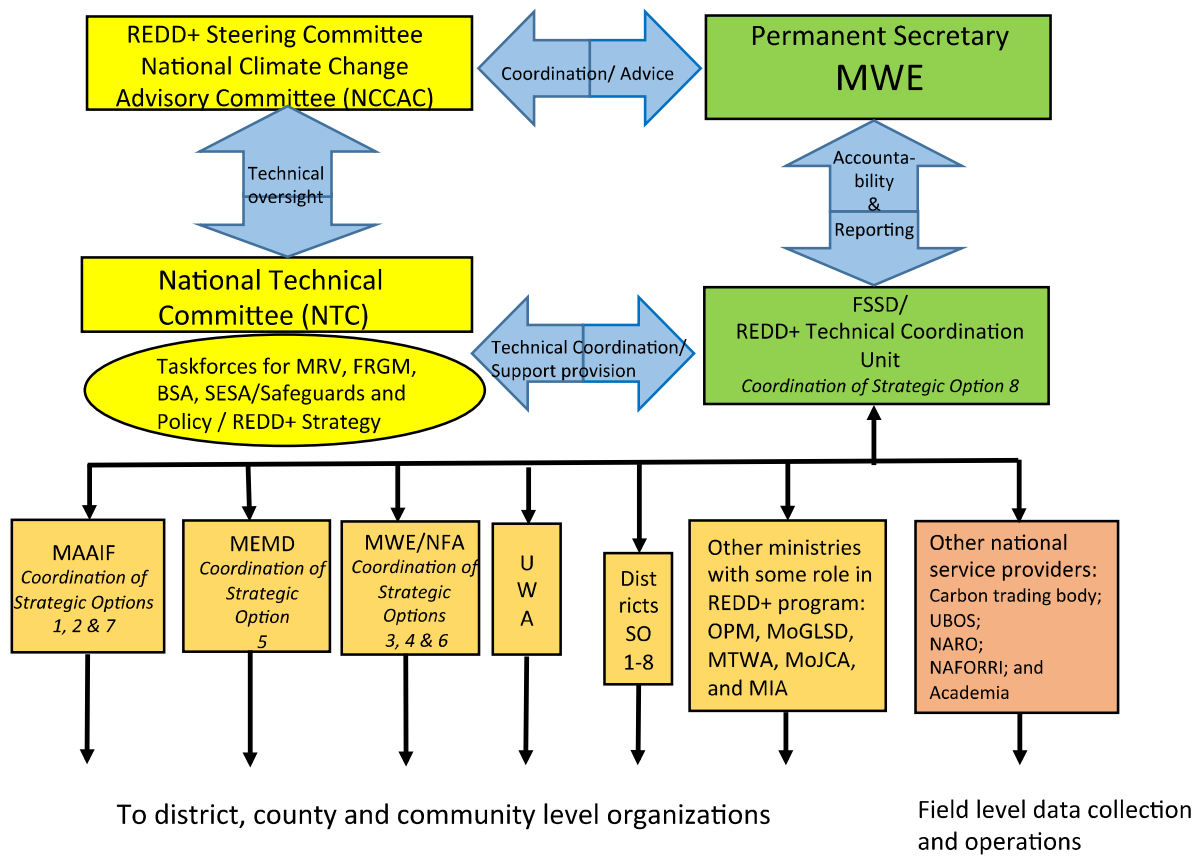


Figure 4. National level organogram for Ugandan REDD+ programme.

Neither MAAIF nor MEMD are operating at district or lower levels, but these two ministries will have one person seconded to the National REDD+ Coordination Unit with expertise in agriculture and livestock rearing (i.e. MAAIF) and wood energy issues (MEMD). Besides these REDD+ personnel, TCU could also have a Carbon Trading Expert seconded from some suitable carbon trading organization and a Refugee and Ethnic Minority Specialist seconded from the Office of the Prime Minister (OPM). These two latter experts do not have to be located at the REDD+ TCU, but can be placed at their own organizations.

OPM will supervise the involvement of refugees at the national level, while the actual work will be conducted in the districts under MOLG's Community Development Office jointly with various UN organizations and CSOs active with refugees. MoGLSD will supervise integrating and mainstreaming gender issues, ethnic minority and marginalized group involvement in all the strategic option activities at national level, while the actual implementation will be conducted in the districts under MOLG's Community Development Office. MTWA oversees the operations of UWA in REDD+ implementation, while MoJCA will further be involved in relevant and needed legal and policy development work. Furthermore, MIA will oversee involvement of the police forces and fire brigades particularly in relation to wildfires and the former one also in relation to national parks and protected areas supervision.

Linkages with all categories of local government (i.e. MOLG and its various departments) will be maintained through both formal and statutory platforms for planning, budgeting and monitoring. For the activities, which the respective Ministries and agencies have comparative advantages to lead (e.g. standards setting, updating inventory, etc.), they will engage CSOs, private sector and traditional/cultural institutions and faith-based organization at local level.

4.2.10 Monitoring, reporting, communication and feedback on REDD+ National Strategy Implementation

It will become highly important to have annually updated statistical data information on how each of the REDD+ strategic options are being implemented in each region and district of Uganda. This information will of course be especially important for carbon trading purposes, but even without carbon trading it will be crucial for the national REDD+ programme operations. The reporting shall involve stakeholders including relevant government agencies, formal and informal forest users, private sector entities, civil societies, indigenous people and other forest-dependent communities.

Besides the overarching monitoring and evaluation set-up there are also some national level organizations, which can well contribute with annual national surveys on performance in various regions of Uganda. These are at least the Ugandan Bureau of Statistics(UBOS), Forest Sector Support Department (FSSD), UTGA, NAFORRI and UWA. This other collected data and statistical information is highly suitable for monitoring non-carbon activities, outputs and outcomes. In the REDD+ Strategic Option Process Report there is listed what kind of data would be particularly needed to be produced by the mentioned organizations

The FCPF of the World Bank has designed an M&E Framework planning and management tool to help collection, analysis and reporting of information against key readiness milestones and deliverables 1) reporting country progress 2) identifying gaps and 3) enabling redirection of operations. Countries are free to use and adapt an existing monitoring and evaluation framework if it can be used to collect and report progress on REDD+ operations on-going in the country (FCPF 2013 and 2017).

The FCPF M&E Framework consists of a standard Results chain, Logical Framework and Performance Measurement Framework (PMF). The PMF could be the tool to use to plan milestones, set indicators, collect and maintain information. This information should then be reported to the FCPF (using the FCPF standard reporting template) or to other partners in other requested formats. A lesson learnt from previous country cases is not to get too ambitious with too many milestones and indicators but choose these realistically (FCPF 2013 and 2017).

The established M&E Framework should preferably build on existing data collection monitoring arrangements as feasible. The used monitoring indicators should be realistic and 'SMART' (specific, measurable, attainable, relevant, time-bound) for monitoring concrete results in terms of carbon reduction impacts. The annual REDD+ results will be broken down into two levels for ease of monitoring. One should start with lower order of results in order to get to the final results and at the same time ensuring that one keeps focus on making corrections as required. In context of the FCPF M&E the lower order results are called OUTPUTS (intermediate results) to be achieved in order to get to OUTCOMES (i.e. key national results).

It is recommended that the following kinds of monitoring indicators based on the selected strategic options should be used:

Strategic Option 1 (CSA):

Target Outcome: Reduction in natural forest-based carbon emissions from CSA.

Guiding questions for assessing Output Results:

- How many ha of forest lands are encroached upon annually from start of REDD+ to assessment date;
- How many ha of farmlands have annually been established on forest lands from start to assessment date.

Strategic Option 2 (Sustainable fuelwood and charcoal):

Target Outcome: Reduction in natural forest-based carbon emissions due to small-holder and commercial energy wood plantations.

Guiding questions for assessing Output Results:

- How much of the total annual fuelwood is produced on farm in the studied county;
- How much of the total annual charcoal is produced on farm in the studied county;
- How much of the total annual small-holder timber and pole wood is produced on farm in the studied county;
- How many improved charcoal kilns are annually registered to small-holder farmers in the studied county.

Strategic option 3 (Large-scale timber plantations):

Target Outcome: Reduction in natural forest-based carbon emissions due to Large-scale timber plantations and improved charcoal kilns linked to these.

Guiding questions for assessing Output Results:

- How many hectares of which introduced species have been established annually;
- How many hectares of annually established plantations have functioning forest management and fire management plans;
- How many improved charcoal kilns are annually registered with large-scale plantations;
- How much of the total annual charcoal amount stems from introduced tree species?

Strategic option 4 (Restoration of natural forests in the landscape):

Target Outcome: Reduction in natural forest-based carbon emissions due to the establishment of CFM/PFM agreements, which require that communities/households take all their wood needs from planted farmland wood sources (i.e. agroforestry and woodlots); and

Target Outcome: Annual number of hectares that shift from degraded Tropical High Forests or Woodlands into restored 1) THFs or 2) Woodlands.

Guiding questions for assessing Output Results:

- How many new CFM/PFM agreements signed annually in the studied county;

- How many hectares covered by the annually new CFM/PFM agreements in the studied county;
- How many hectares have annually been 1) enrichment planted or 2) left alone for restoration in the studied county;
- How many hectares of 1) dense tropical high forests or 2) degraded THFs exist annually in the studied county;
- How many hectares of 1) dense woodlands or 2) degraded woodlands exist annually in the studied county.

Strategic option 5 (Energy efficient cooking stoves):

Target Outcome: Annual amount of saved carbon emissions due to Energy Efficient Stoves in HHs and institutions; and

Target Outcome: Annual amount of saved carbon emissions due to Improved Charcoal Stoves in HHs and institutions.

Guiding questions for assessing Output Results:

- How many 1) HHs and 2) institutions have annually installed EES stoves;
- How many 1) HHs and 2) institutions have annually installed improved charcoal stoves;
- How much of the total annually sold charcoal amount stems from introduced tree species?

Strategic option 6 (Integrated wildfire management):

Target Outcome: Annual amount of carbon emissions from wildfires in Uganda – (declining annual amounts are foreseen)

Guiding questions for assessing Output Results:

- How many hectares of each main land use type have annually been burnt by wildfires in the studied county (carbon amounts for each land use type are known by NFA).

Strategic option 7 (Livestock rearing in Cattle Corridor):

Target Outcome: Annual amounts of artificial inseminations, hectares of fodder plantations and established/rehabilitated water dams and water tanks.

Guiding questions for assessing Output Results:

- How many artificial inseminations, hectares of fodder plantations and established/ rehabilitated water dams and water tanks in the studied county.

Strategic option 8 (Strengthening of policy implementation for REDD+):

Target Outcome: How many of the top 20 REDD+ required policies have been well enforced in Uganda.

Guiding questions for assessing Output Results:

- How many of the top 20 REDD+ required policies have been well enforced in the studied county.

The guidance questions listed above can be used to set milestones at OUTPUT LEVEL (or intermediate results). Each level of result is accompanied by an indicator, which is a form of information collected periodically to tell the national REDD+ strategic option activities are progressing well or not.

One must start building the national M&E Framework that can report the core REDD+ activities and add reporting the other REDD+ activities (e.g. pilot activities) over time as feasible. Setting up a clear and realistic M&E Framework will take substantial upfront effort, but later the systematic efforts spent on the framework design will result in efficiency in the long-term.

The FCPF has designed standard progress reporting forms, which can be adjusted and adopted in Uganda. The National REDD+ TCU Coordinator or the respective National Strategic Option Coordinators can also prepare their own standard reporting forms for their subsidiary organizations depending on the needs in each strategic option.

The M&E Framework can also be used to promote or force district and county authorities to speed up their reporting performance and it also functions as an assessment point for how the REDD+ strategic Option activities are progressing in different areas of Uganda. By publishing the districts and counties statistics related to the progress achieved in various parts of the country there may be also help setting up a competition between districts. However, this will require that at least one district is performing very well. If adoption is slow in all districts they will not be most likely sufficiently challenged to perform better than previously. Therefore, it may be wise to ensure that at least one district is always performing very well.

Standard annual and semi-annual reporting help to accumulate the information needed at the mid-term and evaluation stages. If one designs and monitors indicators systematically, both effectiveness and efficiency of the operations will be easier to reach. Some countries such as Nepal and Liberia, which have already established their national M&E framework, can act as model cases. Relevant materials are also available on the FCPF website (<https://forestcarbonpartnership.org/fcpf-monitoring-evaluation>). There are also FMT and M&E specialists at the FCPF to support Uganda in the design process of its national M&E Frameworks and using the country reporting template.

4.2.11 Risk management

The perceived risks and their respective mitigation measures for institutional arrangements at the national scale have been listed and summarised in Table 13. Other institutional and financial risks are presented in their respective sub-chapters.

Table 13. Risks and mitigation measures related to national level institution set-ups of REDD+

Risk type	Mitigation measures
As a multi-sector national operation REDD+ will be difficult to coordinate properly between various main and sub-sector partners	Good measures for REDD+ implementation coordination, supervision and monitoring and evaluation (based on the FCPF M&E tool) included in the REDD+ programme design, together with commensurate financial resources for each strategic option to ensure good performance of its functions and activities. Linkages with national development priorities and institutional mandates have been entrenched in the design and implementation plans. Measures for donor and sector programmes/projects coordination have been provided or recommended.
Reforming policies is a slow process and enforcement is still slower	Some funds are allocated for each strategic option (1 to 7) for development of the needed sector capacity and policies to support each strategic option. Strategic Option 8 includes activities to strengthen the capacity for technical, administrative and financial management of the REDD+ programme at all levels of governance. The implementation of SO8 is envisioned to strengthen the implementation of all SOs.
Natural forest may be disappearing before REDD+ strategic option activities take up speed in implementation	<p>More funding and technical efforts of NFA, DFS and UWA are needed immediately to stop deforestation. This includes also policy changes concerning private forest ownership, so that forest authorities can supervise better private forest owners (e.g. clear-cutting of forests should need permission and if land is not converted to legally registered other land use the next generation of forest trees must be ensured).</p> <p>The strategic options of the REDD+ programme are designed so that carbon trading is mainly a bonus income, while all actions are economically feasible even without carbon funding. A large number of CFM/PFM must be prepared and agreed on as soon as possible to get good mandate for communities to protect their nearby forests against intruders, which are at high risk without this CFM mandate. Implementation of the REDD+ programme should start as soon as possible in order to stop the disappearance of forests.</p>

Risk type	Mitigation measures
Too high expectations of various stakeholders on REDD+ and the ambition will drop before the process start moving	<p>Good information sharing, training and extension to prepare all stakeholders about REDD+ process and progress must be in place from start, so that people know how results are accumulating in their own and other areas of Uganda.</p> <p>Some emissions reduction projects (including FIP) under FCPF and other financing agencies are expected to start soon and these will further act as pilots of the REDD+ strategic options. The ongoing and new work by several CSOs in different parts of the country can serve as building blocks.</p>
Shortage of competent trained staff personnel in various governmental organizations to successfully get REDD+ on track	<p>Capacity building through training and demonstration actions at all levels of REDD+ implementation. The perceived training will be in the form of hands-on training at DLGs and workshops at all levels.</p> <p>New REDD+ experts are to be employed for all districts and the REDD+ National Coordination Unit. This has been budgeted in the REDD+ programme budget and the action plan contains descriptions of the staff training activities.</p>

4.3 Subnational arrangements

4.3.1. Lead implementer, participating institutions, roles and responsibilities

The REDD+ institutional set-ups for each strategic option at district and lower levels are summarized in Table 14. These sub-national level implementers are carrying out their tasks under the national level strategic option coordinators in sector-wise governmental authority structures. It is mainly NAFORRI, which can be entitled to conduct some of its research tasks more broadly than their line ministry (i.e. MAAIF). All the other government organization bodies will be involved only in their own ministry's strategic option activities.

Table 14. Institutional responsibilities explicitly for REDD Strategy at district level.

Institution	Strategic Opti 1	Strategic Opt 2	Strategic Opt 3	Strategic Opt 4	Strategic Opt 5	Strategic Opt 6	Strategic Opt 7	Strategic Opt 8
MWE/NFA	District tree nursery supervision and mgt.; Distribution of quality tree seeds and seedlings;	District tree nursery supervision and mgt.; Distribution of quality tree seeds and seedlings; Supervision of pole and timber markets;	District tree nursery supervision and mgt.; Supervision of pole and timber markets; Establishment of some plantations;	CFM & PFM agreements, their supervision and boundaries demarcation		National coordination & district and local coordination of SO 6		
NAADS	Guidelines for SLM and extension services; Extension services;	Guidelines for SLM and extension services; Extension services;					Partner in SO 7 at district and local levels	
MOLG	District and local coordination/implementor of SO 1	District and local coordination/implementor of SO 2			District and local coordination/implementor of SO 5	Partner in SO 6 at district and local level for non-forest lands	Partner in SO 7 at district and local levels	
UWA				Partner in SO 4 at district and local level		Partner in SO 6 at district and local level		
A carbon trading body (to be			Partner in SO 3 district and local levels;					

Institution	Strategic Opti 1	Strategic Opt 2	Strategic Opt 3	Strategic Opt 4	Strategic Opt 5	Strategic Opt 6	Strategic Opt 7	Strategic Opt 8
selected)			Expertise on carbon trading issues; Supervision of SO 3 carbon trading;					
UBOS	Annual district surveys of SO 1	Annual district surveys of SO 2			Annual district surveys of SO 5			
NARO	Research on CSA and suitable CSA crop varieties, SLM, agroforestry and policies	Research on suitable CSA crop varieties, SLM, and agroforestry and policies				Research on wildfire impact on farming and wildfire management and policies	Research on livestock rearing	
NAFORRI	Research on agroforestry	Research on agroforestry, energy wood and fast-growing indigenous tree species and policies	Research on plantation forestry, pole and timber production, harvesting, carbon sequestration, trading & policies	Research on natural forests, non-timber forest products, carbon sequestration, forest restoration & policies		Research on wildfire impact on forests and tree plantations and policies	Research on fodder agroforestry plantations and range	
Police/Fire Dept.						Partner in SO6 at district and local level		
County tree	Production of required tree	Production of	Production of	Production of			Production of	

Institution	Strategic Opti 1	Strategic Opt 2	Strategic Opt 3	Strategic Opt 4	Strategic Opt 5	Strategic Opt 6	Strategic Opt 7	Strategic Opt 8
nurseries	seedlings and seed distribution locally	required tree seedlings and seed distribution locally	required tree seedlings and seed distribution locally	required tree seedlings and seed distribution locally			required tree seedlings and seed distribution locally	
Energy wood plantation and charcoal producer associations (new)		Establishment of new & revised energy wood plantation and charcoal producer associations; Guidelines and registration etc.	Establishment of new & revised charcoal producer association; Guidelines and registration etc.					
Service providers *	Various extension and service provision by CSO/NGOs, private and state organizations for rural communities	Various extension and service provision by CSO/NGOs, private and state organizations for rural communities	Various extension and service provision by CSO/NGOs, private and state organizations for rural communities	Various extension and service provision by CSO/NGOs, private and state organizations for rural communities	Various extension and service provision by CSO/NGOs, private and state organizations for rural communities	Various extension and service provision by CSO/NGOs, private and state organizations for rural communities	Various extension and service provision by CSO/NGOs, private and state organizations for rural communities	

4.3.2. Mechanisms for supervision, coordination and stakeholder participation

The sub-national level supervision and coordination will be handled by the respective ministerial bodies operating at the sub-national level, once they also have linkages directly to the national level. The platforms used for stakeholder engagement will be adopted, including the Sector Working Groups and joint sector reviews at national level and local government technical committees at local government level, where the participation of the private sector and civil society organizations is encouraged.

4.3.3 Linkages with districts/local governments

The linkages with all categories of local government will be maintained through both formal and statutory platforms for planning, budgeting and monitoring. For the activities, which the Ministries and agencies have comparative advantage to lead (e.g. standards setting, updating inventory etc.), they will ensure the participation of active CSOs, private sector and traditional/cultural institutions and faith-based organization at local level.

4.3.4 Monitoring & Evaluation, reporting, communication and feedback on REDD+ National Strategy Implementation

The sub-national level M&E activities will be performed under each national level strategic option coordination organization and follow the same format as already outlined at the national level earlier. The REDD+ operations are embedded in sectoral ministries and their national subsidiaries, and the field activities are first reported on county level. After that a compiled county progress report is submitted to the district level authority and then a district progress report is compiled. The county progress reports could be prepared on monthly basis following a simple standard format, which should contain summary information of achievements in implementing a strategic option in the county, monthly progress and plans for the coming month.

The district level progress report is prepared once annually or twice annually, and then forwarded to the national strategic option coordinator, who compiles a national level progress report of strategic option operations to the overall REDD+ Technical Coordination Unit at MWE in Kampala. The district level progress reports, the national level progress report should be placed after acceptance on the district and national strategic option coordinators' website with public access or at least with restricted access under password so that all level REDD+ implementers in the chain of command for the respective strategic option can access the reports.

The Ugandan REDD+ TCU will also as soon as possible prepare an annual REDD+ progress report, which also should be published on the REDD+ TCU website as soon as it has been accepted. In this manner the lower level implementers of REDD+ strategic option activities can see progress by themselves within a relatively short

time frame after their own progress reports have been submitted and they can compare the results with their neighbouring counties, districts and national achievements.

The international M&E progress reporting will be conducted from the national REDD+ TCU. The higher level strategic option coordinators need to monitor their lower level line REDD+ strategic option coordinators quite closely so that a) progress reports are prepared on time, and b) strategic option activities are being actively promoted and outputs achieved. The same also relates to the national REDD+ TCU Coordinator, his/her TCU assisting coordinators and the seven strategic option line coordinators (i.e. including also OPM's operations with refugees and ethnic minorities).

4.3.5 Risk management

The perceived risks and their respective mitigation measures at the sub-national level are presented in Table 15.

Table 15. Risks and their mitigation measures at sub-national level

Risk type	Mitigation measures
Enforcement of policies is ineffective	National sector authorities must start follow up how various REDD+ sector policies are enforced and enforcement must become the highest priority all levels. This should be several times per year followed up from the national level down to each county level and reported back in progress reports. Strategic Option 8 includes activities to strengthen the capacities for technical, administrative and financial management of the REDD+ programme at all levels of governance.
Old land disputes are unsettled	Old land disputes, for instance, with ethnic minorities must be made priority issues to solve. In most cases the solutions do not cost the state that much in terms of land or resources, while the settlement will save a lot of money for local authorities and the involved ethnic minorities once land tenure is organized.
Unregistered and unclear land tenure issues in remote rural areas adjacent to remaining natural forests	The land tenure registration is lagging severely behind in rural areas and the unclear situation is often a hindrance for adopting REDD+ strategic option activities that involves tree planting. Speed in sorting out national land and tree tenure issues must be set priority.
A changing climate is reducing crop yields and enhancing	Linkages between mitigation and resilience strengthen the appreciation of role of forestry. Climate change adaptation

land degradation	strategies e.g., smart agriculture addresses likely effect of climate on forestry. The negative role of wildfires to climate change must be stressed to rural people. The so called traditional type of farming practices provide neither sufficient income nor sustainable production and should be ceased in favour of CSA and other more income generating farming practices.
In most rural settings, governmental authorities do not have sufficiently close contact with communities	This fact must be realized by governmental authorities at all levels and the underlying causes must be identified and removed (most of these are described in these risks and mitigation measures table of this document). Strategic Option 8 includes activities to strengthen the capacity for technical, administrative and financial management of the REDD+ programme at all levels of governance.
There are shortage of knowledge and extension support for making changes in farming practices	Besides DLGs stepping up their performance there should also be promotion of district and local farmers' associations and cooperatives that can also themselves contact DLGs. Outside service providers can support in many cases.
Political interference in local forest management and forest land tenure	One way of dealing with this issue is to start up a massive work of preparing CFM/PFM agreements with communities and thereby protect forest reserves from political land take-overs.
Too few incentives for maintaining forests on private lands	Incentives for policy reforms and implementation targeting private land owners are being embedded in the design and investments of FIP. FIP intends to: i) provide incentives to private land owners to maintain forest on their land or to utilize their land for forestry purposes; ii) strengthen tenure of community and private forests.
Ethnic minorities, refugees and marginalized people lack land and resources to participate in normal manner	MOGLSD's role will supervise the implementation of the eight main REDD+ strategic options vis-a-vis gender issues and ethnic minority group involvement in REDD+ activities at national level while the actual field operations will be conducted by the respective national strategic option coordinators and the districts. For this work grant budget allocations have been earmarked.

4.3.6 District and local level administrative structure by strategic options

Despite the REDD+ programme is national in scale all the concrete REDD+ operations and concrete planning exercises are going to happen at district or lower governmental levels. Each of the REDD+ strategic options will require legal and policy reformation support, which has been described in Chapter 3 of this report. For some

strategic options, this legal and policy support will even be of paradigmatic importance. Such important legal and policy changes will be needed, for instance, for sustainable commercial wood energy, pole and timber production from plantations, while instead there should be a ban on commercially exploiting of these commodities from natural forests. Another strategic option that will need policy support concerns the large-scale adoption of energy efficient fuelwood stoves and improved charcoal kilns.

Structuring and administrating the national REDD+ operations for the district and local level administration of each strategic option should be done as follows.

Strategic Option 1: Climate smart agriculture

Institutional arrangements:

The institutional set-up for Strategic Option 1 will be handled under MAAIF with district and lower level support from mainly NAADS and MOLG local government departments. There seems to be a certain gap between district and local government structures and rural farming communities, which will both need closing directly by the local governmental bodies as well as by NAADS and possibly by outside service providers to some extent.

Service providers and Partnerships with private sector:

In all rural districts of Uganda there is a need to see first what NAADS and MOLG local government departments can carry out by themselves. Only thereafter they shall consider contracting external service providers and form partnerships to strengthen and support the proper adoption of climate smart agricultural practices. For both NAADS and MOLG more funding is allocated for REDD+ implementation as its own service provision. Besides the above-mentioned organizations, additional service provider partnerships could be formed with Ugandan or international NGOs, and in some cases with Ugandan private sector companies, e.g. district farmers associations, all kinds of crop and livestock commodity cooperatives, faith-based organizations (including their international connections and financing), local state and private tree nurseries and local agricultural industrial companies. In case outside service providers are contracted it is better that local governance bodies mainly focus on planning, supervising and managing the contracting of service providers and provide an enabling environment for the strategic option activity implementation. In some occasions, also NARO could act as a service provider.

Demonstration areas and extension activities needed:

In almost any county in Uganda there should be a few private smallholder farms acting as demonstration sites on good agroforestry and sustainable land management practices. Some other smallholder farms or the same ones could then further act as demonstrators for rainwater harvesting from house roof with collection tank and drip irrigation of farm land while some other farms could establish greenhouses for

food crop production. Furthermore, it would be useful to have an additional demonstration site for these activities on some larger private land in order to attract more business-oriented farmers into this kind of agricultural production.

Strategic Option 2: Sustainable fuelwood and charcoal production

Institutional arrangements:

The involved government institutions are well structured but have limited capacity. There is a need of new kinds of energy wood plantation associations and charcoal producers' associations, which use only improved charcoal kilns.

Service providers and Partnerships:

Similarly, with Strategic Option 1 (i.e. Climate smart agriculture) there is a need to let first NAADS and MOLG's local government department build up sufficient extension capacity by themselves. If this is not sufficient they can contract outside service providers and form partnerships to strengthen and support the proper adoption of sustainable wood energy practices on farms. The desired profile of non-governmental service providers and partnerships should be the foremost Ugandan or branches of international NGOs, and in some cases Ugandan private sector companies. These should be linked to district farmers' associations, some crop and livestock commodity cooperatives (e.g. coffee, cocoa, papaya, species and dairy if cows are fed with leaf fodder), local state and private tree nurseries and wood industries as well as agricultural industrial companies. In case of non-governmental service provision, it would be better that local governance bodies would focus on planning, registering, supervising and managing the contracting service providers, and providing an enabling environment for the strategic option activity implementation. Research organizations like NAFORRI, NARO and universities could support the activities with sector analyses.

Demonstration areas and extension activities needed:

Demonstration areas and extension services will be crucial in order to get the strategic option activities replicated in the large scale. NGOs, NAFORRI and DFS could be good supporters of demonstration sites and extension services. The same applies to internationally funded projects.

Strategic Option 3: Large-scale timber plantations

Institutional arrangements:

Most institutions are in place, but still in many cases private plantation owners lack forest management knowledge and many plantations lack fire management plans with no fire protection on the ground. For this strategic option the national REDD+ programme should employ a carbon trading expert to UTGA or the national REDD+ technical Coordination Unit to provide carbon trading expertise for private forest plantation owners.

Service providers and Partnerships:

DFS and NFA foresters should provide relevant services for the private plantation owners. Also, NAFORRI and academic foresters could be involved in these activities. There will be further both internationally and nationally funded donor and NGO projects, which can and should be involved in plantation forestry. Even the sawmilling and other wood industry will be motivated to be involved as they can then impact on how transmission pole and sawn timber trees are grown and thus on timber and pole standards and wood quality.

Strategic Option 4: Restoration of natural forests in the landscape

Institutional arrangements:

In all the regions, structured institutions are available (mainly NFA, UWA and DFS), but these are not well facilitated (lack funds and staff resources), which may be a reason for some corruption (i.e. illegal logging may provide some otherwise missing financial resources). In many districts and counties there are also some state or private tree nurseries and in most districts forest extension is insufficient.

Service providers and Partnerships:

Rural community persons feel insecure with their land tenure rights and particularly tree planting on their land makes them suspicious of losing their farmlands. NGOs involvement in activities seems to reduce this fear.

Anyway, the services providers should be first NFA, UWA and DFS, but in some conflict cases international and national NGOs, district farmers' associations, and international/national projects with relevant kinds of natural forest management activities on their agenda could join the activities. In and around national parks and protected areas UWA would be the natural choice of partner in CFM/PFM agreements.

Demonstration areas and extension activities needed:

There are several NGOs/CSOs involved in CFM/PFM activities, which could act as demonstration sites. For example, We Agroforestry (an international NGO) and the Mpigi District Farmers' Association village with CFM has got a good visiting site for local communities and international guests.

Strategic Option 5: Energy efficient stoves

Institutional arrangements:

MEMD does not have proper presence at district level and below. At district and county levels improved stoves have been promoted by various NGOs private business companies and internationally funded projects.

One energy expert for the national REDD+ technical Coordination Unit has been budgeted as well as one for each district of Uganda for the first five years. This administrative set-up together with the budget support of around 1 million USD could provide MEMD with some better opportunities than currently operating with project funding at district and county levels in Uganda.

Service providers and Partnerships:

At district and county levels the main outside service providers and partners could continue to be NGOs, private business companies and some projects, but now with some better support from MEMD and MOLG in each district.

Strategic Option 6: Integrated wildfire management

Institutional arrangements:

The lead agencies for wildfire management on forestlands are NFA, Districts/Local Government, UWA and the Ugandan police forces. A few private forest owners and forest farming associations may also have their own private fire management system.

Service providers and Partnerships:

A potential main service provider could be the Uganda fire brigade and various private companies with own forest plantations that have proper fire management plans. Also, NFA and UWA should have sufficient experience and may need some incentive to activate themselves in these operations.

Demonstration areas and extension activities needed:

All CFR, LFR and wildlife protected areas should have acceptable fire management plans. Additionally, all national parks and protected areas should have their respective wildlife management plans, which could further be coordinated in district wildlife management plans. Further private forest plantation owners and other larger private landowners should have fire management plans for their respective land property. The relevant government authorities should set a standard for fire management plans and some good ones in each district and county could act as demonstration sites for others.

Fire-fighting training and implementation of fire management plans should be enforced. The national REDD+ programme should provide training events for at least

one expert for each district to be trained in fire-fighting of wildfire. The expert will then act as trainer of other persons in the respective districts.

Strategic Option 7: Livestock rearing in Cattle Corridor

Institutional arrangements:

The Minister of State for Livestock is supporting livestock management issues in the regions. Further District Veterinary Services, NARO Zonal Offices and -programs, and Private livestock farmers association are active. Commercial livestock farmers including the President are devoting time, effort and authority to the topic in the districts.

Service providers and Partnerships:

The main services should be provided by MAAIF and its Directorate of Animal Resources (DAR) and the district local governments. Another important institution for livestock breeding is the National Genetic Breeding Centre and its various local partners. Regarding fodder tree seedlings and grass seeds will NFA, DFS and the Uganda Seeds Ltd. be important to involve. Regards to water dam excavation and restoration will local Community Water Users Associations and the District Water Departments be important.

Demonstration areas and extension activities needed:

For cattle breeding activities, there should be some demonstrations of artificial insemination organized in each county and all districts of the Cattle Corridor as the guiding principle, but reality may slightly alter this standpoint. Regarding fodder agroforestry plantations the guiding principle should again be that there would be at least one demonstration site in each county of the Cattle Corridor. Later any successful establishment of fodder agroforestry plantations can act as demonstration site for others. When it comes to water dams and water tanks for drinking water for livestock it is best to identify the most needed locations as all water dams and water tanks established with this strategic option funding must be considered as demonstration sites. The need is likely to be much larger than possible to fulfil with this strategic option.

5. Financing Arrangement for REDD+ Implementation

5.1 Financing REDD+ implementation within the current planning and budgeting framework

The REDD+ National Strategy will not be implemented as a stand-alone project but as part of the broader national planning framework and linked to the respective financing frameworks. In 2007, government approved the Comprehensive National Development Planning Framework (CNDPF) policy which provides a clear perspective vision and long-term plan to articulate the country's strategic development objectives and priorities against which medium and short-term plans are anchored. The planning instruments which the CNDPF policy has been implemented through during the period of this review (2011-2016) are the 30-year national vision, 10-year national development plan, 5-year national development plans, sector investment plans and Local Government Development Plans. For conformity with priorities set out in these plans, the budget agencies prepare annual plans and budgets. At the time of completion of the National Development Plan II 2015/16-2019/20, the Government has already committed to the REDD+ processes including developing a REDD+ National Strategy and costed action plan. This strategy thus operationalizes the implementation of the second National Development Plan. It sets the targets to increase forest cover as percentage of land area from 14 % (2012/2013) to 18 % by 2020, 21 % by 2030 and 24 % by 2040. NDPII gives effect on the implementation of Vision 2040.

The NDPII is an overarching government plan, which stipulates the medium term strategic direction, development priorities and implementation strategies. Sectors are responsible for developing policies and plans, which must be aligned with the NDP. On the other hand, the Local Government Development Plans (LGDP) are mainly linked to the NDP through the Sector Investment Plans (SIP) and strategies. Accordingly, the finalization of the REDD+ National Strategy provides an opportunity to different sectors to integrate the options and activities that have been identified. The SIP/SDPs and LGDPs are periodically reviewed and aligned to NDPII priorities and other commitments, e.g. Sustainable Development Goals (SDGs), while ensuring that cross cutting issues are well addressed (e.g. population, social protection, human rights, gender, culture and national values, environment etc.).

The budget is the main tool for the Government to allocate resources to implement its plans and address emerging policy priorities, now including options that will be approved under REDD+ National Strategy. The Government uses the Budget Framework Papers and Medium-Term Expenditure Framework (MTEF) to translate policies into implementable plans. The framework for linking policies and plans to the budget is demonstrated in Figure 5. The MTEF is the framework linking policies

and plans to the budget, and it rationalizes plans with financing in an integrated manner. It plays another key role to reduce the imbalance between what is affordable, available and the expenditure requirement. The medium Fiscal Framework or resource Envelope sets fiscal policy and macro-economic targets and the hard budget constraints. The government uses the Budget Framework Papers to link its overall policies and the budget. The budget is an estimate of government revenue and expenditure prepared annually.

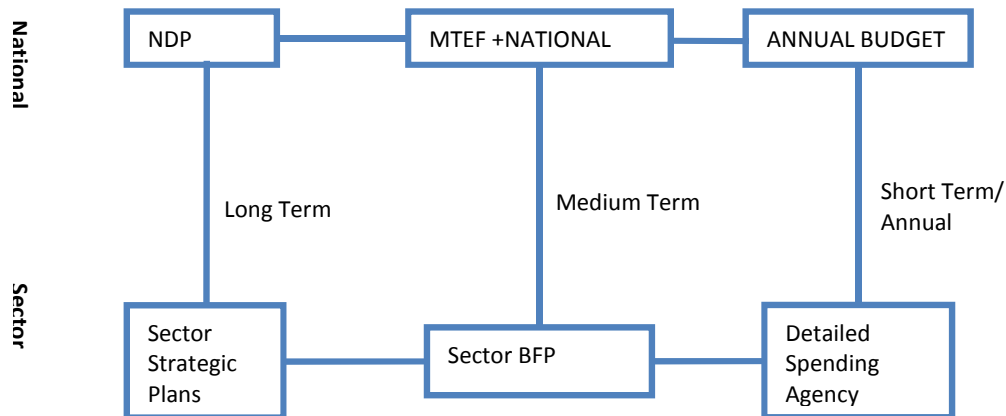


Figure 5. Framework for linking policies and strategies to budgeting

Similarly, agencies and ministries submit detailed and costed plans and their corresponding budgets to MFPEd. Since the 2007/08 Financial Year, the Government adopted and implemented a budgeting structure based on vote functions. A vote function represents a set of services or outputs, which a spending institution is responsible for. The reform was augmented with implementation of output-based budgeting (OBB), a form of performance budgeting. Output based budgeting was introduced to switch focus from activity budgeting to output focus (GoU 2010).

The annual budget allocations are done by MFPEd together with sectors and consideration is made of public expenditure reviews submitted annually by sectors and MTEF, the final budget approved by the cabinet of government ministers is then submitted to the parliament in June.

The government implementation strategy takes cognizance to enhance the implementation of the REDD+ Strategy and Action Plan through strengthening and maximizing institutional synergies amongst the stakeholders to achieve efficiency in resource use. It therefore emphasizes the need to have a well-coordinated and strategic partnership within the Government and the private sector, development partners, the civil society and other non-state actors as implementation of the REDD+ National Strategy and Action Plan is a shared responsibility of all stakeholders. Two

key structures to allow for their participation are a Private Sector/Civil Society Forum and sector working groups. A key strategy therefore will be that the lead agencies for implementation of the identified strategic options use their respective working groups to put REDD+ in annual plans and budgets. A key consideration is that all activities under options have to be submitted by the appointed Accounting Officer who is responsible for controlling and accounting for the allocations. The Accounting Officer makes the sector's plans and budgets in consultation with departmental technical committees. They solicit for the financial resources from the Ministry of Finance, Planning and Economic Planning.

Sub-chapter 5.4 describes how the supporting investment financing for any non-carbon REDD+ activities under the Strategic Options 1 to 8 can be arranged in Uganda. It is to be expected that a large share of the REDD+ programme will be operated without actual carbon trading arrangements. These operations can still have both non-monetary direct and indirect benefits attached to them with needed benefit-sharing arrangements. Sub-chapter 5.5 outlines how carbon trading arrangements should be operated with both monetary and non-monetary BSA arrangements.

5.2 National arrangements for financial management

5.2.1 Five-Year Costed Action Plan for the REDD+ implementation

Table 16 provides a multi-year costed REDD+ National Strategy. To note, it has been found necessary to make the financing plan on the basis of each strategic option rather than the lead agencies or vote holders. This is because the lead agency can have several departments or service providers collectively implementing the same activity in different locations. Through such an arrangement, the Accounting Officer can trace the expenditure to planned activities as they relate to REDD+ priorities. Secondly, it aligns well with the government intention to improve front-line service delivery rather than fund institutions per se.

The budgeted allocation for the Ministry of Finance Planning and Economic Development (MoFPED) will support employment of staff personnel to start establishing the Autonomous National Fund at MoFPED. All crosscutting financial flows related to overall coordination and monitoring have been budgeted to MWE/FSSD, MAAIF, MEMD, MTWA/UWA, OPM and MoGLSD respectively. It would be useful and secure better contact between these three ministries if MAAIF and MEMD would second one senior staff member to the national REDD+ Technical Coordination Unit directly.

Other national level state services providers such as UBOS, NARO, NAFORRI and academic institutions should be funded through the national Technical Coordination Unit (TCU) either directly (in case of UBOS) or in the case of NARO and NAFORRI based on proper research plans with budgets or still further, in the case of academic institutions via an application process between competing academic institutions.

Table 16. The 5-Year Costed Action Plan for Uganda national REDD+ programme establishment phase.

Budget item	2018	2019	2020	2021	2022	Total in
	USD	USD	USD	USD	USD	USD
MoFPED						
MoFPED and staff	38,400	38,400	38,400	38,400	38,400	192,000
REDD+ Technical CU/crosscutting						
MWE/MAAIF/MEMD/ MTWA/UWA, secondments & TCU office & sector support	1,937,466	1,311,834	1,311,834	1,311,834	2,155,834	8,028,802
OPM service support	730,688	281,942	384,442	268,442	268,442	1,933,956
MoGLSD service support	2,274,975	441,248	543,748	427,748	427,748	4,115,470
UBOS support	200,000	200,000	200,000	200,000	200,000	1,000,000
NAFORRI research	250,000	250,000	250,000	250,000	200,000	1,200,000
NARO research	250,000	250,000	250,000	250,000	200,000	1,200,000
Academia research	100,000	100,000	100,000	100,000	200,000	600,000
Strategic Option 1 (CSA)	5,858,233	3,677,050	3,760,383	3,659,050	3,657,050	20,611,766
Refugee grant support	100,000	100,000	100,000	100,000	100,000	500,000
Marginal and Forest- dependent communities	100,000	100,000	100,000	100,000	100,000	500,000
Strategic Option 2 (Wood energy)	5,614,900	3,433,717	3,517,050	3,415,717	3,413,717	19,395,100
Refugee grant support	100,000	100,000	100,000	100,000	100,000	500,000
Marginal and Forest- dependent communities	100,000	100,000	100,000	100,000	100,000	500,000
Strategic Option 3 (Plantations)	234,000	267,600	267,600	267,600	417,600	1,454,400
Refugee grant support	100,000	100,000	100,000	100,000	100,000	500,000
Marginal and Forest-	100,000	100,000	100,000	100,000	100,000	500,000

dependent communities						
Strategic Option 4 (CFMs etc)	5,171,625	5,171,625	5,261,925	5,171,625	5,171,625	25,948,426
Refugee grant support	150,000	150,000	150,000	150,000	150,000	750,000
Marginal and Forest-dependent communities	150,000	150,000	150,000	150,000	150,000	750,000
Strategic Option 5 (EES Stoves)	5,611,567	3,430,383	3,513,717	3,412,383	3,410,383	19,378,433
Refugee grant support	100,000	100,000	100,000	100,000	100,000	500,000
Marginal and Forest-dependent communities	100,000	100,000	100,000	100,000	100,000	500,000
Strategic Option 6 (Wildfires)	546,380	507,180	1,660,513	1,636,433	1,636,433	5,986,940
Refugee grant support	100,000	100,000	100,000	100,000	100,000	500,000
Marginal and Forest-dependent communities	100,000	100,000	100,000	100,000	100,000	500,000
Strategic Option 7 (Livestock mgt)	4,600,000	6,600,000	6,600,000	5,600,000	5,600,000	29,000,000
Refugee grant support	100,000	100,000	100,000	100,000	100,000	500,000
Marginal and Forest-dependent communities	100,000	100,000	100,000	100,000	100,000	500,000
Strategic Option 8 (Policies)	400,000	400,000	400,000	400,000	400,000	2,000,000
TOTAL Establishment phase USD	35,318,234	27,860,979	29,559,612	27,909,232	28,897,232	149,545,293

For MWE/FSSD, MWE/NFA, MAAIF, MEMD, UWA, Districts and NAADS there should be a separate internal short project document to show how these institutions intend to use their respective funding support in the REDD+ operations. Each of them have been allocated a minimum of one million US dollars for the Costed Action Plan implementation for which they need to have a concrete plan for technical activities and financial matters in implementing the respective sector support projects.

The funding provision for the Ministry of Local Governance is provided both for strengthening of MOLG and its departments' own structures and staffing, but also for this ministry's service provision for communities. MOLG and its departments have an important role to fill as extension providers to rural communities and in contracting external service providers such as civil society organizations, private entities, industrial companies to support rural communities and individual households and businessmen with extension and other services needed.

OPM will supervise the involvement of refugees at the national level, while the actual work will be conducted in the districts with most of the budget allocations directed via MOLG's Community Development Office with some technical support from various UN organizations and CSOs active with refugees. MoGLSD will supervise the involvement of gender issues, ethnic minority and marginalized group involvement in all strategic option activities at national level, while the actual work with most of the budget resources will be conducted in the districts under MOLG's Community Development Office

Thereby, the aim is to ensure the possibilities for the refugees, ethnic minorities and marginalized households to be fully involved in the REDD+ activities. It is paramount to have these separate budget allocations to secure the environmental and social safeguards and ESMF framework.

Finally, there are allocations to some external service providers for provision of services for REDD+ operations in the field. In cases of the police and fire department, UBOS and county tree nurseries these allocations can be provided fairly directly against a plan for implementation and as long as funding is available within the budget line for each Strategic Option. The support to service providers could be against application or even tendering if there is sufficient competition for the service provision.

5.2.2 Budget for the following 20 years of REDD+ implementation

The budget (Table 17) for the 20 years that follow after the first five years (i.e. the Five-Year Costed Action Plan) is mainly indicative, but it still gives good indication on the budget allocations needed to fulfil REDD+ implementation at the national scale in Uganda when all the REDD+ operations are integrated in respective sector financing.

The 20-year budgeting format is following the 5-year budgeting. However, the aim has been to gradually reduce the budget over the years as less support is needed towards the end of the REDD+ programme. The reason for this is that more resources are needed to establish and develop capacity during the first years. Towards the end of the REDD+ programme duration all activities are already up and running and

various investments are already made. Therefore, the last years are mainly focused on reaping the benefits of the investments made during the early years.

Table 17. 20-year budget for Uganda national REDD+ programme establishment phase.

Budget item	2023-	2028-	2033-	2038-	Total in
	2027	2032	2037	2042	USD
	USD	USD	USD	USD	
MoFPED					
MoFPED and staff	192,000	200,000	220,000	240,000	852,000
REDD+ Technical CU/crosscutting					
MWE/MAAIF/MEMD/ MTWA/UWA secondments & TCU office & support	8,028,800	8,028,800	8,028,800	8,028,800	32,115,200
OPM service support	2,000,000	1,000,000	1,000,000	1,000,000	5,000,000
MoGLSD service support	4,000,000	4,000,000	4,000,000	4,000,000	16,000,000
UBOS support	1,000,000	1,000,000	1,000,000	1,000,000	4,000,000
NAFORRI research	1,200,000	1,200,000	1,200,000	1,200,000	4,800,000
NARO research	1,200,000	1,200,000	1,200,000	1,200,000	4,800,000
Academia research	600,000	600,000	600,000	600,000	2,400,000
Strategic Option 1 (CSA)	19,900,000	18,400,000	16,900,000	14,400,000	69,600,000
Refugee grant support	500,000	500,000	500,000	350,000	1,850,000
Marginal and Forest-dependent communities	500,000	500,000	500,000	350,000	1,850,000
Strategic Option 2 (Wood energy)	20,350,000	18,600,000	16,950,000	14,300,000	70,200,000
Refugee grant support	500,000	500,000	400,000	300,000	1,700,000
Marginal and Forest-dependent communities	500,000	500,000	400,000	300,000	1,700,000
Strategic Option 3 (Plantations)	900,000	950,000	950,000	950,000	3,750,000
Refugee grant support	500,000				500,000
Marginal and Forest-dependent communities	500,000				500,000
Strategic Option 4 (CFMs etc)	23,200,000	16,600,000	15,100,000	13,600,000	68,500,000
Refugee grant support	500,000	500,000	400,000	350,000	1,750,000
Marginal and Forest-dependent communities	500,000	500,000	400,000	350,000	1,750,000
Strategic Option 5 (EES Stoves)	16,700,000	15,500,000	14,000,000	13,000,000	59,200,000
Refugee grant support	500,000	500,000	400,000	350,000	1,750,000

Marginal and Forest-dependent communities	500,000	500,000	400,000	350,000	1,750,000
Strategic Option 6 (Wildfires)	5,000,000	5,000,000	5,000,000	5,000,000	20,000,000
Refugee grant support	500,000	500,000	400,000	350,000	1,750,000
Marginal and Forest-dependent communities	500,000	500,000	400,000	350,000	1,750,000
Strategic Option 7 (Livestock mgt.)	13,000,000	10,000,000	8,000,000	6,000,000	37,000,000
Refugee grant support	500,000	500,000	400,000	300,000	1,700,000
Marginal and Forest-dependent communities	500,000	500,000	400,000	300,000	1,700,000
Strategic option 8 (Policies)	1,000,000	850,000	650,000	500,000	3,000,000
TOTAL REDD+ programme USD	125,270,800	109,128,800	99,798,800	89,018,800	423,217,200

5.2.3 Mechanisms for supervision, coordination and stakeholder participation

The Ministries and Local Governments will mainly have to rely on the existing accounting systems, procedures, decision making platforms and monitoring systems to advance the implementation of the REDD+ National Strategy. A monitoring and evaluation system and a SESA implementation structure will be added, though. Those Accounting Officers failing to account for the previous budget releases stand with the risk to delay additional releases in time and/or to be replaced by the Permanent Secretary, MFPEd. A key activity envisaged under this strategy is to build the capacities of the existing and new staffs in using government planning, budgeting and reporting systems.

On the other hand, the civil society organizations and private sector can also access the resources based on Memorandum of Understanding with Strategic Option lead agencies for activities under the REDD+ National Strategy and/or as service providers with contracts, who can only be paid based on successful delivery. Thus, the MoUs or contracts become instruments for articulation of outputs and outcomes that have to be delivered within the specified period and the budget.

5.2.4 Linkages with districts/local governments

Local governments receive their conditional grants for their identified activities through the respective line ministries. For example, the conditional grants for forestry to local governments are released by the Ministry of Water and Environment, while those for agriculture are released by the Ministry of Agriculture, Animal Industry and Fisheries.

5.2.5 Financial monitoring, reporting, communication and feedback on REDD+ financial implementation

The financial monitoring, reporting, communication and feedback on financial implementation should be established in a similar manner as the M&E Framework planning and management presented in Chapter 4.2.10. The actual civil servants, who carry this out, will be in most cases different from the technical follow-up M&E Framework, but organizations involved will be the same ones. It is further advisable that some core management staff personnel at the national level check jointly through both technical and financial management before this information is submitted forward to the national REDD+ Technical Coordination Unit. In this manner any mistakes can be detected already at district, national and REDD+ Technical Coordination Unit level (FCPF 2013 and 2017).

5.2.6 Risk management

Some sub-national level financial risks and their mitigation measures listed in Table 18.

Table 18. Some sub-national level financial risks and their mitigation measures.

Risk type	Mitigation measures
Too high expectations of various stakeholders on REDD+ and the ambition will drop before the process start moving	Good information sharing, training and extension to prepare all kinds of stakeholders in about REDD+ process and progress must be in place from start, so that people know how results are accumulating in their own and other areas of Uganda. Please see also some additional comments under national level risk management.
Shortage or inadequacy of trained staff personnel in various governmental organizations to successfully get REDD+ on track	Capacity building through training and demonstration actions at all levels of REDD+ implementation. The perceived training will be in the form of hands-on training at DLGs and workshops at all levels. New REDD+ experts to be employed for all districts and the REDD+ National Coordination Unit. This has been budgeted in the REDD+ programme budget and the action plan contains a description of the manner of staff personnel training.
Identifying of sufficient funding for REDD+ implementation is likely to be somewhat challenging	All manners of fund-raising must be explored besides actual carbon trading options. This will mean all kinds of international and national programme and project funding must be geared towards REDD+ strategic option activities. Exploring all kinds of nationally, district and locally

	available funding from investors, cooperatives, industries, and rural households.
Fiduciary challenges	Prudent financial management systems and controls will be developed at the onset of the project implementation. Strategic Option 8 is designed to deal with this problem to strengthen the implementation of all strategic options.
Corruption	Compulsory, all national and sub-national implementation plans must contain an anti-corruption plan. Strategic Option 8 is designed to deal with this problem to strengthen the implementation of all strategic options.

5.3 Subnational arrangements for financial management

5.3.1 Overview of sub-national financial management

The Five-Year Costed Action Plan (i.e. 2018 – 2022) including the proposed national REDD+ programme budget and the indicative 20-Year REDD+ Implementation Budget for the years (2023 – 2042) have been presented earlier (Chapter 5.2.1 and 5.2.2). It is proposed that all financial flows are coordinated by the respective strategic option line ministries without circumvention. MOLG is in this respect seen as a line ministry of its own.

5.3.2 Distribution of funding to sub-national partner institutions

All the governmental civil servant organizations operating as partner institutions at the national and sub-national levels will get their annual REDD+ implementation funding from their respective sector line ministries. As all the budget information is transparently and publicly known will each of the partner institutions know how much financial support they should receive annually, and thus the sector line ministry cannot subtract any funding from this annual allocation. On the other hand, all partner institutions will be financially accountable to their sector line ministries.

All the other sub-national level partner institutions, which are not governmental bodies will get their funding against annual work plan and budgets or even against a competitive technical and financial proposal in the case of service providers. No funding should be distributed to the sub-national level without a clear technical and financial plan prepared, which will then be incorporated in the sub-national level Monitoring and Evaluation Framework.

5.3.3 Mechanisms for supervision, Coordination and Stakeholder participation

The sub-national level supervision and coordination will be handled by the respective ministerial bodies operating at the sub-national level and who also have linkages directly to the national level. The platforms used for stakeholder engagement will be taken advantage of, including the Sector Working Groups and joint sector reviews at national level and local government technical committees at local government level, where the participation of the private sector and civil society organizations is encouraged.

5.3.4 Linkages with districts/local governments

The linkages with all categories of local government will be maintained through both formal and statutory platforms for planning, budgeting and monitoring. For the activities, which the Ministries and agencies have comparative advantage to lead (such as in standard setting, updating inventory etc.), they will have to ensure the participation of active CSOs, private sector and traditional/cultural institutions and faith-based organization at local level.

5.3.5 Monitoring & Evaluation, reporting, communication and feedback on REDD+ financial management

The financial monitoring, reporting, communication and feedback on financial implementation should be established in a similar manner as the M&E Framework planning and management at the national level. The actual civil servants, who carry this out will be in most of cases different from the technical follow-up M&E Framework but organizations involved will be the same ones. It is further advisable that some core management personnel at the district level check jointly through both technical and financial management before this information is submitted further in hierarchy to the national level to the respective national strategic option coordinators. In this manner can any mistakes be detected already at district, national and REDD+ Technical Co-ordination Unit level (FCPF 2013 and 2017).

5.3.6 Risk management

Some sub-national level financial risks and their mitigation measures listed in Table 19.

Table 19. Some sub-national level financial risks and their mitigation measures.

Risk type	Mitigation measures
Rural households lack funds for pre-investments	Several of the REDD+ strategic options can be achieved by a step-wise moving from cheaper REDD+ option activities towards more expensive ones. Many national, district, county, community and household type of financial support mechanisms can be developed.
Local government authorities insufficient resources for REDD+ implementation or even current mandate operations	The national sector funding priorities must be changed so that more funding is devoted towards agriculture, forestry and household energy sectors in the national economy. This REDD+ National Strategy has earmarked more funding for DLGs for their operations. Another source is international programme/project funding. Once REDD+ operation starts to function will also rural households and forest owners accumulate more funding by themselves, which is then starting to circulate in the Ugandan rural and national economy.
Fiduciary challenges	Prudent financial management systems and controls will be developed at the onset of the project implementation at district and local levels.

5.4 Financial Arrangement for each of the Strategic Options

In the specific benefit-sharing arrangement study conducted in parallel with the REDD+ National Strategy formulation process the consultants came up with the below Table 20, which covers both monetary and non-monetary benefits that accumulate from the REDD+ Strategic Option activities.

The non-monetary direct and indirect benefits listed in Table 20 will accumulate for the REDD+ Strategic Option activities disregarding these activities are linked to a carbon trading arrangement or not. Therefore, there is a need to incorporate these non-monetary benefits also in the non-carbon trading part of the national REDD+ programme. The non-monetary benefits should be categorized and assigned by the respective National Strategic Option Leaders to each and every government and other institution as well as grass-root stakeholder involved in the implementation of Strategic Option activities in Uganda. In this manner the National Strategic Option Leaders can in progress reports report to the national REDD+ Programme Coordinator how the non-monetary benefits flow in the Ugandan society vis-à-vis a specific REDD+ Strategic Option.

Table 20. Illustrative examples of benefits derived by stakeholders for the forthcoming national REDD+ programme in Uganda.

Monetary	Non-monetary Direct	Non-monetary Indirect
<ul style="list-style-type: none"> • Cash • Economic flow of benefits from tourism • Tax incentives • Access to credit on preferential terms • Salaries and allowances 	<ul style="list-style-type: none"> • Capacity building, training, extension (governance, bookkeeping, nursery and plantation management, environmental management plans) • Community infrastructure like schools, clinics • Legal access to fuel wood and non-timber forest products • Rent-free land for commercial plantations • Alternative livelihoods (community nurseries, shea nuts, beekeeping, coffee, timber, fuel wood, fruit, carbon credits) • Support for acquiring communal and freehold land title • Community nurseries • Ecological restoration and monitoring of priority habitat • Land-use plan; improved land/forest-tenure • Improved market access and business networks • Sense of ownership (especially communities neighbouring or surrounding) 	<ul style="list-style-type: none"> • Reforestation of degraded areas, reduced flood, drought and landslide risk • Improved resilience to seasonal variations • Health benefits, cleaner air from more efficient cook stoves • Improved water quality and quantity • Decreased human/wildlife conflict • Increased support for biodiversity conservation • Improved working relationships (including trans-boundary) • Improved working conditions for employees • Travel opportunities to share knowledge and experiences

Source: MWE Benefit Sharing Arrangement study Final Report 2017.

The main budget funding for the forthcoming national REDD+ programme implementation phases will not be secured in one single contract with any international or national financing agency and instead it will be accumulated from several financing agencies. MWE has already managed to secure part of this budget in the form of the Forest Investment Programme (FIP), which is about to start up in 2017/2018. It is unknown whether other sector line ministries have any similar project initiatives forthcoming. All kinds of financing options from international, national and sub-national sources must be explored. From now on each Ugandan ministry involved in climate change mitigation should (in their on-going projects with forthcoming new phases of financing and in all new projects) support the REDD+ Strategic Option activities to some extent or probably even completely through some kind of project or programme interventions.

Outside the main donor funded budget outlined above there are huge investment needs that are required to be covered by the involved rural and urban private households, communities and private business entities themselves. The aim here is to derive large amounts of funding for REDD+ activities from the grass-root level and each investor will reap the financial profit him/herself from the activity results. REDD+ Strategic Options 1 to 5 are completely depending on such individual small investments. Table 21 presents some potential local financing mechanisms for the REDD+ National Strategy Options, which can support the individual households, the

communities or the private business entities in their respective investment needs for Strategic Option activities. The ideas presented in Table 21 are not fully comprehensible, but give an indication on how the stakeholders see the potential funding situation in their respective regions in the near future.

Table 21. Some potential local financing mechanisms that can be used by individual households, communities and private entities in their respective investments of Strategic Option activities.

Eastern Region	Northern Region	Central Region	Fort Portal W. Region	Mbarara SW Region
Strategic Option: SO1: Climate smart agriculture				
GoU (KCCA Urban farming project, YLP, UWEP), SACCOs, VSLs, Centenary Bank, World Vision, Caritas, BUCADEF, religious institutions, USAID, SNV, WB, and personal savings	Operation Wealth Creation (OWC), NUSAF 3, SACCOs, MWE/REDD+, Village Saving Loan Groups (VSLGs), cooperatives, saving culture promoted, farmer cost sharing, joint contract farming	SACCOs, NGOS, MWE	Commercial banks, SACCOs, cooperatives, own financing, GoU subsidies	Conditional grants, cooperatives, SACCOs, directive funding to farmer groups through proposals, own financing
Strategic Option: SO2: Sustainable wood energy production				
DDED, OWC, GIZ, IUCN, NFA	District Discretionary Grants (DDEG), OWC, GIZ, IUCN, NFA	International NGOs, banks, local government, CBOS, institutions such as UWA, NEMA, UWA	No funding opportunity	No funding opportunity
Strategic Option: SO3: Commercial timber plantations				
Local government though limited and some NGOs	Local government though limited and some NGOs	FIEFOC, SAWLOG, TIST (carbon credit), OWC, NFA (Seedlings and land), MAAIF (Sustainable Land Management), CDOs	Grants by SPGS, lease mechanism by NFA, Uganda Development Bank loans (<10 interest rate), grants from MWE, MAAIF under FIEFOC2, Nat. community Tree Planting Programme by NFA, Pearl	FIEFOC (MWE/MAAIF), SPGS, TIST (donor incentives for carbon credit?), OWC, NFA (seedlings and land provision), MAAIF (sust. land management), CDOs,

Eastern Region	Northern Region	Central Region	Fort Portal W. Region	Mbarara SW Region
			Capital (invest. financiers) for fruit growers, own investment groups	
Strategic Option: S04: Natural forest restoration				
NFA Tree Fund, intern. donors, PES systems	By HHs, Government, Development partners (NGOs and projects)	No local funding opportunities, SPGS and Global Environment fund	No local funding opportunities, SPGS and Global Environment fund	No local funding opportunities, SPGS and Global Environment fund
Strategic Option: S05: Energy efficient stoves				
GIZ, Community connect under USAID, SACCOs, VSLAs, Local government support through departments, Own savings	NGOs (ACORD etc.), GIZ, USAID proj. VSLAs, SACCOs, LGs through departments, own savings, cooperatives	Africa 2000 Network was supporting the stoves Eco trust support	Africa 2000 Network was supporting the stoves, Eco trust support	Africa 2000 Network was supporting the stoves in Kisoro and Kabale, Eco-Trust support in Mitooma
S06: Integrated wildfire management				
No funding known	No funding known	UWA & NFA, Private tree farmers, Forest Farming Associations	None known except fines & penalties	Lead agencies UWA & NFA, Private tree farmers, Forest Farming Associations

Additionally, there are numerous on-going and planned international and national donor projects on topics related to climate change and even carbon financing in many sectors. Many of these on-going projects could be designed differently in their next phases to better take into account the REDD+ strategic option activities and to enable direct financing support for the above mentioned grass-root level households, communities, CBOs and private business entities.

Further there are many CSOs (e.g. Vi Agroforestry, EcoTrust, Planvision) and faith-based organization (e.g. various international and national churches and other religious communities) funded projects in many districts that deal with climate change and have carbon trading activities for the mentioned grass-root level stakeholders.

Locally, the issue of establishing cooperatives and conservation trust funds may not have fully been explored and organized in all districts. Several agricultural commercial commodities have their own national and local cooperatives, which will need to be branched out to new districts or new cooperatives will need to be established.

The Ugandan banking and micro-finance sectors will need drastic reforms so that these really can support rural households much better than they have done so far. The Government may have to provide some guarantee in order for these financing institutions to reduce their (very high) credit loan interests. On the other hand, wood energy and timber producers have to reform also themselves, so that the commodities sold on the market are fully legal and sustainable.

It should further be explored whether agricultural, wood-based, and renewable energy industries and companies could provide investment support for farming and forest-adjacent households. These will later in the commodity value-chains benefit even themselves as better quality products are produced (in standard format that the industries can use optimally in their industrial value-addition production processes). The Government shall assess this and support these processes to take place. It may require some subsidies with the raw material production, but can be turned into revenues and taxes in the other end of the industrial value addition process.

5.5 How carbon financing impacts on the administrative set-up

5.5.1 Overview

The national REDD+ programme will be too large for incorporating carbon financing set-ups for all the REDD+ Strategic Options at full scale. In this sub-chapter, the aim is to describe the carbon trading administrative set-ups that will be needed in the national REDD+ programme. The foreseen transaction costs that are likely to be accumulating from the proposed REDD+ Strategic Option activities are summarized in Table 22.

Table 22. Foreseen transaction costs for each proposed strategic sub-option.

Strategic sub-option	Transaction costs foreseen
SSO 1.1. Agroforestry and SLM practices	TCs will be very high on large-scale in particular. S01.1 will always be a pro-poor alternative as a carbon trading arrangement.
SSO1.2. Rainwater harvesting with tank and drip irrigation	TCs will be high, but less so than SSO1.1.
SSO 1.3. Greenhouse cultivation of vegetables	TCs could be affordable if some new MRV method for this is developed to assess the actual impact of carbon emission reduction in neighbourhood of greenhouses.
SSO 2.1. Sustainable energy wood plantations with agroforestry	TCs can be affordable, but this kind of carbon trading should first start in project scale and then later expand if still feasible.
SSO2.2. Small-holder timber plantation with coffee agroforestry	TCs can be affordable.
SSO 2.3. Improved charcoal kilns linked to energy wood plantation sites	TCs should be affordable with a good centralized MRV system in place.
SSO 3.1. Transmission pole and timber plantations	TCs should be affordable with a good MRV system in place. Carbon auditing costs and other TCs will be reduced per ha when there are larger amounts of centralized plantations involved.
SSO3.2. Commercial saw-log plantations	TCs should be affordable with a good MRV system in place. Carbon auditing costs and other TCs will be reduced per ha when there are larger amounts of plantations.
SSO 2.3. Improved charcoal kilns linked to timber plantation sites	TCs should be affordable with a good centralized MRV system in place.
SSO 4.1. Designated areas for natural forest regeneration	Difficult to upscale to a national programme scale. TCs can be affordable.
SSO 4.2. Protected natural forest management (i.e. national parks and forest reserves)	Difficult to upscale to a national programme scale. TCs can be affordable.
SSO 4.3. Devolution of forest management through PFM and	This SSO is linked to the SSO 4.1. and 4.2.

similar set-ups	
SSO 4.4. Traditional/ customary forest management practices	This SSO is linked to the SSO 4.1. and 4.2.
SSO 5.1. Energy efficient fuelwood stoves	TCs will be high on large-scale in particular. Difficult to up-scale with affordable TCs. May remain a pro-poor alternative as carbon trading arrangement.
SSO 5.2. Improved charcoal stoves	TCs will be high on large-scale in particular. Difficult to up-scale with affordable TCs. May remain a pro-poor alternative as carbon trading arrangement.
SSO 6.1. Integrated wildfire management	TCs may be affordable as this carbon trading can be operated for entire districts and MRV assessed with satellite images annually. Technical assistance needs and capacity building efforts can be targeted based on problem areas identified from satellite images.
SSO 7.1. Livestock breeding programme	TCs for carbon trading is non-relevant here as this action has only some indirect relevance to carbon emissions.
SSO 7.2. Establishment of drinking water dams for livestock	TCs for carbon trading is non-relevant here as this action has only some indirect relevance to carbon emissions.
SSO 7.3. Establishment of fodder agroforestry plantations	As the agroforestry plantations specifically are to be used for annual fodder production for livestock will the carbon sequestered into fodder trees and grasses be uninteresting from carbon trading viewpoint. As the agroforestry plantations aim to provide additional fodder in a fodder scarce environment is not even the indirect carbon sequestration of importance from carbon trading view.
SSO 8.1. Strengthening of policy enforcement in REDD+ implementation	This activity is kind of overlapping with the other strategic option activities in that it strengthens to implementation of the other ones and therefore it has no carbon sequestration or emissions by itself.

It can be concluded that all the Strategic Options and their respective sub-options could be possibly operated to some extent as REDD+ carbon trading arrangements, but some sub-options are better in this respect than others. However, the proposed Strategic Options are also feasible without carbon trading, which means that any carbon trading is just an extra income source on top of the main income from private and public investment in these strategic option activities.

It is foreseen that at least four types of carbon trading set-ups are feasible to be conducted within the national REDD+ programme:

- a) Carbon trading from large-scale timber plantations (Strategic Option 3)
- b) The nested approach FIP Project carbon trading, pilot scale REDD+ strategic option activities in certain districts of Uganda;
- c) Other carbon trading opportunities directly within the national REDD+ programme;
- d) Various separate small-scale programmes and projects that incorporate carbon trading.

5.5.2 Carbon trading from large-scale timber plantations (Strategic Option 3)

To arrange carbon trading from large-scale timber plantations is foreseen as the easiest alternative for carbon trading within the national REDD+ programme of Uganda. This carbon trading arrangement will require a proper monitoring, reporting and verification (MRV) process to be established, which incorporates all those large timber plantations that are intended to be involved in the carbon trading arrangement. These plantations will need establishment of good inventory demarcation and auditing structures in and around the plantations as well as relevant plantation and fire management plans in place. There should also be good registration archives at UTGA and the REDD+ Technical Coordination Unit for all involved timber plantations.

The national REDD+ programme budget need to have provision for the needed salary, social costs and equipment for the employment of a carbon trading expert to UTGA or to the National REDD+ Technical Coordination Unit, who will oversee the actual carbon auditing supervision from the Ugandan government side as well as for the actual carbon trading operations. The respective participating timber plantation owners should have the opportunity to choose whether they want to purchase the UTGA carbon trading expert's services or whether they want to conduct the carbon trading themselves. In the latter case, the timber plantations owners would operate their carbon trading operations as a kind of separate carbon project. There will be both pros and cons for such a separate carbon trading project set-up, which are at least the following:

- One would have to pay annual salary to a person who handles the carbon trading and auditing arrangements instead of just paying for needed services every five years or so;
- The carbon trading transaction costs will be covered by the plantation owner in both cases, but in the national REDD+ programme participation case there could be some financial support for transaction costs. On the other hand, any received carbon funding would have to be shared between several benefitting stakeholders

(i.e. the plantation owner and the national REDD+ programme governmental organizations).

5.5.3 The nested approach FIP Project carbon trading activities in certain districts of Uganda

This nested approach FIP carbon trading project operations will be started up in the Lake Albert, Lake Kyoga and Upper Nile Water Management Zones, which together constitute over three fourths of the whole Ugandan land area. FIP is mainly funded by the World Bank and there are close links to the WB Forest Carbon Partnership Facility, which have already indicated the will to finance the carbon emission reduction operations within FIP. The FIP project document further states the intention to gradually replicate and expand the carbon emission reduction program activities from the referred water management zones to other ones in Uganda perhaps in accordance with a REDD+ zonal management model. The designing of the carbon emission reduction program operations may be concretized at later stage. The FIP project will be a separate entity, although it will be in practice closely affiliated with the national REDD+ programme operations.

5.5.4 Other carbon trading opportunities directly within the national REDD+ programme

Regarding direct carbon trading within the national REDD+ programme, firstly, it will be an advantage to carefully follow how the FIP ERP operations are taking shape and then follow suit. It will be wise to start up such carbon trading operations initially as projects with clear administrative boundaries of sub-county, county or district sizes. For some strategic options, it will be difficult to conduct MRV and auditing operations, while others are more easily managed. From the MRV point of view the easier type of strategic option activities could, for instance, be the following ones:

- Establishment of greenhouses (SO 1.3);
- Establishment of energy wood plantations (SO 2.1);
- Establishment of improved charcoal kilns (SO 2.3 and SO 3.3);
- Installation of EES stoves in some administrative location with clear boundaries (SO 5.1);
- Installation of ICS stoves in some administrative location with clear boundaries (SO 5.2);
- Integrated wildfire management operations in some clearly demarcated areas (SO 6.1).

For the other strategic option activities it would be best to observe how the FIP ERP operation and some of the “We Agroforestry”-project operations succeed in their

carbon trading activities before starting any similar activities directly within the national REDD+ programme.

5.5.5 Various programmes and projects that incorporate carbon trading

There are already quite a few individually operating carbon trading projects and programmes on-going in Uganda and it would be unwise to either force these to integrate completely under the national REDD+ programme or to ban any new such projects from starting up in the future. These existing projects and programmes already have their carbon trading structures and benefit sharing arrangements in place and these could be hampered considerably if these projects are forced to operate directly as parts of the national REDD+ programme. Their manner of operation may also have been designed to function on a small scale and their source of carbon funding may function better if they are left alone. These projects may also substantially contribute to the overall REDD+ operations in Uganda, e.g. demonstrating the carbon funding and livelihood improvement potential of REDD+.

5.5.6 Benefit sharing arrangements from REDD+ carbon trading

The ways how carbon trading transaction costs are likely to accumulate in each respective REDD+ Strategic Sub-option activity were analysed above (in Sub-chapter 5.5.1). Table 20 (in Sub-chapter 5.4) presented what kinds of monetary and non-monetary benefits there can be expected from the forthcoming national REDD+ programme of Uganda and it was concluded in the same sub-chapter that non-monetary benefits will also accumulate from non-carbon trading REDD+ activities. This sub-chapter presents how the sharing monetary benefits can be arranged.

There are four types of carbon trading arrangements (as stated earlier), which are the most likely ones to become realized in the National REDD+ Programme. As these four kinds of carbon trading arrangements are different in their scope and performance, different monetary benefit sharing arrangements are needed to be developed for each arrangement:

a) Carbon trading from large-scale timber plantations (Strategic Option 3):

The Strategic Option 3 has got as a line ministry responsible for it can be organized as a project or programme operated by this line ministry involving only those entities (government, other institutions and private sector business or community), which are directly involved in the actual Strategic Option 3 operations connected to the carbon trading contract with one or several carbon trading organizations (voluntary or financing institution based). The involved parties should be particularly mentioned in the carbon trading contract. Entities can also be involved in carbon trading arrangements, which are covering only parts of this strategic option and will then be handled under points b) and d) below.

b) The nested approach FIP Project carbon trading pilot scale REDD+ strategic option activities in certain districts of Uganda:

In this case the carbon trading arrangements cover one or several (even all) strategic option activities of the national REDD+ programme in some pilot areas of Uganda (i.e. four areas have been specified in FIP). It is recommended that BSA is then organized as a local project or programme under MOLG in the specified pilot area. However, the FIP pilot areas are not following closely the administrative boundaries in the selected watershed ecozones, which means that there may be several projects where each project follows the respective administrative (i.e. county or sub-county) boundaries. Other government bodies operating in the project area such as NFA, UWA, and other similar bodies that are not under the ministerial mandate of MOLG should be assigned shares in the BSA in accordance with the performance under these organizations out of the total carbon trading income that accumulates in the carbon trading project. MOLG will also coordinate that other locally directly involved stakeholders are given their share as outlined in the BSA study (please see MWE BSA Report 2017).

c) Other carbon trading opportunities directly within the national REDD+ programme:

There may be also other national or district level REDD+ strategic options besides those concerning SO3, which can be carbon trading arrangements. In this case there should be each strategic option contracted for carbon trading separately from other strategic options and the respective national SO leader should be in charge of the carbon trading arrangement coordination as in point a) above.

d) Various small-scale separate programmes and projects that incorporate carbon trading:

These kinds of carbon trading arrangements can be organized by CSOs or international or national projects funded by international or national financing agencies or organizations (such as e.g. church aid or voluntary groups). All of these carbon trading arrangements will target specified smaller areas or specific individual households or communities and will be coordinated by a non-government body such as a project or CSO. In this case will only those directly involved parties be involved in the monetary BSA in accordance to rules set by the project coordinating body or the CSO themselves.

6. Integration of REDD+ National Strategy with other REDD+ Processes

6.1 REDD+ Readiness Preparation and Implementation Frameworks

UNFCCC COP Decision 1/CP.16 (paragraph 71) requests developing country Parties aiming to undertake the REDD+ activities in accordance with national circumstances and respective capabilities, to develop the following elements:

- (a) A national strategy or action plan;
- (b) A national forest reference emission level and/or forest reference level (or sub-national one as an interim measure);
- (c) A robust and transparent national forest monitoring system for the monitoring and reporting of the activities;
- (d) A system for providing information on how the safeguards referred to in Appendix I to Decision 1/CP.16 are being addressed and respected throughout the implementation of the activities.

According to this Warsaw Framework for REDD+ forest reference emission levels and/or forest reference levels (FREL/FRL) expressed in tonnes of carbon dioxide equivalent per year are benchmarks for assessing each country's performance in implementing the activities (Decision 1/CP.16, paragraph 70). The referred forest sector activities include

:

- (a) Reducing emissions from deforestation;
- (b) Reducing emissions from forest degradation;
- (c) Conservation of forest carbon stocks;
- (d) Sustainable management of forests; and
- (e) Enhancement of forest carbon stocks.

FREL/FRL shall be established taking into account methodological guidance provided in Decision 4/CP.15, paragraph 7, and maintaining consistency with anthropogenic forest related greenhouse gas emissions by sources and removals by sinks as contained in each country's greenhouse gas inventories. A qualified FREL/FRL submission is expected to specify a forest definition, scale, reference period, scope of activities, carbon pools and greenhouse gases, and adjustment needs considered (Annexes of Decision 12/CP.17 and Decision 13/CP.19). The FREL/FRL submission must present information that is transparent, complete consistent with guidance agreed by the Conference of the Parties (COP) and accurate for the purpose of allowing a technical assessment of the data, methodologies and procedures used. The

information provided should be guided by the most recent Intergovernmental Panel on Climate Change guidance and guidelines, as adopted or encouraged by the COP.

Decision 11/CP.19 outlines the modalities for national forest monitoring systems. The robust national forest monitoring systems should provide data and information that are transparent, consistent over time, and are suitable for measuring, reporting and verifying anthropogenic forest-related emissions by sources and removals by sinks, forest carbon stocks, and forest carbon stock and forest-area changes resulting from the implementation of the activities. They are to be consistent with guidance on measuring, reporting and verifying nationally appropriate mitigation actions by developing country Parties agreed by the Conference of the Parties, taking into account methodological guidance in accordance with decision 4/CP.15.

Decision 4/CP.15 outlines methodological guidance for activities relating to reducing emissions from deforestation and forest degradation and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries. It requests developing country Parties

- (a) to identify drivers of deforestation and forest degradation resulting in emissions and also the means to address these;
- (b) to identify activities within the country that result in reduced emissions and increased removals, and stabilization of forest carbon stocks;
- (c) to use the most recent Intergovernmental Panel on Climate Change guidance and guidelines, as adopted or encouraged by the Conference of the Parties, as appropriate, as a basis for estimating anthropogenic forest-related greenhouse gas emissions by sources and removals by sinks, forest carbon stocks and forest area changes;
- (d) to establish, according to national circumstances and capabilities, robust and transparent national (and sub-national) forest monitoring systems that
 - (i) use a combination of remote sensing and ground-based forest carbon inventory approaches for estimating, as appropriate, anthropogenic forest-related greenhouse gas emissions by sources and removals by sinks, forest carbon stocks and forest area changes;*
 - (ii) provide estimates that are transparent, consistent, as far as possible accurate, and that reduce uncertainties, taking into account national capabilities and capacities; and*
 - (iii) are transparent and their results are available and suitable for review as agreed by the Conference of the Parties.*

Appendix I to Decision 1/CP.16 provides guidance and safeguards for policy approaches and positive incentives on issues relating to REDD+ activities. The

following (Cancun) safeguards should be promoted and supported in scope of REDD+ implementation:

- (a) Actions that complement or are consistent with the objectives of national forest programmes and relevant international conventions and agreements;
- (b) Transparent and effective national forest governance structures, taking into account national legislation and sovereignty;
- (c) Respect for the knowledge and rights of indigenous peoples and members of local communities, by taking into account relevant international obligations, national circumstances and laws, and noting that the United Nations General Assembly has adopted the United Nations Declaration on the Rights of Indigenous Peoples;
- (d) The full and effective participation of relevant stakeholders, in particular indigenous peoples and local communities
- (e) Actions are consistent with the conservation of natural forests and biological diversity, ensuring that the actions are not used for the conversion of natural forests, but are instead used to incentivize the protection and conservation of natural forests and their ecosystem services, and to enhance other social and environmental benefits;
- (f) Actions to address the risks of reversals;
- (g) Actions to reduce displacement of emissions.

In order to comply with both the Cancun safeguards and World Bank's Operational Policies and Procedures, the REDD+ countries are required to carry out a Strategic Environmental and Social Assessment (SESA). That process results to an Environmental and Social Management Framework (ESMF) that sets out the principles, rules, guidelines, and procedures to assess potential environmental and social impacts and risks, and contains measures to reduce, mitigate, and/or offset adverse environmental and social impacts and enhance positive impacts and opportunities of the REDD+ projects, activities, or policies/regulations.

The national forest monitoring systems (NFMS) may provide data and information that is relevant for other components of the REDD+ information system, such as the Safeguards Information System (SIS) (UNFCCC Decision 1/CP.16). SIS provides a systematic approach for collecting and providing information on how REDD+ safeguards are being addressed and respected throughout REDD+ implementation, which are to be submitted periodically in national communications to the UNFCCC. The SIS design covers indicators for determining whether a policy or intervention is being effectively implemented; methodologies for information collection; and framework for provision of information (storing and sharing). SIS is also expected to be country-driven, built preferably upon existing or new relevant information systems, and created through policies, laws and regulations to gather and manage safeguard information at the national level.

The REDD+ implementation framework defines institutional, economic, legal and governance arrangements necessary to implement REDD+ strategy options (FCPF/UN-REDD 2015). Country-specific solutions need to define the role of government, landowners, and other participants in REDD+ transactions, to share and deliver REDD+ benefits, to respect the rights of Indigenous Peoples and forest-dependent communities, to clarify land tenure to the extent possible and mediate associated conflicts, and to manage carbon transactions through a transparent process.

The success of REDD+ is expected to depend on the design and implementation of benefit-sharing mechanisms and arrangements, which are operational at multiple levels of governance (Thuy 2013). They can allow affected communities to become partners in REDD+ activities, governments to achieve greater social inclusiveness, and investors to reduce risks associated with a project. If benefits are equitably shared with local stakeholders, it will also reduce the likelihood of reversals of emission reductions, which could be caused by local populations that lack economic alternatives. To facilitate transparent monitoring a national REDD+ information system or registry should be in place to provide public access to geo-referenced information on the location, ownership, carbon accounting and financial flows for sub-national and national REDD+ programs and projects (FCPF/UN-REDD 2015).

Feedback and Grievance Redress Mechanisms (FRGM) are based on an assessment of existing national institutional capacity for feedback and grievance redress, including to identify existing and potential conflict and grievances that could arise during REDD+ readiness, and implementation of REDD+ National Strategy activities; to identify mechanisms that can detect, prevent and minimize the escalation of, and resolve conflicts and grievances; to strengthen policy, legal and institutional framework for managing grievances and; to strengthen institutional capacity and presence of an active mechanism to receive feedback and handle conflict in a timely manner and at all levels; and to build the capacity on REDD+ Readiness and FCPF for key stakeholders and personnel on the presence of a clear FGRM.

6.2 A tool for REDD+ strategy integration in the context of Uganda

The preliminary forest reference level (FRL) was submitted to UNFCCC in January 2017, but the revised contents were elaborated in June 2017 (MWE 2017). This document has been developed by the Ministry of Water and Environment, through a partnership between the Forestry Sector Support Department and the National Forestry Authority. The building blocks of this FRL were developed by the MRV Task Force, technically reviewed by NTC and endorsed by NCCAC. They include forest definition (minimum tree cover of 30 per cents, minimum area of 1 hectare attaining minimum height of 4 meter), determination of scale (national), reference period

(2000-2015), scope of activities (forest remaining as forest, forest to non-forest, non-forest to forest), gases (CO₂) and pools (AGB, BGB). The produced activity data and emission factors distinguish tropical high forests, woodlands and forest plantations.

Development of the Uganda's National Forest Monitoring System and Measurement, Reporting and Verification (MRV) System supported by the UN-REDD National Programme component is still at its early stages. The process and discussions for institutional arrangements for the NFMS development and functionalities have started. NFMS is intended to meet all its monitoring functions of the NFMS and MRV under national, regional and international requirements and obligations. Uganda looks forward to additional resources to improve estimation of emissions from forest degradation, update data series and implement NFI in 2018.

Uganda's functional safeguards and safeguards information system (SIS) is intended to provide the most modern and integrated approach for monitoring social and environmental risks and benefits that may arise from the implementation of REDD+ activities in consistency and compliance with national, regional, international and development partners safeguard frameworks. Safeguards reports are expected to contain information how safeguards are respected and addressed. They can be generated through SIS building on linkages between safeguards and other aspects of the national REDD+ action plan. The construction process of a functional SIS in Uganda includes i) development of the national REDD+ safeguard standards (criteria and indicators), ii) the completed participatory SESA of REDD+ National Strategy options, iii) identifying and mapping prioritized biodiversity and ecosystem-based multiple benefits of REDD+, and iv) preparing an integrated SIS architecture that brings different safeguards together including potential linkages with NFMS.

Uganda submitted its initial national communication in 2002 and the second national communication in 2014 to UNFCCC. The second communication includes respective chapters for the national circumstances; national greenhouse inventory (2000); impact, vulnerability and adaptation measures; measures to mitigate climate change; constraints, gaps, and related financial, technical and capacity-building needs; and other relevant information for reaching convention objectives. The REDD+ National Strategy feeds into the 3rd national communications process with the mitigation action plan including potentially the agriculture, land use change and forestry, and energy sectors.

The national greenhouse gas inventory framework provides the reference to design interventions that address the most significant emission sources at national level. The UNFCCC COP Decision17/CP.8 and IPCC guidelines (1996, 2003 and, 2006) and publicly available data have been applied for the second national greenhouse gas inventory, which applies year 2000 as the base year. The emission estimates cover five inventory sectors: energy, industrial processes, agriculture, land use, land use change and forestry, and waste. The greenhouse gases reported include carbon

dioxide (CO₂), carbon monoxide (CO), methane, (CH₄), nitrous oxide (N₂O), nitrogen oxides (NO_x), sulphur dioxide (SO₂) and non-methane volatile organic compounds (NMVOC). LULUCF is a key component of the GHG inventory. CO₂ and non-CO₂ GHG emissions and removals have been estimated in the six LULUCF land categories, forests, grassland, cropland, wetlands, settlements, other lands.

Table 23 serves as a supporting tool and describes the direct means of integration the REDD+ Strategy and Action Plan and implementation framework elements and other relevant processes including greenhouse gas inventory.

Table 23. The REDD+ National Strategy integration with FRL, NFMS/MRV, SIS, GHG-I, NC, FGRM, BSA, and ESFM processes.

Process	Means of integration for implementation
Forest Reference Levels	<ul style="list-style-type: none"> • Setting up a business-as-usual baseline benchmark value to assess the impacts of the REDD+ National Strategy measures, actions and interventions that result to reduced emissions and/or increased removals, and forest carbon stocks • Stepwise approach to improve methodologies and to extend scope of activities, carbon pools and gases when FRL is updated with 5-year intervals.
National Forest Monitoring System / Measurement, Reporting and Verification	<ul style="list-style-type: none"> • Measuring, reporting and verifying anthropogenic forest-related emissions by drivers, sources and removals by sinks, forest carbon stocks, and forest carbon stock and forest-area changes resulting from implementation of the REDD+ activities • Monitoring the performance of implementation of national REDD+ related policies and measures and national strategies or action plans that could include monitoring of capacity-building technology development and transfer and results-based demonstration activities, to be able to provide recommendations for new policies and measures • Monitoring the performance of policies and measures from other sectors which have implications for REDD+, to be able to provide recommendations for new policies and measures
Safeguard Information System for promoting and respecting Cancun safeguards	<ul style="list-style-type: none"> • Monitoring for managing social and environmental risks and benefits that will arise from implementation of the REDD+ activities • Monitoring that REDD+ National Strategy addresses environmental and social priorities associated with changing patterns of land use and forest management • Indicators, methodologies and framework of information provision are specified as part of the SIS design • REDD+ National Strategy revision and prioritisation

	<p>process to consider the co-benefits when assessing the socio-economic impacts</p>
National greenhouse gas inventory	<p>REDD+ National Strategy interventions may need to be revised to address the most significant emission sources reported in the national greenhouse gas inventories.</p>
National Communication	<p>The REDD+ National Strategy contributes with the contents on the Nation Communication chapters regarding</p> <ul style="list-style-type: none"> • the drivers of forest degradation and deforestation, • the national strategy and action plan on mitigation interventions and reference scenarios concerning the energy, agriculture and LULUCF sectors.
Benefit Sharing Arrangements (BSA)	<ul style="list-style-type: none"> • refers to the institutional set-up and the financing arrangements of the REDD+ National Strategy • REDD+ National Strategy provides frameworks with robust indicators for each strategic option to assess intervention performance funds according to the verified performance • proportional distribution of funds to the different actors along the chain of intervention defined for each Strategic Option • verified benefits generated by the strategic interventions are channelled down by the BSA system.
Feedback and Grievance Redress Mechanism (FGRM)	<ul style="list-style-type: none"> • The major sources for the existing conflicts and grievance issues are as following: <ul style="list-style-type: none"> ○ unclear boundaries of the forest protected areas; ○ exclusion of local governments from the management of central forest reserves; ○ exclusion of forest adjacent communities from the management of forests; ○ failure by institutions to fulfil their mandate and landlessness resulting from unplanned population growth • The major causes of the existing conflicts and grievances issues have been already taken into consideration in developing the different strategic options and their implementation arrangements • Continuous attention needs to be paid when planning and implementation of REDD+ strategic options to avoid the identified causes of the existing conflicts and grievances.

<p>Environmental and Social Management Framework (ESMF)</p>	<ul style="list-style-type: none"> • Pointing out the residual risks identified in scope of SESA, but to be handled outside the REDD+ National Strategy implementation: land tenure and resettlement issues • Resourcing the Ministry of Lands for continue and intensify its activities in the areas of the REDD+ National Strategy implementation, including: <ul style="list-style-type: none"> ○ Giving communal land certificates in areas where communal land ownership is practiced, free of charge to the communities ○ Intensification of giving land certificates in all parts of the country, accompanied by activities to sensitize people on the need for land registration ○ Carrying out boundary demarcation, land registration and land titling • Implementation of the Resettlement Framework for Indigenous Marginalized People, Forest-Dependent Communities and Informal Occupants of Gazetted Forests
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7. Cross-cutting issues: Land tenure, capacity-building and gender integration

7.1 Land tenure arrangements as a pre-requisite for REDD+ implementation

Land ownership and shared utilization rights are likely to have a serious impact on the speed and progress of REDD+ implementation. To support the REDD+ process, it is strongly recommended that the Government allocates a substantial budget and other resources so that the Ministry of Lands can continue and intensify the on-going and new activities that would be relevant to the REDD+ implementation, including:

- Giving communal land certificates in areas where communal land ownership is practiced, free of charge to the communities as already done in parts of Kasese, Karamoja, and Northern Uganda.
- Intensifying the Systematic Land Adjudication and Certification project, giving land certificates in all parts of the country. A focus should be on areas where land has not been registered before, accompanied by activities to sensitize people on the need for land registration. So far, Shema, Apac and Lango districts have benefited from this project.
- Carry out boundary demarcation and land registration, possibly land titling of all CFRs where this has not been done, in cooperation between NFA and MLHUD.

7.2 Capacity needs and capacity building arrangements

7.2.1 Capacity gaps

There are people in the core ministries, private sector, research bodies and in NGOs, who have been for a long time involved in REDD+ preparation work and have in-depth knowledge of many aspects of REDD+ work. Also districts and lower levels have technical experts, who have field experience with several of the proposed selected strategic option activities although these activities have not earlier been realized as strategic option activities.

All the capacity gaps are not known at the moment, but the major ones relate to the actual REDD+ implementation. The list of capacity gaps could be presented as follows:

- An overview of REDD+ set-up for Uganda;

- Presentation of each strategic option and sub-options as these will be implemented under the respective line ministries;
- Various REDD+ concepts and their meaning;
- Mechanisms for supervision, coordination and stakeholder participation;
- Linkages with districts/local governments;
- Monitoring, reporting, communication and feedback on the REDD+ National Strategy Implementation;
- Risks and their mitigation measures;
- Financial management structures at national and sub-national levels;
- Financing mechanisms for implementation of the selected REDD+ strategic option activities;
- Means and tools for integrating international and national projects with the REDD+ strategic option activities;
- Building up of extension services for REDD+ implementation;
- Establishment of various producer associations and cooperatives needed for REDD+ implementation;
- Policy enforcement and anti-corruption issues.

The Forestry Investment Programme under MWE will also start soon and implement the selected REDD+ strategic options in three large watershed management zones of Uganda. The FIP process will identify many gaps and develop many training materials, which can be used in the National REDD+ training events later.

7.2.2 Capacity building needs and capacity building arrangements

The REDD+ Technical Coordination Unit and the respective Strategic Option Coordinators should make a study tour to some other African country, which has already started up the REDD+ implementation with all administrative and management set-ups in place. The FCPF and the UN-REDD Programme could also potentially assist in arranging a training session for these persons in Uganda. The relevant training needs will also evolve in the process once the first training sessions have been held and the participants have been able to comment on capacity gaps they perceive.

The above-mentioned core REDD+ management staff persons would in the next stage of training and capacity building be the trainers of other senior civil servants in the ministries and other governmental bodies that will be crucial for REDD+ implementation, including senior district technical experts, who have core roles in the district level management of REDD+ programme operations. These persons will then in their turn train other district level experts, so that eventually there will be sufficient REDD+ expertise in each district of Uganda (in forest, agriculture, livestock and wood energy issues).

The district REDD+ experts will be in charge of REDD+ operations in their respective districts and their first task is then to train their other colleagues in the districts, as REDD+ operations which eventually will become the mainstream work of all sub-national level civil servants in agriculture, livestock, forestry and energy sectors. The REDD+ capacity building should eventually reach down to the county and sub-county level, so that all the line civil servants understand REDD+ process and implementation issues.

7.2.3 Capacity building strategies and actions

The core REDD+ national management group should produce REDD+ national and sectoral guidelines, which can be used as standardized training materials particularly for the district level training. At the lower level trainings should be conducted both in workshops and in the field (practical training with communities).

The training material produced should be standardized so that all trained persons in Uganda would have the same standard training package on REDD+ issues. When it comes to local capacity building needs there can be some differentiation on training materials, for instance, on extension services and local agricultural practices. The FIP programme could also contribute to development of the REDD+ training materials and -activities.

7.3 Gender integration

A Gender and REDD+ workshop held in Kampala in April 2015 (IUCN 2015) concluded the following issues to be incorporation in REDD+ process and work:

- The Gender and REDD Action Plan for Uganda 2015 and 2016 indicating deliverables for Uganda Gender Mainstreaming Actions;
- Gender and REDD+ Taskforce functioning as a key stakeholder of the national REDD+ process in Uganda, by Dec 2015;
- Briefing paper on the process and contribution of the gender Sub-Working group to a pro-poor and gender-balanced REDD+ National Strategy design;
- Uganda's REDD+ National Strategy design process is pro-poor and gender-balanced;
- Increased understanding of REDD+ and Gender issues, clarification and protection of natural resource rights of women, equal access of men and women to multiple benefits associated with forest and tree management guaranteed, reduced gender discrimination in collaborative forest management arrangements.

Other issues that the Gender Road Map for REDD+ discussed was that one should say women instead of a neutral word gender, which also include men. It has been

recognized in many instances that women have often been marginalized from all the processes of access, control, and decision making. For such initiatives as REDD+ to create a gender balance, positive discrimination for women has to be brought on board. However, for the finally developed Roadmap at the workshop the participants still settled for an inclusive approach for cover both men and women and thereby continue to use the word gender (IUCN 2015).

The developed road map is a living document where a number of policies were analysed to identify entry points for enhancing gender mainstreaming just as other relevant policies that have come up such as the Oil and Gas policies will be included in the updated analysis.

Some other critical issues identified in the Gender and REDD+ Action Plan included:

- The involvement of Youth
- The involvement of indigenous people and people with HIV/AIDS
- Sharing of responsibilities among stakeholders
- Building synergies with all relevant and related Ministries and Policies
- Popularizing REDD+ and its benefits/ incentives
- Creating more awareness on REDD+

The Gender Road map will be followed in the REDD+ implementation process.

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Annexes

Annex 1. Hectare based financial assessment of proposed interventions

Strategic option 1: Climate smart agriculture:		
Sub-option 1. Sustainable land management (SLM) and agroforestry practices		
Production	Unit value in Uganda	Source
Average total adjusted baseline household income in 2015	USD 560 as average of all rural farming households	UBOS 2014
Average total adjusted agriculture income in 2015	USD 335	FAO 2013
% increase in farm income due to envisioned climate smart agriculture	50%	Benin et al. 2008 and EPRC 2014
Baseline carbon stock	8,7 tCO ₂ /ha/year	MWE/NFA 2016
Average annual carbon stock enhancement on main open farmlands	3 tCO ₂ /ha/year	Estimate from SLMP II project
Average annual carbon enhancement in home gardens	finally 72,5 tC/ha and thus 7 tC/ha/year	Negash 2013
Proposed share of homegardens from total farmlands	30% of available hh farmland	Expert estimate
Recurrent management cost		
Labour opportunity cost (land clearing, ploughing, planting/sowing, weeding, harvesting, bagging per 1.12 ha/year)	USD 668/ha/year	Dalipagic & Elepu 2014
Own labour for SLM improvements	USD 50/ha/year	Estimate based on UNDP 2014
Seed cost: annual	USD 36/ha/year	Dalipagic & Elepu 2014
Fertilizers + own cattle manure	USD 20/ha/year	Same source as

(50 kg/ha/year): annual		above
Implements/tools: annual	USD 20/ha/year	Same source
Agroforestry seedlings (60 seedlings): year 1	USD 5/ha	Ecotrust info in Masingi District 2016
Revenues		
Average total crop income in BAU scenario	USD 902/1.12 ha	Dalipagic & Elepu 2014
Estimated average income increase for average farmer from agroforestry, SLM	50% from BAU scenario of which 30% improved crop yield from nitrogen fixing trees and additional own fruits, fuel wood, fodder and SLM improvements	
Co-benefits		
Improved livelihoods and well-being of population Reduce deforestation & land pressure in rural areas Improved/varied nutrition among rural population Improved health effects among population Better education opportunities and wealth among farmer households	All these calculations would need some first priority calculations, which could then be replicated and adjusted over larger areas of farm lands	

Strategic option 1: Climate smart agriculture:		
Sub-option 2. Rainwater harvesting with collection tank and drip irrigation		
Production	Unit value in Uganda	Source
Average total adjusted net baseline household income in 2015	USD 800	UBOS 2015 for wealthier HHs
Average total adjusted agriculture income in 2015	USD 480	UBOS 2015 for wealthier HHs

% increase in farm income due to envisioned climate smart agriculture	200%	Fermont & Benson 2011/Benin et al. 2008, EPRC 2014
Baseline carbon stock	8,7 tCO ₂ /ha/year	MWE/NFA 2016
Average annual carbon stock enhancement on main open farmlands	3 tCO ₂ /ha/year	Estimate from SLMP II project
Average annual carbon enhancement in home gardens	Same as in Table 1, but reached perhaps faster and with certainty	Expert estimate
Proposed share of homegardens from total farmlands	30% of available hh farmland	Expert estimate
Recurrent management cost		
<u>For a 60m³ watertank collection system</u>		All cost figures here are from URWA 2013
Labour opportunity cost (own labour)	USD 177/own in-kind labour	
Skilled and unskilled labour (external)	USD 275	
Construction materials	USD 559	
Timber for construction	USD 174	
Watertank equipment and drip irrigation kit	USD 250	
Treadle pump	USD 124	
Smaller tanks can reduce price		
Revenues		
Average total crop income in BAU scenario	USD 480/1.12 ha	Fermont & Benson 2011/Benin et al. 2008, EPRC 2014
Estimated average income increase for average farmer from RWH system	At least 200% from BAU scenario (both reduced drought loss and yield increase)	
Co-benefits		

Reduce deforestation & land pressure in rural areas	All these calculations would need some first priority calculations, which could then be replicated and adjusted over larger areas of farm lands
Improved/varied nutrition among rural population	
Improved health effects among population	
Better education opportunities and wealth among farmer households	

Strategic option 1: Climate smart agriculture:		
Sub-option 3. Greenhouse cultivation of vegetables		
Production	Unit value in Uganda	Source
Average total adjusted baseline household income in 2015	USD 1000	UBOS 2014 for wealthier HHs
Average total adjusted agriculture income in 2015	USD 600	UBOS 2014 for wealthier HHs
% increase in farm income due to envisioned greenhouse cultivation	500%	The Nation 2013
Proposed share of homegardens from total farmlands	Only 20 by 8 metres is needed for the greenhouse	
Recurrent management cost		
Labour opportunity cost for greenhouse cultivation	USD 400/ha/year	Expert estimate
Greenhouse plastic sheets and kit	USD 744/greenhouse	All cost figures from The Nation 2013
10 labourer for installation	USD 237/installation	
Fertilizers, pesticides and seeds etc.	USD 338/operation cost	
Water pump system	USD 100	
With shade net instead of plastic sheet costs can be	Alternatively, greenhouse with net at USD 446.	

reduced by 40%		
Revenues		
<p>Average total crop income in BAU scenario</p> <p>Estimated average income increase for average farmer from greenhouse cultivation of tomatoes. On 160 m2 there can be 600-650 tomato plants and one get after 2.5 months 10-15 kg of tomatoes during 4-6 months. Other crops like hot chili, sweet pepper and cucumber etc. can be also grown. These vegetables may even produce higher profits than tomato.</p>	<p>The main farmland can produce as shown in Tables 1 and 2. Table 3 focuses on a 160 m2 area.</p> <p>The tomatoes can be sold for market price between USD 0.60 to USD 1.20 per kilogram. Income can be USD 1838 to 2757 at cost of USD 1419 => net USD 419 to 919. Second and third year is 80% profit as greenhouse can be used in same spot for 3 yrs. Then greenhouse must be moved or plant crop changed completely to something not related to tomato.</p>	<p>The data and figures are from article in The Nation 2013</p>
Co-benefits		
<ul style="list-style-type: none"> • Improved livelihoods and well-being of population • Reduce deforestation & land pressure in rural areas • Salinization (a potential negative co-benefit) • Improved/varied nutrition among rural population • Improved health effects among population • Better education opportunities due to more wealth among rural population 		

Strategic Option 2: Sustainable fuelwood and (commercial) charcoal production		
Sub-option 1. Commercial small-holder and community bioenergy woodlots		
Production	Unit Uganda	Source
If established on 1 ha of farm field it is possible to have taungua agroforestry cultivation with a food crop (e.g. maize)	USD 800/ha year	UBOS 2015 for wealthier HHs
With Sesbania or Calliandra wood can be harvested annually (vigorous coppicing annually)	15-30 tons/ha/year	Christensen 2012
CO ₂ eq increment per year	mean 44 ton CO ₂ eq/ha/year	Christensen 2012
The trees are nitrogen fixers and can at least double crop yield		
Annual fodder during years	2-5 tons of fodder/average year	Christensen 2012
Investment cost		
Labour opportunity cost for crop cultivation	USD 400	Christensen 2012
Labour opportunity cost for bioenergy plantation	USD 389	Christensen 2012
Input cost for crops	USD 60	Christensen 2012 and Dalipagic & Elepu 2014
Input cost for tree seedlings/trees	USD 162/ha in year 1	Ecotrust info from Masingi District
Recurrent cost		
Harvesting cost of fuelwood	Own HH labour at USD 5/m ³	Expert estimate
Revenues		

Crop revenues as stated above		
Average fuelwood price paid by rural and small-town urban households	USD 65/ton of fuelwood	Christensen 2012
Using/selling of leaf fodder of 2-5 tons/year for stall-feeding cows	Set at USD 50. In scientific reports calculated as increased milk production per cow at USD 100/year	Conservative estimate based on Ekou 2014 and ILRI 2007
Potential Co-benefits		
<ul style="list-style-type: none"> • Improved livelihoods and well-being of population • Sustainable fuelwood, charcoal, pole and timber production; • Organized bioenergy value chains and better taxation opportunities; • Reduced erosion and soil management on large areas; • Nitrogen fixing in soils (with nitrogen-fixing trees); • Better penetration of rain into soils; • Some agroforestry income opportunities. 		

Strategic Option 2: Sustainable fuelwood and (commercial) charcoal production		
Sub-option 2: Commercial small-holder and community pole and timber plantations		
Production	Unit Uganda	Source
If established on 1 ha of farm field it is possible to have taungya agroforestry cultivation with groundnut or other crop	USD 600/ha 1 st year, USD 450 2 nd year and USD 350 3 rd year	UBOS 2015 for relevant HHs
Coffee harvesting from year 6 to 20		
Coffee, cocoa or passion fruit can be grown under trees with harvest from year 5 to end of tree rotation.	4000kg/year/ha under shade Mean yield 2 kg of coffee/tree	Kiyingi and Gwali 2012
Maesopsis eminii MAI for 20 years	MAI 12 m ³ /ha/year	Buchholz et al. 2012
CO ₂ eq increment per year	20.3 CO ₂ eq/ha/year	
Investment cost		

Labour opportunity cost for crop cultivation	USD 400	Expert estimate
Labour opportunity cost for timber plantation 1 st year	USD 389	Christensen 2012
Annual input cost for crops 1-3 yrs	USD 60	Christensen 2012
Input costs for 1000 coffee seedlings	USD 135 USD 158/year from year 6	Kiyangi and Gwali 2012
Annual inputs of 1215 kg manure/ha		Kiyangi and Gwali 2012
Input cost for tree seedlings/trees	USD 162	Ecotrust info from Masingi District 2016
Recurrent cost		
Harvesting cost of fuelwood	Own HH labour at USD 5/m ³	Expert estimate
Thinning at 5, 10 years 8.75 m ³ timber + 5 m ³ fuelwood 35 timber + 15 fuelwood	Own HH labour at USD 17/m ³	UTGA 2016
Revenues		
Crop revenues as stated above		
Annual coffee yield should sell for	USD 2706/ha/year on average	Kiyangi and Gwali 2012
Average fuelwood price paid by rural and small-town urban households	USD 65/ton of fuelwood	Christensen 2012
Thinning incomes given as 1 st thinning 8.75 m ³ + 5 m ³ fuelwood 2 nd thinning 35 m ³ + 15 m ³ fuelwood Final cutting 250 m ³	8cmx2m pole= USD 4.2 A tree with 2 logs of 12ft each (2X366 cm length) sold for USD 14.7 to 29.4 USD 265 to 295/mature tree	Ecotrust info from Masingi District 2016
One big tree may fetch price of	over whole rotation then USD 59,000 + USD 2900 for 1 ha	
Overall income generation		

from 400 Maesopsis trees given
as

Potential Co-benefits

- Improved livelihoods and well-being of population
- Sustainable fuelwood, charcoal, pole and timber production;
- Organized bioenergy value chains and better taxation opportunities;
- Reduced erosion and soil management on large areas;
- Nitrogen fixing in soils (with nitrogen-fixing trees);
- Better penetration of rain into soils;
- Some agroforestry income opportunities.

Strategic Option 2: Sustainable fuelwood and (commercial) charcoal production

- **Sub-option 3: Improved charcoal kilns linked to plantation sites:**

This sub-option has been analyzed in the main report directly based on Bagabo et al. (2014) and Kikuru (2014) and information from sub-options 2.1 the strategic option. The price of average charcoal sack sold in Uganda was found in MEMD (2016) National Charcoal Survey.

Strategic option 3: Large-scale commercial timber plantations		
Sub-option 1: Commercial transmission pole and timber plantation		
Production	Unit Uganda	Source
Establishment of stand with 1333 seedlings/ha at spacing 3x2.5 m	MAI expected to be 25m ³ /ha/yr	All figures from UTGA 2016
Thinning at years 4, 8 and 9	0 (14), 48 and 113 m ³ in poles/logs, respectively.	
Pruning at years 2, 4, 7 and 13	Plus 40% fuelwood	
CO ₂ eq increment in stand	1111, 700, 500 & 300 stems, respectively.	
Clear-felling at age 25	42.2 tons/ha/year 360 m ³ /ha	
Investment cost		
Land lease and surveying	USD 272/ha	All figures from UTGA 2016
Supervision	USD 20/ha/year	
Road construction & maintenance	USD 15/ha and USD 10/ha/year	
Establishment operations	USD 381	
Seedling management operations	USD 204 in years 1-3	
Weeding in years 4-5	USD 45/ha/yr	
Recurrent cost		
Pruning at 3, 7, 9 and 13	USD 29, 34, 37 & 50 respect./ha	All figures from UTGA 2016
Thinning at 2, 4 and 9	USD 100, 662 (+95) and 4986 (+170)/ha	
Clear-felling cost at 25 years	USD 15884 (+360)/ha	
Revenues		
Thinning at 2, 4 and 9 years	USD 0, 2382 and 15953 resp.	Modified from UTGA 2016
Clear-felling	USD 50823	
	+ fuelwood revenues in	

	thinning and clear-cut 980, 896, 1400 and 5040 (20% fuelwood)	
Potential Co-benefits		
<ul style="list-style-type: none"> • Increase income generation of commercial transmission pole and timber plantation owners; • Organized fuelwood, charcoal, pole and sawn timber business; • Reduced erosion on large areas; • Support for biodiversity restoration; • Restored aquifers and water-based PES; • Mitigation of climatic change (locally & globally). 		

Strategic option 3: Large-scale commercial timber plantations		
Sub-option 2: Commercial pole and sawlog plantation		
Production	Unit Uganda	Source
Establishment of stand with 1111 seedlings/ha at spacing 3x2.5 m	MAI expected to be 26m ³ /ha/yr	All figures from UTGA 2016
Thinning at years 2, 4, 8	0 (20), 40 and 50m ³ in poles/logs, respectively. Plus 40% fuelwood/thinning.	
Pruning at years 2, 4, 7 and 9	1111, 700, 500 & 300 stems, respectively.	
CO ₂ eq increment in stand	43.9 tons/ha/year	
Clear felling at age 25	440 m ³ /ha	
Investment cost		
Land lease and surveying	USD 272/ha	All figures from UTGA 2016
Supervision	USD 27/ha/year	
Road construction & maintenance	USD 15/ha and USD 17/ha/year	
Establishment operations	USD 381	
Seedling management	USD 204 in years 1-3	

operations	USD 45/ha/yr	
Weeding in years 4-5	USD 10/ha/year	
Fire protection years 1-25	USD 25/ha/year	
Open area mgt		
Recurrent cost		
Pruning at 2, 4, and 7	USD 29, 34, 37 & 50 respect./ha	Modified from UTGA
Thinning at 2, 4 and 9	USD 125, 2572 and 6000/ha	2016
Clear felling cost at 25 years	USD 12867/ha	
Revenues		
Thinning at 2, 4 and 9 years	USD 0, 2779 and 16942 resp.	Modified from UTGA 2016
Clear-felling	USD 62121 + fuelwood in thinning and clear-cut: USD 1750, 1960, 3360 and 6160.	
Potential Co-benefits		
<ul style="list-style-type: none"> • Increase income generation of commercial transmission pole and timber plantation owners; • Organized fuelwood, charcoal, pole and sawn timber business; • Reduced erosion on large areas; • Support for biodiversity restoration; • Restored aquifers and water-based PES; • Mitigation of climatic change (locally & globally). 		

Strategic option 3: Large-scale commercial timber plantations

- **Sub-option 3: Improved charcoal kilns linked to plantation sites:**

This sub-option has been analyzed in the main report directly based on Bagabo et al. (2014) and Kikuru (2014) and information from sub-options 1 and 2 of the strategic option. The price of average charcoal sack sold in Uganda was found in MEMD (2016) National Charcoal Survey.

Strategic Option 4. Restoration of natural forests in the landscape		
Sub-option 1. Designated areas for natural forest regeneration		
Production	Unit Uganda	Source
Baseline carbon stock in high natural forest reserve areas in Uganda	Approx. 388 ton CO ₂ eq/ha in above ground biomass;	NFA 2016
Carbon stock in severely degraded high natural forests	Approx. 138 ton CO ₂ eq/ha in above ground biomass.	
Annual biomass increment	12 tCO ₂ eq/ha/year	
Investment cost		
Boundary delineation 1 st year	USD 7/ha	Based on UTGA 2016
Recurrent cost		
Boundary maintenance (annual)	USD 7/ha/year	Based on UTGA 2016 and expert estimate
Patrol/monitoring and fire protection	USD 14/ha/year	
Average NTFP harvest cost (households)	USD 7/year	
Revenues		
Average NTFP income per household	USD 548.7/hh/year	Tugume et al. 2015
Potential Co-benefits		
Restoration of biodiversity (flora and fauna); Reduced erosion on large areas; Various ecotourism income; Medicinal and aromatic plants etc.;; Restored aquifers and water-based PES opportunities; Mitigation of local micro climate change;		

Strategic Option 4. Restoration of natural forests in the landscape		
Sub-option 2: Restoration of degraded protected natural forest (i.e. national parks and forest reserves)		
Production	Unit Uganda	Source
Baseline carbon stock in high natural forest reserve areas in Uganda	Approx. 388 ton CO ₂ eq/ha in above ground biomass;	All data based on NFA 2016
Carbon stock in severely degraded high natural forests	Approx. 138 ton CO ₂ eq/ha in above ground biomass.	
Annual biomass increment	13m ³ /ha/yr or 22 tCO ₂ /ha/yr	
Annual wood removal (roundwood) starting from year 4 forward	3m ³ /ha or 8.4 tCO ₂ /ha/year	
Annual removal of fuelwood	3m ³ or 8.4 tCO ₂ /ha/year	
On woodlands baseline biomass (AGB)	26.2 t/ha	
Annual sustainable increment is	0.7 t/ha	
Investment cost		
Boundary delineation 1 st year	USD 7/ha	Based on UTGA 2016
Planting cost (labour and transport)	USD 8/ha	
Seedling cost on high forest land - 400 seedlings (UGX 300) /seedling)	USD 36/ha	
Only 200 seedlings planted on woodlands	USD 18	
Recurrent cost		
Boundary maintenance (annual)	USD 7/ha/year	Based on UTGA 2016
Patrol/monitoring and fire protection	USD 14/ha/year	

Thinning	USD 17/m ³ for poles and USD 6/m ³ for fuelwood	
Average NTFP harvest cost in high forests (households) from year 3 forward	USD 7/year	
Only NTFP harvest allowed on woodlands annually from start		
Revenues		
Average NTFP income per household in high forest	USD 548.7/hh (before year 6 only 40% of total);	Based on Tugume et al. 2015
Average NTFP income/hh on woodlands is	40% of NTFP income in high forest or USD 208,48/HH/ha	
Harvested poles	USD 140/m ³ after year 6	Ecotrust info from Masindi District 2016
Harvested fuelwood from year 4	USD 70/m ³	
Potential Co-benefits		
Restoration of biodiversity (flora and fauna);		
Reduced erosion on large areas;		
Various ecotourism income;		
Medicinal and aromatic plants etc.;		
Restored aquifers and water-based PES opportunities;		
Mitigation of local micro climate change;		

Strategic Option 4. Restoration of natural forests in the landscape:

- **Sub-option 3: Devolution of forest management through PFM and similar set-ups:**
- **Sub-option 4: Traditional/customary forest management practices:**

These two sub-options are intertwined with sub-options 4.1. and 4.2. and do therefore not need separate financial analysis.

Strategic option 5: Energy efficient cooking stoves:		
Sub-option 1: Energy efficient fuelwood cooking stoves in rural households and institutions		
Production	Unit	Source
Fuelwood is main energy source for cooking for rural and small town urban households (i.e. 4563436 HHs in early 2016) and in 948 institutions	On average 3323 kg/HH/year among with traditional stove in Uganda	Further calculated based on MEMD, 2016 (National Charcoal Survey 2015)
Average fuelwood savings with an Energy Efficient Cook (EES) stove in HHs and	58% saved fuelwood/HH/yr	
The number of households that currently use energy efficient wood stoves are	HHs or 6% of total No. fuelwood HHs.	
The average fuelwood savings with EES in institutions is	45% saved fuelwood/Inst./yr	
Traditional institutional fuelwood use	29100 kg/unit/year	
And the number of institutions are	36.1% of 15586 institutions use EES	
Investment cost		
Average cost to	USD 22.4/unit	Locally quoted price
Average cost to institutions for improved charcoal stove in institutions	USD 200/unit/yr	Unique 2014 price information
Recurrent cost		

Average fuelwood price paid by rural and small-town urban households	USD 220.6/year USD 70/ton of fuelwood	MEMD 2016 (National Charcoal Survey 2015) UTGA 2016
Average cost for fuelwood in traditional institutions	USD 1931.8 /unit/year	Based on financial analysis with the above provided data
Average savings in annual fuelwood cost once EES stove is in use in households and savings in institutions on average	USD 127.9 /unit/yr USD 869.3/unit/yr	Based on financial analysis with the above provided data
Potential Co-benefits		
<p>Longer life expectancy for women</p> <p>Better health among the Ugandan population</p> <p>Better livelihood and wealth situation in households</p> <p>Reduced smoke particle amounts in houses</p>	<p><i>All these calculations would need some first priority calculations, which could then be replicated and adjusted over larger areas of irrigated farm lands</i></p>	

Strategic option 5: Energy efficient cooking stoves:		
Sub-option 2: Improved charcoal cooking stoves in rural households and institutions		
Production	Unit	Source
Charcoal is main energy source for cooking for urban and wealthier rural households (i.e. 2291210 HHs in early 2016) and 33866 institutions	On average 962 kg/HH/year among stated HHs in Uganda	All data is got or calculated based on MEMD 2016 (National Charcoal Survey 2015)
These institutions use on average	26.2 kg/day or 9563 kg	
Average charcoal savings with an improved cook stove in households	36% saved charcoal/HH/yr	
Average charcoal in traditional stove institutions	14345 kg/unit/year	
One kilogram charcoal requires	9 kg of fuelwood	
The number of households that currently use improved charcoal stoves are	Approx. HHs or 21.4% of total No. charcoal HHs.	
The number of institutions that use ICS are currently totally 33866	32.9% of all institutions use ICS	
Investment cost		
Assumed price paid by household for each improved cook stove	USD 10/unit	WWF 2011, UNDP 2014
Assumed price paid by institution for each improved cook stove	USD 150/unit	WWF 2011, UNDP 2014
A stove will last for three years after which a new one is needed.		Unique 2014 price information

Recurrent cost		
Average annual charcoal expense paid by urban and wealthier rural households when one charcoal bag is	USD 124.74/year	All figures got or calculated from MEMD 2016 (National Charcoal Survey 2015)
	USD 8.1/bag of charcoal (+ USD 111.89 in some other energy form)	
HHs' average savings in annual charcoal cost once improved charcoal stove is in use	USD 44.9/year	
Trad. institutions pay annually USD for purchase of charcoal	USD 1856.1/unit/yr	Based on financial analysis with the above provided data
Average weight of charcoal sack in Uganda	62.6 kg/charcoal bag on average during wet and dry seasons combined = 15.4 sacks/HH/ year	
Potential Co-benefits		
<p>Longer life expectance for women</p> <p>Better health among the Ethiopian population</p> <p>Better livelihood and wealth situation in households</p> <p>Reduced smoke particle amounts in houses</p>	<p><i>All these calculations would need some first priority calculations, which could then be replicated and adjusted over larger areas of irrigated farm lands</i></p>	

Strategic Option 6: Integrated fire management		
Production	Units in Uganda	Source
Aim of Strategic Option is to reduce wildfires by 70% from 2015 situation on each woody land type in Uganda		Target set by the Expert Team
Investment cost		
10 persons in in Uganda get full integrated wildfire management training in Kenya	USD 1200/person	Expert estimate
100 DFO get full IWF training in Uganda	USD 250/person (including training, accommodation, travel and food)	Expert estimate based on UTAMU website 2016
Half annual salary expenses of 10 specialists	USD 12354	Uganda salary explorer website 2016
Half annual salary expenses of 100 DFOs	USD 11470	Uganda salary explorer website 2016
Recurrent cost		
Annual average field budgets (travel expenses, training courses & awareness campaigns etc.) of DFOs in each district for IWF Mgt.	USD 1000/district	Expert estimate
Revenues		
Reduction in carbon emissions from wildfires in plantations	USD 7000/ha saved wood expenses	These figures are based on calculations for Strategic Option 4 and 5 in this report
Reduction in carbon emissions from wildfires on woodlands	USD 2200/ha saved wood expenses	
Reduction in carbon emissions	USD 70/m3 of wood saved	

on shrublands, bushlands and grasslands	from burning to ashes	
Potential Co-benefits		
Damages to other people's property reduced; Increment in AGB and BGB and carbon resources;		

Annex 2. Legal and policy framework: Key strengths, weaknesses and recommendations /observations

Policy/legal instrument	Provisions/content relevant to REDD+	Related REDD+ strategic option	Strengths	Weaknesses	Recommendations /observations
The East African Climate Change Policy (2010)	Section 3.2 calls upon Partner States to exploit emerging environmental markets such as REDD+ through the design of favourable policy instruments	Rural electrification and renewable energy solutions	Uganda's current efforts to develop a REDD+ National Strategy are consistent with EAC regional policy priorities	The policy is non-legally binding, and Partner States are not obliged to implement the policy	The policy should be followed by legislation passed by the regional parliament to put into effect the identified priorities and strategies
Uganda Forestry Policy (2001)	<ul style="list-style-type: none"> Section 3 outlines various policy priorities and strategies, including the protection and sustainable management of all government forest reserves. Section 4 calls for clarifying the role of districts in forest sector development 	<p>Sustainable fuelwood and (commercial) charcoal use</p> <p>Large-scale commercial timber plantations</p> <p>Restoration of natural forests in the landscape</p> <p>Energy efficient cooking stoves</p> <p>Integrated wildfire management</p>	Except for a few shortcomings, the forestry policy is a comprehensive instrument for ensuring sustainable management of forest reserves which is critical to REDD+ implementation	<ul style="list-style-type: none"> Inadequate implementation of the policy Lack of strategies on how to deal with carbon rights ownership 	<ul style="list-style-type: none"> Devise strategies to improve implementation of the policy Revise forestry policy to provide policy directions on dealing with carbon rights ownership
Uganda National Land Policy (2013)	<ul style="list-style-type: none"> Under Section 39 of the policy, the Government intends to amend the Land Act and other relevant laws so as to provide clarity on the nature of land rights. Under Section 42 of the policy, the government will strengthen traditional land management and administration institutions Under Section 46 of the policy, the government intends to resolve the impasse between bona fide/lawful occupants and registered owners Under Section 97 of the policy, the government will 	<p>Large-scale commercial timber plantations</p> <p>Restoration of natural forests in the landscape</p>	If the strategies outlined in the policy are fully implemented, a conducive environment for REDD+ will be created	<ul style="list-style-type: none"> The policy is yet to be operationalized. Inadequate funding for policy implementation Many of the relevant land laws such as the 1995 Constitution, the Land Act (Cap 227), and the Land Acquisition Act (Cap 226) were enacted prior to the adoption of the land policy, and may need revision to address some of the issues covered by the policy. 	<ul style="list-style-type: none"> Fully operationalize the National Land Policy, 2013. In particular, Land Tribunals should be quickly operationalized as proposed by the policy, to help deal with disputes related to REDD+. Recognize and enforce decisions of traditional land management and administration institutions as proposed by the policy.

Policy/legal instrument	Provisions/content relevant to REDD+	Related REDD+ strategic option	Strengths	Weaknesses	Recommendations /observations
	<p>enhance promotion and protection of land rights</p> <ul style="list-style-type: none"> Under Section 115 of the policy, the government will revive the operations of the land tribunals 				
The National Climate Change Policy (2015)	Under Section 4.3.1 of the policy, the country's policy priority on REDD+ is articulated	<p>Rural electrification and renewable energy solutions</p> <p>Energy efficient cooking stoves</p>	<ul style="list-style-type: none"> Section 5.1.1 of the policy describes institutional arrangements for implementation The policy is accompanied by a costed implementation strategy that defines the manner in which policy priorities and strategies will be implemented 	<ul style="list-style-type: none"> The effective implementation of the policy will require significant funding whose source is not clear Uganda's accessibility to the Green Climate Fund may be hampered by lack of appropriate institutional framework The policy does not set out specific timelines and sources of finance for the implementation of the identified REDD+ strategies Lack of effective coordination amongst the various implementing institutions Lack of a clear mandate and responsibilities of the various institutions may create conflict over the control of REDD+ funds The necessary legal and institutional framework for implementing the various policy priorities and strategies is 	<ul style="list-style-type: none"> Clarify the source of finances for implementing the policy Put in place the necessary to enable the country's access to the Green Climate Fund Clarify the mandate of the various institutions to avoid conflict over control of REDD+ funds Put in place the necessary legal framework to facilitate implementation of the policy

Policy/legal instrument	Provisions/content relevant to REDD+	Related REDD+ strategic option	Strengths	Weaknesses	Recommendations /observations
				yet to be put in place	
The National Environment Management Policy for Uganda (1994)	The goal of the policy is sustainable social and economic development which maintains or enhances environmental quality and resource productivity	Sustainable fuelwood and (commercial) charcoal use	The policy contains some relevant provisions for the sustainable management of forests	The policy was adopted when the extent of the climate change problem was yet to be fully understood, and as a result it does not contain elaborate strategies for dealing with the challenges of climate change, including REDD+	Expedite the approval of the Draft National Environment Management Policy for Uganda (2014)
Uganda National Policy on Conservation and Sustainable Development of Wildlife Resources (2014)	Section 2.5 of the policy outlines several priorities and strategies including those relating to the sustainable management of wildlife populations in and outside wildlife protected areas	Integrated wildfire management	The policy describes strategies for partnering with forestry and wetland management institutions and local governments to effectively manage wildlife in wetlands, forest reserves and private land	<ul style="list-style-type: none"> • The relevant enabling law – the Uganda Wildlife Act (Cap 200) – was enacted in 1996 before the adoption of the policy in 2014 • The policy does not have adequate strategies for dealing with forest reserves under the management of UWA 	<ul style="list-style-type: none"> • Revise the Uganda Wildlife Act (Cap 200) to provide for the implementation of strategies elaborated in the policy • Revise policy to describe adequate strategies for dealing with forest reserves under the management of UWA
The Energy Policy for Uganda, 2002 & the Renewable Energy Policy for Uganda, 2007	Both policies outline Uganda's strategies aimed at promoting sustainable management of the biomass resource as well as renewable energy sources of power (such as solar power) that relieve the pressure off the forests (Section 4.2.3 of the Energy Policy; Section 3.5 of the Renewable Energy Policy)	<p>Sustainable fuelwood and (commercial) charcoal use</p> <p>Rural electrification and renewable energy solutions</p> <p>Energy efficient cooking stoves</p>	Policy instruments contain adequate strategies for promoting renewable energy and sustainable use of biomass	<ul style="list-style-type: none"> • Limited uptake of renewable energy by the population • Inadequate implementation of the policy • Duplication of strategies by adopting 2 (Renewable Energy, 2007 and the Energy Policy, 2002) • The enabling law – the Electricity Act – was enacted in 1999 before both policies were enacted 	<ul style="list-style-type: none"> • Undertaking studies to evaluate the effectiveness of the two energy policies • Review both policy instruments and develop one harmonized energy policy instrument
National Agriculture Policy, 2013	The policy describes strategies to achieve food and nutrition security and improve household incomes through coordinated interventions that focus on enhancing sustainable	<p>Climate-smart agriculture</p> <p>Livestock management</p>	The policy is heavily focused on the agricultural sector	The policy does not outline any strategies for the promotion of agro-forestry which would help to reduce the rate of deforestation	Revise the policy to describe strategies to curb deforestation and forest degradation that are occurring as a result of agricultural expansion

Policy/legal instrument	Provisions/content relevant to REDD+	Related REDD+ strategic option	Strengths	Weaknesses	Recommendations /observations
	agricultural productivity and value addition; providing employment opportunities, and promoting domestic and international trade.			and forest degradation	Revise policy to include strategies for promoting agro-forestry Formulate irrigation policy
Uganda Gender Policy, 2005	The policy is a guide to all stakeholders in planning, resource allocation, implementation and monitoring and evaluation of programmes with a gender perspective		The implementation of gender policy has important implications for REDD+ considering that the actions of both men and women affect the trends of deforestation and forest degradation in Uganda	<ul style="list-style-type: none"> Policy provisions for gender mainstreaming in Uganda are not backed up by relevant legal provisions The environment sub-sector has not taken deliberate steps to ensure gender mainstreaming in its programmes and activities 	The environment sub-sector needs to take deliberate actions to promote gender mainstreaming in forest management
The National Biotechnology and Biosafety Policy, 2008	Section 4.3 requires strong emphasis to be placed in priority areas of agriculture, health, industry, environment, and natural resources development		The policy contains strategies for the safe application of biotechnology	An enabling legislation is yet to be enacted although Uganda has developed National Biotechnology and Biosafety Bill, 2012	Expedite the enactment of the National Biotechnology and Biosafety Bill, 2012
The National Water Policy, 1999	The policy underpins the importance of forests in the protection of catchments and the water quality and general survival of the water systems		The policy contains adequate strategies to ensure coordination of all water stakeholders including agricultural production, energy, and forestry	Poor regulation of water resources use and compliance to water laws and regulations	Strengthen compliance to water laws and regulations
United Nations Framework Convention on Climate Change (UNFCCC), 1992	Article 4 of the UNFCCC sets out commitments for all parties including commitments that relate to promoting sustainable management, and conservation and enhancement of sinks and reservoirs of all GHGs		The international legal framework provides a firm foundation for REDD+ implementation	The international legal framework is still under development, and the rules are constantly changing. Uganda is yet to domesticate the UNFCCC	Uganda should domesticate the UNFCCC so that its provisions are part of Uganda's laws
Paris Agreement, 2015	Article 5(2) of the Paris Agreement provides for REDD+		The Paris Agreement provides a strong international legal foundation for countries to	Uganda is yet to ratify the Paris Agreement.	Once ratified, Uganda should take steps to ratify the Paris Agreement

Policy/legal instrument	Provisions/content relevant to REDD+	Related REDD+ strategic option	Strengths	Weaknesses	Recommendations /observations
			continue with REDD+ efforts		
Decision 1/CP.16: Cancun agreements	Paragraph 71(d) of Decision 1/CP.16 requires that REDD+ safeguards should be respected and promoted by the country's legal framework. The Cancun safeguards are aimed at protecting the integrity of the REDD+ programme, and protecting the rights of indigenous peoples and local communities		Uganda has in place several forest programmes and policies, and is subject to several international agreements, all of which aim at reducing deforestation and forest degradation as well as protecting the rights of indigenous peoples and local communities	The country's poor record in enforcement of laws and regulations may affect the extent to which the Cancun safeguards are promoted and respected	Strengthen enforcement of relevant laws and regulations to ensure promotion and respect for Cancun safeguards
The ILO Convention 169 on Indigenous and Tribal Peoples, 1989	Article 2 provides that indigenous peoples shall not be forcibly removed from their lands or territories		Contains adequate provisions for the protection of the rights of indigenous peoples and local communities	The convention is yet to be ratified by Uganda	The convention should be ratified by Uganda
Treaty for the Establishment of the East African Community (1999)	Article 114 (2) (a) sets out actions that States shall take to ensure conservation and management of forests		Lays the foundation for the legal framework on sustainable management of forests. REDD+ initiatives are consistent with the Treaty provisions	Lack of comprehensive legal framework for the sustainable management of forests at the regional level	There is need for a specific regional legislation on forests management in the EAC. In this respect, the process for enacting the EAC Forest Management Bill, 2015 should be expedited
National Forestry and Tree Planting Act, 2013	<ul style="list-style-type: none"> Section 4 classifies forests into various categories Section 15 of the Act gives legal recognition to collaborative forest management 	<p>Sustainable fuelwood and (commercial) charcoal use</p> <p>Large-scale commercial timber plantations</p> <p>Restoration of natural forests in the landscape</p> <p>Energy efficient cooking stoves</p> <p>Integrated wildfire management</p>	Contains adequate provisions for sustainable management of forests including REDD+ implementation	<ul style="list-style-type: none"> Absence of provisions on the legal ownership of carbon rights. Absence of legal provisions providing for the role of local governments in the management of Central Forest Reserves Absence of a law on REDD+ benefit sharing, which may be a trigger for conflicts and grievances The Act restricts the application of CFM to only 	<ul style="list-style-type: none"> Introduce specific legal provisions that define carbon rights; and provide elaborate procedures for their registration The Act should be amended to introduce legal provisions providing for the role of local governments in the management of forestry resources Introduce legal provisions on REDD+ benefit sharing The Act should be amended to provide for the application of CFM to all forest types including private and community forests

Policy/legal instrument	Provisions/content relevant to REDD+	Related REDD+ strategic option	Strengths	Weaknesses	Recommendations /observations
				<p>central and local forest reserves</p> <ul style="list-style-type: none"> Some structures such as Forestry Committees established under the Act are not operational 	<ul style="list-style-type: none"> Forestry Committees should be quickly operationalized at the local level
Draft National Forestry and Tree Planting Regulations, 2013	Regulation 107 defines carbon sellers		<ul style="list-style-type: none"> Facilitate implementation of the Act 	<p>The attempt to define carbon sellers and buyers under the Regulations is ambiguous and contradicts the provisions of the National Forestry and Tree Planting Act, 2013.</p>	<ul style="list-style-type: none"> Revise Regulations and remove ambiguous provisions that contradict the National Forestry and Tree Planting Act, 2013. The issue of carbon rights ownership should be dealt with through an amendment of the National Forestry and Tree Planting Act, 2013 or through a completely new Act of Parliament altogether.
The National Environment Act (Cap 153 Laws of Uganda)	<ul style="list-style-type: none"> Section 45 of the Act requires NEMA to issue guidelines and prescribe measures for the management of all forests in Uganda Section 46 of the Act requires NEMA to promote the use of renewable sources 	Sustainable fuelwood and (commercial) charcoal use	The Act empowers NEMA to compliment the efforts of NFA in sustainable forestry management	<ul style="list-style-type: none"> Limited manpower and financial capacities have hampered the effective implementation of the Act Institutions established by the Act such as district and local environment committees are not fully operational due resource and capacity constraints The Act was enacted in 1995 and does not cover issues related 	<ul style="list-style-type: none"> Provide financial resources to facilitate implementation of the Act Establish institutions under the Act such as district and local environment Revise Act to cover current issues such as REDD+ and other incentive based mechanisms Revise Act and provide dispute resolution mechanism for REDD+ and others environmental disputes

Policy/legal instrument	Provisions/content relevant to REDD+	Related REDD+ strategic option	Strengths	Weaknesses	Recommendations /observations
				<p>to climate change mitigation such as REDD+</p> <ul style="list-style-type: none"> The Act does not adequately provide for key environmental management principles such as the use of economic instruments to enhance environmental management 	
Land Act (Cap 227)	<ul style="list-style-type: none"> Section 2 of the Act provides for four main land tenure systems Section 34 of the Act provides that a person who owns land should utilize it in accordance with governing environment and forestry sectors 	<p>Large-scale commercial timber plantations</p> <p>Restoration of natural forests in the landscape</p>	<ul style="list-style-type: none"> Despite its shortcomings, the Act has provisions that enable the sustainable use and utilization of land 	<ul style="list-style-type: none"> The Act recognises competing interests of lawful/bona fide occupants and registered land owners on the same piece of land which is a trigger of conflicts and grievances Gaps in the current law permit institutions to de-gazette forest reserves Gaps in the current law permit government to compulsorily acquire land including forests reserves without prompt payment of a fair and adequate compensation 	<ul style="list-style-type: none"> Amend the Act to remove the recognition of competing interests over the same piece of land Develop guidelines prescribing terms and conditions for management of all land held by District Land Boards in trust for the citizens of Uganda Revise law to ensure that government promptly pays adequate compensation in cases of compulsory acquisition of land Revise law and specify terms and conditions under which institutions can de-gazette forest reserves Revive operations of land tribunals under the Act to enhance conflict resolution
The Local Governments Act (Cap 243 Laws of Uganda)	Section 2 of the Act gives effect to the decentralisation of functions, powers, responsibilities and services at all levels of local governments		The local government system can be an important avenue through which sustainable management of forests can be achieved	<ul style="list-style-type: none"> Inadequate implementation of Act has led to a weak local government system Diminishing sources of revenue for local governments, with the abolition of graduated tax 	Amend the Act to enhance the role of local governments in the management central forest reserves
The Uganda Wildlife Act (Cap 200 Laws of Uganda)	Section 2 of the Act provides for the promotion and conservation of		The Act has adequate provisions for the conservation	<ul style="list-style-type: none"> The Act does not contain any specific provisions 	<ul style="list-style-type: none"> Amend Act to specify the responsibilities of UWA in managing

Policy/legal instrument	Provisions/content relevant to REDD+	Related REDD+ strategic option	Strengths	Weaknesses	Recommendations /observations
Uganda)	wildlife throughout Uganda		of wildlife in Uganda	regulating the management of forests under the control of UWA <ul style="list-style-type: none"> The Act does not have Regulations to facilitate implementation 	forests under their control <ul style="list-style-type: none"> Develop Regulations under the Act to facilitate implementation
The Public Finance Management Act, 2015	The Act regulates various aspects of public finance management in Uganda		Section 75(1) of the Act provides that the central government shall retain 94 percent of the revenue from royalties arising from petroleum production and the remaining 6 percent shall be shared among the local governments located within the petroleum exploration and production areas of Uganda. This is an example of how REDD+ financial benefits can be shared	There are no specific provisions on the sharing of REDD+ financial benefits	Legal provisions could be incorporated to enable local governments retain a percentage of the financial benefits accruing from REDD+ projects.
The Electricity Act, 1999	Section 63 provides that the Government shall promote, support and provide rural electrification programmes through public and private sector participation	Rural electrification and renewable energy solutions	The Act provides the necessary regulatory framework to enable the population to increase access to electricity, thus helping to reduce pressure on forests as a source of energy	<ul style="list-style-type: none"> The Act lacks adequate sanctions for non-compliance with regulatory requirements The Act does not provide for the development of trans-boundary electricity projects The Act does not provide for the establishment of the Rural Electrification Agency as an autonomous agency thus affecting its ability to deliver The Act imposes a 5% rural electrification levy which discourages 	<ul style="list-style-type: none"> The Act should be amended to reconstitute the Rural Electrification Fund as an integral part of the Rural Electrification Agency as an autonomous authority of the Government The Act should also be amended to strengthen sanctions for non-compliance with regulatory requirements

Policy/legal instrument	Provisions/content relevant to REDD+	Related REDD+ strategic option	Strengths	Weaknesses	Recommendations /observations
				the private sector to take on projects in rural areas	

Annex 3. Identified environmental and social impacts

Strategic Option and sub-option	Environmental impacts		Social impacts	
	Positive	Negative	Positive	Negative
<i>Strategic option 1: Climate smart agriculture</i>				

<ul style="list-style-type: none"> - <i>SLM and agroforestry practices;</i> - <i>Rainwater harvesting with collection tank and drip irrigation;</i> - <i>Greenhouse cultivation of vegetables;</i> 	<p>Reduced GHG emissions</p> <p>Reduced clearance of forestland for agriculture</p> <p>Reduced encroachment on wetlands and other protected areas</p> <p>Increased crop yield and food production on smaller parcels of land</p> <p>Widespread/increased adoption of multipurpose production of crops, fodder, wood, medicinal plants, etc., on the same piece of land</p> <p>Increased tree cover from agroforestry</p> <p>Improved CC resilience of agriculture</p> <p>Improved microclimate</p> <p>Reduction of water-stress of crops or even reduced wilting or death of crops</p> <p>Improved ecosystem stability</p> <p>Reduced soil erosion and landslides</p> <p>Improved soil structure</p> <p>Increased water holding capacity of soil</p> <p>Increased water availability</p>	<p>Increased nutrient load from fertilizers leading to eutrophication of water bodies</p> <p>Cultivation of some vegetables that are more pest prone, such as tomatoes</p>	<p>Improved incomes and livelihoods, also for poor households</p> <p>Reduced workload with improved technologies</p> <p>Increased water availability</p> <p>Improved food security</p> <p>Improved employment opportunities</p> <p>Business-oriented and commercial operations made possible through the value chain</p> <p>Increased adaptation to climate change, thereby reduced risks.</p> <p>Marginalized households can participate and benefit (if grants provided)</p> <p>Improved water security and conservation</p> <p>Increased revenues for tax collection</p> <p>Improved service delivery</p> <p>Reduced domestic violence and child-trafficking (children are now sometimes moved when families can't feed them)</p> <p>Reduced land-related</p>	<p>Loss of traditional agricultural practices</p> <p>Inequitable participation and benefiting from the technologies of CSA.</p>
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	from rainwater harvesting Enhanced biodiversity in agroforestry systems		conflicts Enhanced social capital Increased knowledge and skills Increased tax-paying capacity	
Strategic option 2: Sustainable fuelwood and (commercial) charcoal production				
<ul style="list-style-type: none"> - <i>Commercial mall-holder and community bioenergy woodlots;</i> - <i>Commercial mall-holder and community poles and timber plantations;</i> - <i>Improved charcoal kilns linked to bioenergy woodlots</i> 	<p>Reduced GHG emissions Reduced pressure on natural forests</p> <p>Increased tree cover and carbon stocks</p> <p>Sustainable supply of wood for fuel and charcoal</p> <p>Increased efficiency in charcoal production</p> <p>Reduced soil erosion and landslides</p> <p>Improved soil structure (in relation to fuel woodlots)</p> <p>Positive nutrient fertilizer effects from integrated multi-storey agroforestry production</p> <p>Increased moisture in field micro-climate</p> <p>Sustainable and nutritious fodder production that enables stall-feeding and cow milk production</p>	<p>Reduced groundwater quantity by some tree species</p>	<p>4-6 times higher household income generation</p> <p>Business-oriented and commercial operations made possible</p> <p>Organised and increased charcoal production which attracts funding</p> <p>Employment opportunities</p> <p>Reduced conflicts over access to fuel wood and charcoal</p> <p>Improved energy security</p> <p>Improved tenure security</p> <p>Improved food security</p> <p>Reduced time and burdens of collecting firewood especially on women and children.</p> <p>Women can use charcoal residues for making briquettes</p> <p>Enhanced skills in making,</p>	<p>Displacement of food production</p> <p>Reduced traditional ecological knowledge</p>

			installing, maintaining and selling of energy stoves Increased sustainable supply of wood for energy Increased tax-paying capacity	
Strategic option 3: Large-scale commercial timber plantations				
<ul style="list-style-type: none"> - <i>Commercial transmission pole and timber plantation;</i> - <i>Commercial pole and sawlog plantation</i> - <i>Improved charcoal kilns linked to plantation sites</i> 	<p>Reduced GHG emissions</p> <p>Reduced pressure on natural forests for timber, enabling natural forests to regenerate hence biodiversity will be restored and conserved</p> <p>Enhanced ecological functions e.g. microclimatic regulations, nutrient cycling, erosion control</p> <p>High recovery rates of harvested trees from plantations (charcoal production)</p>	<p>Loss of natural ecosystems</p> <p>Increased nutrient load from fertilizers leading to eutrophication of water bodies</p> <p>Pollution from chemicals with effects on biodiversity, e.g. loss of pollinators</p> <p>Reduced groundwater quantity by some tree species (disturbance/reduction of flow to water springs)</p>	<p>Increased income for plantation owners</p> <p>Employment opportunities for local workers</p> <p>Social services (CSR) from plantations owners</p> <p>Increased profitability of plantation forestry from diversified products</p> <p>Tax income for authorities</p> <p>Knowledge and skills from plantation development, management, MRV, etc</p> <p>Technology transfer towards commercialization of plantation, and industrialization</p> <p>Improved tenure security</p> <p>Improved social cohesion amongst plantation workers</p> <p>Access to wood leading to energy security</p> <p>Income and revenue from</p>	<p>Competition for land with food production</p> <p>Human-wildlife conflicts</p> <p>Risk of eviction of illegal settlers in forest reserves (included in table of risks below).</p>

			commercial exports	
Strategic option 4: Restoration of natural forests in the landscape				
<ul style="list-style-type: none"> - Designated areas for natural forest regeneration; - Protected natural forest management (i.e. national parks and forest reserves); - Devolution of forest management through PFM and similar set-ups; - Traditional/customary forest management practices 	<p>Reduced GHG emissions</p> <p>Improved condition of the rehabilitated natural forests</p> <p>Increased forest biodiversity conservation, including improved habitat for wildlife and increased wildlife population</p> <p>Halted forest degradation through enrichment planting and reforestation with indigenous species</p> <p>Improved ecosystem services, including water resources</p>	No serious environmental problem identified	<p>Organized and increased forest-based income generation for forest-adjacent communities, including from value added activities e.g. handicraft; honey; nurseries; boundary patrols, etc.</p> <p>Improved contribution of forest to other sectors of the economy</p> <p>Continuation of forest-based cultural services</p> <p>Organized forest management for both selective timber and NTFP collection as agreed in CFM/PFM.</p> <p>Improved institutional collaboration between communities.</p> <p>Continued cultural and educational practices, including Conservation of high cultural and heritage values</p> <p>Increased tourism potential and revenue for both community and national-</p>	<p>Continued or increased human-wildlife conflicts</p> <p>Distortion of social norms and systems</p>

			<p>level players</p> <p>Tenure security for private and communal areas</p> <p>Reduced conflict arising from clearly demarcated boundaries</p>	
Strategic option 5: Energy efficient cooking stoves				
<ul style="list-style-type: none"> - For fuelwood; - For charcoal 	<p>Substantially reduced fuel wood and charcoal consumption</p> <p>Substantial reduction in carbon emissions</p> <p>Substantially reduced pressure on natural forest for fuel and charcoal</p>	<p>No serious environmental problem identified</p>	<p>Improved health through reduction of respiratory problems associated with exposure to air pollutants from burning wood</p> <p>Reduced burn injuries, especially among children</p> <p>Time freed to attend other activities, especially for women and girls</p> <p>Income savings due to reduced expenditure on charcoal and firewood</p> <p>Employment in stove production</p> <p>Increased small-scale business knowledge</p> <p>Reduced violence against girls and women collecting wood far away.</p> <p>Increased awareness among both urban and rural households</p>	<p>Loss of social constructs associated with traditional cooking methods and cuisines</p>

Strategic option 6: Integrated wildfire management				
-	<p>Reduction of GHG emissions</p> <p>Enhanced nutrient retention, nutrient recycling and organic matter in soils leading to higher crop yields in the long run</p> <p>Improved management of grassland and woodlands (for grazers and browsers)</p> <p>Enhanced habitat heterogeneity</p> <p>Increased forage for domestic and wildlife from tree leaves and bushes (but not grasses)</p> <p>Reduced air temperatures and dryness</p> <p>Reduced air pollution</p> <p>Increased natural regeneration of some species</p> <p>Increased protection of biodiversity (including nesting sites, plants and slow moving above ground and under the ground fauna)</p>	<p>Loss or displacement of biodiversity</p> <p>Increases in susceptibility to invasiveness</p> <p>Reduced regeneration of species that need fire/heat to germinate</p>	<p>Reduced loss of property and life (humans, livestock and crops) due to fire</p> <p>Weed and pest control</p> <p>Increased land productivity (reduced weeds, reduced costs for land preparation, reduced pests, forage improvement, etc.)</p> <p>Increased probabilities for hunting success</p> <p>Reduced respiratory problems in wildfire season</p>	<p>Disrupts/interferes with the cultural values and practices associated with wildfires</p>
Strategic option 7: Livestock rearing in Cattle Corridor				
<ul style="list-style-type: none"> - <i>Livestock breeding improvements</i> - <i>Fodder agroforestry plantations</i> 	<p>Reduced GHG emission intensity</p> <p>Reduced pressure on</p>	<p>Displacement or loss of biodiversity (vegetation manipulation, acaricides)</p>	<p>Increased community resilience to livelihood shocks</p>	<p>Land use conflicts between livestock, crops and wildlife</p> <p>Disrupted cultural values/attachments and</p>

<p>- <i>Water dams and tanks as livestock drinking water</i></p>	<p>rangeland ecosystems /improved rangeland conditions Enhanced rangeland environmental services Increased rangelands resilience to climate change Increased land-use efficiency Reduced farmland expansion Improved milk & meat production per hectare Reduced pressure on natural habitats Improved microclimate Improved soil fertility and productivity Reduction of water stress of livestock and people Increased tree cover from agroforestry</p>	<p>disposals, vermin/problem animal management) Trampling of vegetation around water dams and tanks</p>	<p>Increased access to water Increased household income Improved employment situation Improvement of human nutritional needs Increased social esteem when livestock rearing is possible</p>	<p>traditional systems</p>
<p><i>Strategic option 8: Strengthening of policy implementation for REDD+</i></p>				
	<p>Strengthened capacity of the REDD+ strategic options to reach their target levels through updated, revised and enforced policies, with both carbon emission reduction and environmental benefits Stringent enforcement and</p>		<p>Great benefits to majority of Ugandan households from enforced and updated policies Social and climate change goals of Uganda reached through enforcement of policies and laws, with improved national income</p>	

	new and better anti-corruption policies and guidelines, necessary to reach REDD+ goals		generation and tax-paying ability	
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Annex 4. Risks associated with implementation of the Strategic Options, with comments

Environmental Risks	Social Risks	Comments
Strategic option 1: Climate smart agriculture		

Environmental Risks	Social Risks	Comments
<p>Pollution from improper disposal of plastic coverings of greenhouses.</p> <p>Aquatic and ecotoxicology and human toxicology from pesticides.</p>	<p>Land tenure issues not addressed and solved enough.</p> <p>Low adoption of technologies by poor communities due to high initial costs.</p> <p>Forest dependent communities like the Batwa excluded since they are not agriculturalists and don't own land.</p>	<p>Eutrophication of water bodies possible with bad management of agro-inputs (fertilizers, pesticides, etc.)</p> <p>Introduced species might interfere with the food web.</p> <p>Need of careful screening of agroforestry tree species to prioritise e.g. fruit and nitrogen fixing trees.</p> <p>Clear tenure situation is a prerequisite for people's willingness to invest in improved land productivity.</p> <p>Special interventions will be necessary for forest dependent communities.</p> <p>Extension services needed</p> <p>Some labour-intensive CSA activities could lead to child labour and increased costs.</p> <p>Risk of increased inequalities: the rich will be able to increase their production and the poor remain lagging behind.</p> <p>The technologies are unaffordable for landless, those with very small pieces of land and indigenous marginalised groups.</p> <p>Women should have right to take part in family land use decisions.</p> <p>Poor infrastructure such as grass roofed houses means that one cannot harvest water.</p> <p>Being exposed to climate change, there might be increased food insecurity for communities who</p>

Environmental Risks	Social Risks	Comments
		<p>cannot afford irrigation or greenhouses.</p> <p>Greenhouse must be moved to a new soil area after every 3 years in order not to increase harmful soil microbes too much</p> <p>The same vegetables or closely related ones should not be cultivated in the same greenhouse for more than 3 years in a row before rotating crop</p>
<p>Strategic option 2: Sustainable fuel wood and (commercial) charcoal production</p>		
<p>Imbalance between native species and exotics resulting into dominance of monocultures with their effects.</p> <p>Cutting down of private natural forests to plant high value plantation wood species.</p> <p>Improper site-species matching.</p> <p>Reduced natural and indigenous tree and herbaceous species if degraded forests converted to woodlots.</p>	<p>Land tenure issues not addressed and solved enough.</p> <p>Food insecurity at household level because of trees grown on agricultural land.</p> <p>Loss of biodiversity and ecological resilience (if bioenergy woodlots displace/substitute natural ecosystems).</p> <p>Improper or inadequate market survey for the charcoal value chain, leading to local communities not benefitting from the charcoal business.</p> <p>Increased woodlot boundary conflicts.</p>	<p>Important to ensure that woodlot establishment is on degraded or bare land where it is unlikely that natural forests will ever return.</p> <p>Existing land laws need be enforced. Clear tenure situation is a prerequisite for people's willingness to invest in private woodlots.</p> <p>Competing land uses amidst the limited land holdings might lead to fragile ecosystems like wetlands and natural forests being converted.</p> <p>Commercial charcoal making based on natural forests must be stopped to reduce illegal competition.</p> <p>Extension services needed.</p> <p>Banking sector should develop lending and services to small-scale operations (woodlots, kilns).</p> <p>Increased income gaps between men and women, as the later hardly engage in commercial tree growing on family land.</p>

Environmental Risks	Social Risks	Comments
		<p>Incentives needed for rural poor to participate in profitable charcoal business.</p> <p>Long-term land and tree tenure security need be solved for indigenous people for them to participate.</p> <p>Flexibility in stove design needed in relation to cooking pots, size of kitchens and households.</p>
Strategic option 3: Large-scale commercial timber plantations		
<p>Imbalance between native species and exotics resulting into dominance of monocultures with their effects.</p> <p>Damage to soil from mechanized operations of large scale commercial forestry.</p> <p>Loss of natural forest if natural forests are cut down to plant timber value species.</p> <p>Improper site-species matching with risk of diseases and low yields.</p> <p>Siltation of water bodies unless mitigation measures against erosion are put in place.</p> <p>Encroachment for food production on fragile ecosystems like wetlands and natural forests when land is taken for plantations</p> <p>Plantation damage by wildfires and pests (such as termites) with reduced positive effects.</p> <p>Habitat fragmentation.</p>	<p>Land tenure issues not addressed to good enough solution, with risks of land grabbing, leaving communities more impoverished, thus increasing their dependence on natural resources</p> <p>Lack of or limited knowledge among local communities on incentives and BSA arrangements leading to people not getting the benefits and/or being exploited by the private sector.</p> <p>Food insecurity if turning productive agricultural land to wood production.</p> <p>Increased tenure insecurity.</p> <p>Eviction of illegal settlers in forest reserves.</p> <p>Vermin from the plantations causing conflicts between plantation owners and communities.</p> <p>Historically established customary access to land denied local communities.</p>	<p>Important to ensure that forest plantation establishment is on degraded or bare land where it is unlikely that natural forests will ever return.</p> <p>Most timber from natural forest need be proclaimed illegal, with the exception of sustainably managed wood from PFM/CFM.</p> <p>With bad or no land-use planning plantations may fragment pervious contiguous natural systems, displacing natural forests and woodlands.</p> <p>In-migrated plantation workers may cause trouble.</p> <p>There might be fuel wood scarcity for the rural poor as most wood residues used for charcoal.</p> <p>Increased income inequality, the rich will benefit more from large scale tree growing than the poor communities.</p> <p>Large plantations may serve as hide-outs for criminals.</p> <p>Charcoal making/trading often dominated by outsiders, making the option less beneficial to the</p>

Environmental Risks	Social Risks	Comments
		<p>local communities.</p> <p>Local livelihoods should be integrated into forest plantation management plans.</p>
<p>Strategic option 4: Restoration of natural forests in the landscape</p>		
<p>Forest closure and restricted access might lead to depletion of natural forests on private land, and growing food in the wetlands [assuming the current wetlands strategy remains unimplemented].</p> <p>Failed PFM and similar set-ups may result into open access scenarios resulting into continued forest loss and degradation</p> <p>Lack of enforcement of CFM agreements resulting in continued forest degradation.</p>	<p>Land tenure issues not addressed and solved enough.</p> <p>Forest boundaries not well established which means that evictions of illegal settlers, cancelling of illegal titles, and closure to ensure regeneration will not be effective and there will be recurrent encroachment activities and high costs of enforcement.</p> <p>Issues of the indigenous forest dependent communities who have a history of eviction not being solved, plus increased population, may lead to increased use of forests.</p> <p>Benefits from CFM too small to refrain communities from forest degradation.</p> <p>Elite capture and continued poor forest management if governance issues not taken care of e.g. accountability and transparency, institutional coordination and capacity building for relevant institutions, including LG, and clear implementation arrangements.</p> <p>Political will too low to ensure tangible investment, avoid interference in forest management, poor strategy implementation</p>	<p>Close collaboration between NFA/UWA/DFS and local communities, plus SFM plans, needed to make devolution of forest management a success, avoiding e.g. over-harvesting of NTFPs.</p> <p>A large number of CFM/PFM must be prepared and agreed early on to get good mandate for communities to protect their nearby forests against intruders of various kind.</p> <p>New legislation needed for management of private natural forests.</p> <p>Closures or restricted entry to protected areas may lead to communities depleting forests on private land for agricultural and forest dependency needs.</p> <p>Vermin from the forests may destroy food crops.</p> <p>Risk for CFM agreements leaving out women and children. Better CFM arrangements needed.</p> <p>Some people hold land titles in target areas.</p> <p>Risk for increased scarcity of forest resources needed by communities when in crisis.</p> <p>Clear mandate needed for adjacent communities to keep out people from outside.</p>

Environmental Risks	Social Risks	Comments
	and forestry land grabbing.	
Strategic option 5: Energy efficient cooking stoves		
Introduction of and increased environmental waste at the end of stoves' lifespan.	<p>Lack of diverse, context-fit cook-stoves to suite different communities, leading to low adoption of the technologies.</p> <p>Poor gender considerations in technology development leading to low adoption rate.</p> <p>Inadequate Extension Services to ensure wider adoption of technologies.</p> <p>Inhibitive prices of technologies making it difficult for very poor indigenous, marginalised and forest dependent communities.</p>	<p>Some types of stoves are faster than traditional stoves and people need to get used to this.</p> <p>The stoves need to be renewed every three years.</p> <p>Traditional methods still used unless issues related to size of cooking pots, cooking time, and initial costs are addressed.</p> <p>Risk of insect problems since less smoke to penetrate thatched roofs.</p>
Strategic option 6: Integrated wildfire management		
Uncontrollable fires: wild fires will be hard to control in areas where there are absentee landlords with big tracts of land neighbouring landless and poor people.	<p>Traditional free-grazing cattle herders opposing fighting wildfires</p> <p>No or limited wish by local communities to change practices and behaviour to manage fire appropriately.</p> <p>Little interest in fire management among stakeholders (public, semi-public, associative and private).</p> <p>Accidents using fire to manage woodlands, grasslands and seasonal wetlands.</p>	<p>No or little funding when Government not having resources and donors not interested funding the activities.</p> <p>Some decision-makers at national, regional and local level may be reluctant to a project that could change their habits.</p> <p>Using fire to manage woodlands, grasslands and seasonal wetlands affect biodiversity forms (both plants and animals) with low resilience to fires.</p> <p>Some invasive plant and grass species tend to be more resilient to fires and use of fire would/could favour their flourishing thereby taking over</p>

Environmental Risks	Social Risks	Comments
		<p>/displacing the non-resilient plants/grasses.</p> <p>Land tenure issues and clear ownership rights must be settled to reduce wildfires.</p> <p>National level trans-boundary burning practices e.g. by the Turkana in Karamoja region will be hard to control.</p>
Strategic option 7: Livestock rearing in Cattle Corridor		
<p>Increasing human population and a thereby increasing cattle population cause environmental risks not possible to mitigate.</p> <p>Poor animal health support.</p> <p>Conversion of rangelands to croplands leading to shortage of forage (referring to Karamoja).</p> <p>Prolonged drought spells</p> <p>Invasive grass species (not palatable ones) that take over pasture lands in some places</p>	<p>Land tenure issues not addressed and solved enough, including land conflicts with neighbours over grazing.</p> <p>Credit facilities not available, needed for restocking and infrastructural development.</p> <p>Slow development of water ponds leading to poor watering facilities for livestock.</p> <p>Limited extension support, needed for genetic potential, providing proper nutrition and ensuring animal health.</p> <p>Slow uptake of crossbreeds.</p> <p>Animal thefts.</p>	<p>Some households may expand their herd and thus increase environmental pressure.</p> <p>Need to sort out unclear and unsecure land tenure.</p> <p>Need for land use planning and related conflict resolution.</p> <p>Planning need to take account of the multiple roles and functions of livestock for resource poor farmers: food source, farm input supplier (manure, traction), insurance and an entry point towards a more market-oriented production.</p> <p>Many drugs provided by veterinary services may be useless in curing the livestock.</p>
Strategic option 8: Strengthening of policy implementation for REDD+		
<p>Skills and capacities for environmental policy making and enforcement not strengthened enough.</p> <p>Remaining corruption destroys large parts of any environmental and climate change mitigation efforts</p>	<p>Skills and capacities for social policy making and enforcement not strengthened enough.</p> <p>Remaining corruption may still create obstacles to social policy enforcement.</p> <p>Opposition to more stringent policy enforcement from some policy makers who</p>	<p>Nothing negative found in this as whole Ugandan society and economy will benefit from good policy enforcement.</p> <p>This Strategic Option is a priority option before any other option as otherwise already achieved goals will be wasted.</p>

Environmental Risks	Social Risks	Comments
Much achievements lost or distorted unless good fiscal rules and regulations are followed properly.	themselves have been involved in corruption. Much achievements lost or distorted unless good fiscal rules and regulations are followed properly.	Good capacity building and training programmes needed. Anti-corruption measures must be compulsory at all stages of national REDD+ programme.