CONCEPT NOTE

Reference number: **Research area 1**: Broadening the utilization base for forest resources in the provision of food, fuel (including biofuel), fibre, wood and environmental services. CGS/NARS/3/1

Title: Carbon dynamics in natural forest ecosystems in Uganda

Principal Investigator and contact details:

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Signature of principal investigator:

Project Duration: **3 Years: October 2008-September 2011**

Expected Total Costs: **US $79,805 (Shs.127, 687,500)**

Background

Tropical forests play a significant role in our climate systems, as well as in human-induced climate change. Deforestation in the tropics has turned out to be one of the largest sources of current emissions of carbon dioxide, which is the most important green house gas. Destruction of tropical forests is second only to combustion of fossil fuels in contributing to global warming (IPCC 2001). Deforestation accounts for up to 20% of global co_2 emissions and for up to 25% of all global green house gas emissions. Almost all this is attributable to forest conversion in the tropics (FAO, 2006). The IPCC, 2000 estimates that about 270 Giga tones of Carbon have been emitted from the burning of fossil fuels and the production of cement, whereas 136 Gt C come from land use change, mainly through forest conversion. Annual emissions from land use change in the 1990s were approximately 1.6 Gt C, almost entirely due to loss of approximately 13 million ha of tropical forests per year (FAO, 2006). Deforestation is also the largest source of emissions in the developing world (Houghton, 2005).

The current legal framework under the United Nations Convention on Climate Change (UNFCCC) and its Kyoto Protocol (KP) do not contain any mechanism to reward efforts aimed at preventing deforestation in developing countries. Instead, the possibilities to gain carbon credits from forestry activities under the Clean Development Mechanism are limited to projects involving forest plantations (UNFCCC, 2001). However, environmentalists have been pointing out that the scale of tropical deforestation in contributing to climate change corresponds to the potential of avoided deforestation (AD) as solution.

The proposal to include Avoided Deforestation (AD) in future climate regimes is being debated. The proposal suggests creating a mechanism of compensating countries which reduce their deforestation rates and thus their green house emissions. Initial responses to the AD proposal have largely been favourable and this proposal will be considered after the Kyoto protocol's first commitment period, which ends in 2012.

In light of the above, this study aims at preparing the country to benefit from any efforts that aim at paying for Avoided deforestation in Uganda. Many countries around the world are embracing carbon trading as a means of funding the conservation of natural forests. However, Uganda has not fully prepared itself for this because there is lack of substantial information on amount of carbon absorbed or released through deforestation. This study aims at generating baseline information on carbon sequestration potential of Uganda's natural forests and would go a long way in encouraging both government and private forest owners, who own the largest area of natural forest in Uganda, to stop converting them to alternative uses. This will be a great incentive in the biodiversity conservation strategy. Central forest reserves and community forests would also benefit from this by generating financial resources that would facilitate management activities and improve livelihoods of communities in forested areas. All this will lead to better livelihoods and economic development of Uganda.

Overall objective

Assess the effects of deforestation on the carbon dynamics in a natural forest ecosystem in Uganda.

Objectives

1. Determine the carbon stock in undisturbed natural forest ecosystem
2. Estimate amount of carbon in a unit forest area after deforestation

Expected outputs

1. A Carbon data bank for Uganda's natural forests created
2. Carbon dynamics as a result of deforestation determined

Activities

Output 1: Carbon stock for Uganda's natural forests estimated

- Identify suitable undisturbed natural forest
- Complete inventory of all organisms present
- Collection of above ground biomass data

- Collection of soil and below ground biomass data
- Laboratory determination of above-ground and below-ground carbon
- Data analysis
- Report writing

Output 2: Carbon dynamics as a result of deforestation determined

- Clear undisturbed forest area
- Measure all microclimatic variables
- Collect soil samples from the cleared forest area
- Determine soil carbon in the lab
- Data analysis
- Computation of soil carbon after deforestation
- Report writing

Methodology to be used

This study will be conducted in Mabira forest reserve in Mukono district. This is the largest forest reserve in central Uganda. The forest is appropriate because it located between Uganda's two major industrial towns of Jinja and Kampala, which emit the most carbon-dioxide because of the numerous factories.

An "undisturbed" forest (part of forest that has not been harvested for over 50 years) will be selected basing on published historical data. A sample plot of 10m X 10m will be selected and microclimatic data; such as; air and soil temperature, soil moisture, humidity, wind speed, rainfall and run-off will be collected. All major plant and animal species in the plot area will be identified with help of a taxonomist. Above-ground biomass will be estimated by collecting data on tree height, diameter, branches and leaves. All plants will be assessed for their abundance, diversity and size class structure.

After one year of this study, the same sample area of the growing stock will be cleared and changes in the microclimatic conditions, soil carbon will be measured

Growing stock data, which is usually expressed in terms of cubic metres will be converted to Megagram carbon (1MgC = 10^6 gC) using the Brown (1997) equation below:

$CS_i = CD * VD_i * BEF_i$

Where

CSi : above ground carbon stock of i forest (MGC ha^{-1})

CD: Carbon density

VDi: growing stock of i forest (M^3 ha^{-1})

WDi: weighted wood density of i forest (Mg m-3)

BEFi: Weighted average of biomass expansion factor of i forest

Soil samples will be collected at the surface (0 to 30 cm) middle 30-60 cm and bottom 60-90 cm. All the samples will be from each layer separately, dried and sieved and soil carbon will be determined using wet oxidation methods.

Timeframe: October 2008-September 2011

Statement of deadline for proposals: 26th June 2008

Budget limit: **$79,805 (Shs.127, 687,500)**

Personnel requirement

Scientist	Qualification	Role/skill	Institution
Epila-Otara	PhD	Principal Investigator	NaFORRI
Katumba Balikitenda	BSc.	Tree physiologist	NaFORRI
Isaac Kiyingi	MSc.	Environmental Economist	NaFORRI
Gerald Eilu	PhD	Biodiversity inventory	Makerere university
J.S Tenywa	PhD	Soil specialist	Makerere university
Jacob Agea	MSc.	Data handling and analysis	Makerere university
David Nkuutu	BSc.	Taxonomist	Rada-Uganda
Jimton Acobo	BSc	Biomass inventory specialist	NFA

Reporting

The technical reports will be prepared by the principal investigator with the help of the team. These quarterly and annual reports will be made as per indicated formats in Annex 9 and 10 respectively. The NaFORRI finance officer will compile both quarterly and annual financial reports using the format in Annex 13 section 2 and copies will be given to the Director of research at NaFORRI.

Demonstration of Competency

The National Forestry Resources Research Institute has experience in research and development that dates back to 1950s. Currently, NaFORRI's research mandate covers a wide range of topics related to forestry and environment. NaFORRI has therefore implemented a number of research projects including donor funded projects such as E.U funding for agroforestry research, ARTP1 and ARTP2 and many others over the years.

Data collection in this slightly newer field requires a considerable amount of time, funding and human resource requirements. Because of this complexity, NaFORRI believes a multi-disciplinary team should be assembled to conduct this research. The director of research at NaFORRI who will be the accounting officer has considerable experience.

Dr. Epila-Otara

Dr, Epila has attended many climate change negotiations and carbon trade issues for the last seven years. He has therefore gained considerable insights into the requirements for implementing carbon related projects. He will be the principal investigator to steer the implementation of the project because of his over 30 years experience in teaching and research. He has demonstrated his ability to lead a team of researchers when he successfully led the Gatsby Charitable Foundation funded project that brought Eucalyptus clones from South Africa to Uganda in 2000-2005.

Katumba Balikitenda

Katumba Balikitenda is an Agroforestry Scientist at the National Forestry resources research Institute. He has worked as a Research Assistant for six years. He worked on several projects including screening of useful trees for domestication, identifying tree species wood & energy in Eastern Uganda, adaptive research on several tree species around the Mabira forest enclaves, training farmers on several agroforestry technologies. Mr. Katumba specifically worked on a pilot carbon project in Bushenyi district. He helped farmers select appropriate tree species for growing, choosing suitable planting niches and collecting tree data for calculation of carbon credits for individual farmers. He helped farmers drafted carbon agreements with sellers and training them in the whole process of carbon trading.

Jacob agea

Jacob Agea is experienced in teaching, training, research and consultancy. He has conducted research mainly on ecology, conservation & agroforestry potential of *Acacia senegal* in the rangelands of Luwero & Nakasongola Districts, Uganda (financed by NORAD); Potential of domesticating indigenous fruit trees for income & household food security in Northern Uganda (funded by NURRU) and farmer-centred rural planning and resource management. He has undertaken several consultancies including Analysis of forest and land resource utilization, management and their impact on livelihoods in Teso and Lango farming systems, sponsored by DFID and implemented by Uganda Project Implementation and Management Centre (UPIMAC) through Forest Resources Research Institute (FORRI-Uganda); Development of component 4 (capacity building, dissemination and replication strategy) for a project on removing barriers to the effective management of invasive alien species (IAS) in Africa (under a GEF-CABI funded initiative by the National Agricultural Research Organization (NARO); Has successfully supervised over 15 students for their bachelors degrees and has written 3 book chapters in teaching & training compendium for college students in Community Forestry & Extension. Mr. Agea will be responsible for data analysis/Model development in this study.

Jimton Acobo

Jimton Acobo is a GIS specialist at the National Forest Authority (NFA). His specialty is in biomass survey methods because he worked on the biomass project that compiled the National Biomass data that we currently use for the country. He can map and use most GIS tools in Biomass studies.

David Nkuutu

David Nkuutu is currently a private consultant in East Africa. However, he had previously worked as a Forest ranger in the former Forest department. He has worked both with several projects such as wildlife conservation society (WCS) in the Albertine and individuals such as Prof. Axel Poulsen, a Danish consultant in the area of biodiversity and participated in inventories in all major forests of Uganda. This has made him the best taxonomist in Uganda today. He has conducted several Environmental impact studies including: Kikagati hydro power project on river Kagera, Kakyera Resort hotel Near lake Mburo national park, seismic in Kanungu and many others. David is specialized in plant identification; resource mapping using GIS tools, land use planning and forest inventory techniques.

Isaac Kiyingi

Dr. Gerald Eilu

Gerald Eilu is biodiversity specialist with vast knowledge of biodiversity inventory methods. He Lectures at Makerere University, Faculty of Forestry and Nature conservation

J.S Tenywa

Demonstration of capacity to administer contract

The National Forestry Resources Research Institute is the NARI of excellence spearheading forestry research for improved livelihoods, economic growth and natural resources conservation. Its area of expertise are in farm forestry, natural forests, plantation forests, forest products and services, integrated pests, diseases and fire management and socioeconomic, gender and human concerns. In these areas, it has well qualified human resource to be a centre of excellence in research and development. NaFORRI has enormous experience from several decades of implementing research and

development projects funded by donor agencies such as E.U, Gatsby Charitable Foundation, UN commodity fund, ICRAF and AFORNET)

References

FAO, 2006

Houghton, 2005

IPCC 2001

IPCC, 2001

UNFCCC, 2001

Appendix C: Organization

The director of Research at NaFORRI will be the overall coordinator and Accounting officer of the project. The Principal Investigator will oversee the daily implementation and execution of the project activities including the overall management of the research team. The team of scientists will perform specific roles and responsibilities in their areas of expertise as tentatively tabulated in Appendix C. The routine implementation of the project will be forwarded to the Principal Investigator who will in turn submit progress reports to the Director. The financial resources of the project will be managed by the Director and Finance officer of NaFORRI. Office space, vehicles, and personnel will be provided by NaFORRI. Scientists involved in the project will be paid allowances and per-diem as established in the NAROC's Financial/Emoluments Guidelines and Regulations

Appendix D: Project Budget summary

Item No.	Item description	Total Cost (U.SHs)	$
01	Vehicle costs	23,400,000	14,625
02	Office supplies	9,800,000	6,125
03	Forest equipment	6,800,000	4,250
04	Laboratory costs	11,700,000	7,313
05	Per diems	28,500,000	17,813
06	Capital items	10,450,000	6,531
07	Dissemination	5,600,000	3,500
08	Institutional overhead (15%)	18,862,500	11,789
09	Evaluation (5%)	6,287,500	3,930
10	Contingencies (5%)	6,287,500	3,930
	TOTAL	**127,687,500**	79,805