



PROJECT IDENTIFICATION FORM (PIF)

PROJECT TYPE: Full-sized Project
THE GEF TRUST FUND

Submission Date: 04 March 2009
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PART I: PROJECT IDENTIFICATION

GEF PROJECT ID¹: PROJECT DURATION: 48 months
GEF AGENCY PROJECT ID:
COUNTRY(IES): Sudan
PROJECT TITLE: Integrated Carbon Sequestration Project in Sudan
GEF AGENCY(IES): IFAD
OTHER EXECUTING PARTNER(S): Forest National Corporation,
 Higher Council for Environment and Natural Resources, (Ministry of
 Agriculture, Animal resources and Irrigation)
GEF FOCAL AREA (S)²: Climate Change
GEF-4 STRATEGIC PROGRAM(S): CC-SP6 and CC-SP4
NAME OF PARENT PROGRAM/UMBRELLA PROJECT: NA

INDICATIVE CALENDAR*	
Milestones	Expected Dates mm/dd/yyyy
Work Program (for FSP)	JUN 09
CEO Endorsement/Approval	NOV 10
Agency Approval Date	DEC 10
Implementation Start	OCT 11
Mid-term Evaluation (if planned)	OCT 13
Project Closing Date	OCT 15

* See guidelines for definition of milestones.

A. PROJECT FRAMEWORK

Project Objective: to promote a climate-friendly rural development path in Central and Eastern Sudan by increasing the carbon stock and reducing net GHG emissions in the country, while at the same time sustaining rural development in the Butana.

Project Components	Inv, TA, or STA ^b	Expected Outcomes	Expected Outputs	Indicative GEF Financing ^a		Indicative Co-Financing ^a		Total (\$) c = a + b
				(\$) ^a	%	(\$) ^b	%	
1. Afforestation activities to increase the national carbon sequestration potential.	Inv.	<ul style="list-style-type: none"> - Forest carbon stock increased - Carbon emission reduced - National GHG balance reduced 	<ul style="list-style-type: none"> - 10,000 ha increase of reforested area in sites with less than 40% of canopy cover, leading to an incremental carbon uptake of 380 KtC - Agro-forestry initiatives are tested - Community resource management plans developed to avoid conflicts among users - Improved water management (construction of 10 cisterns, water harvesting, and improved water efficiency). 	1,730,000	29.2	4,200,000	70.8	5,930,000
2. Forest and carbon stock management and maintenance.	Inv.	<ul style="list-style-type: none"> - Carbon storage capacity of vegetation cover maintained in the long run - Carbon stock is conserved due to better forest fire management, including through innovative techniques - Risk of carbon stock loss reduced due to introduction of micro-insurance 	<ul style="list-style-type: none"> - Participatory forest management promoted as a way to protect the carbon stock from drivers of deforestation (illegal felling, over grazing, poor management, etc) - Fire management system is improved and post-fire management plans are developed and implemented - Long-term sustainability of biomass carbon storage potential increased 	755,000	20.1	3,000,000	79.9	3,755,000

¹ Project ID number will be assigned by GEFSEC.

² Select only those focal areas from which GEF financing is requested.

		schemes	- Forest micro-insurance schemes tested on a pilot base in 2 sites					
3. Capacity building at the national level for monitoring and reporting on carbon stock and changes and awareness raising on biocarbon stock at the local level.	TA	<ul style="list-style-type: none"> - Decision makers and technicians are trained on latest LULUCF mapping techniques - Effective monitoring of forest carbon stock and fluxes established - Technicians are equipped with and trained to measure carbon stocks and fluxes in the land use systems - Relevant information and data is collected, updated and disseminated, including GIS - Local communities are aware of the potential benefits from carbon sequestration 	<ul style="list-style-type: none"> - Baseline and monitoring system for deforestation and forest degradation established - 6 training sessions for policy makers undertaken (48 policy makers trained) - 20 training sessions (120 technicians) - Relevant time series is collected and processed/analyzed for monitoring land use change and carbon - Existing GIS systems upgraded to include LULUCF data - Specific studies to generate local data and parameters for better estimation of carbon stock changes and fluxes are carried out - Awareness raising campaigns organized at the local/community level 	350,000	28	900,000	72	1,250,000
4. Promotion of sustainable energy production at the community level.	Inv., TA	<ul style="list-style-type: none"> - Potential for energy production from biomass residues increased - Energy from biomass is produced from different inputs through modern and sustainable technologies 	<ul style="list-style-type: none"> - Reduced GHG emissions from energy production at the community level - Use of improved and modern climate friendly stoves is promoted to replace inefficient wood stoves - Energy production from biomass is sustained by different inputs (wood, agricultural residues, animal wastes, sun) 	450,000	23.1	1,500,000	76.9	1,950,000
5. Project management				365,000	21.3	1,350,000	78.7	1,715,000
Total project costs				3,650,000	25	10,950,000	75	14,600,000

^a List the \$ by project components. The percentage is the share of GEF and Co-financing respectively of the total amount for the component.

^b TA = Technical Assistance; STA = Scientific & Technical Analysis.

B. INDICATIVE CO-FINANCING FOR THE PROJECT BY SOURCE and by NAME (in parenthesis) if available, (\$)

Sources of Co-financing	Type of Co-financing	Project
Project Government Contribution	In-kind	500,000
GEF Agency(ies)	cash	10,100,000
Others	In-kind	350,000
Total Co-financing		10,950,000

C. INDICATIVE FINANCING PLAN SUMMARY FOR THE PROJECT (\$)

	Previous Project Preparation Amount (a) ³	Project (b)	Total c = a + b	Agency Fee
GEF financing	0	3,650,000	3,650,000	365,000
Co-financing	0	10,950,000	10,950,000	
Total	0	14,600,000	14,600,000	365,000

PART II: PROJECT JUSTIFICATION

A. STATE THE ISSUE, HOW THE PROJECT SEEKS TO ADDRESS IT, AND THE EXPECTED GLOBAL ENVIRONMENTAL BENEFITS TO BE DELIVERED:

A.1. Background information. Sudan is the largest country in land area in Africa and has an estimated population of 38 million (2008⁴). The population growth rate is 2.6%, compared with a Sub-Saharan African average of 2.1%. The Sudanese economy continues its sustained growth since 1997. Over the period 2000-2007, it is estimated that annual Gross Domestic Product (GDP) growth reached 8% on average, due principally to higher oil production, and to a lesser degree good harvests and the rise of the services sector. The economic outlook⁵ for 2009-2012 is influenced by falling oil prices. The GDP growth in 2008 is estimated at 5.6%.

Agriculture is the backbone of the Sudanese economy and it is the main source of livelihood for Sudan's rural inhabitants. Agriculture provides 90% of the national food requirements and constitutes 80 % of non-oil exports. The traditional rainfed sector⁶ accounts for 26% of the GDP in 2005 and accounts for 67% of agriculture GDP. Agriculture growth fluctuation is mainly caused by vulnerability of the production to climatic variability, the declining productivity in the rainfed sector and the import restrictions on Sudanese livestock due to disease outbreaks.

Forestry in Sudan is inevitably linked with animal husbandry, rain-fed agriculture and village or urban life and thus assumes a significant supportive function. Woodland areas cover about 74.1 million ha (29.6 % of Country's area)⁷. Trees and shrubs play a crucial role in Sudan economy and the lives of its people. Their distribution is such that 65% are in the southern region whereas the remaining 35% are found in the northern region. The forestry sector contributes about 15% to the GDP⁸. In addition, the forestry sector provides 15% of job-opportunities available in the rural areas and 30% of the feed of the national herds. Wood for fuel is the major forest product. The contribution of forestry to the national energy supply is estimated to account for 71% of the total energy consumed in the country. Gum arabic is the second non-wood forest production in Sudan. Since late 1980s, gum arabic became the second biggest export after cotton, amounting to about 11 % of total exports and constituting 80% of the world production. Other non-wood forestry products include honey, beeswax and other fruits and nuts.

A.2. Issue to be addressed. As reported in the Sudan Initial National Communication (INC) to the United Nations Framework Convention on Climate Change (UNFCCC), agriculture and land-use, land-use change and forestry (LULUCF) are the main emitters of greenhouse gases (GHGs) in Sudan. Agriculture contributes to 50,083 Gg of CO₂-equivalent and LULUCF generate net CO₂ emissions of 15,577 Gg (corresponding to more than 75% of total CO₂ emitted). This was a consequence of a steady reduction in the stocked volume of forest resources in Sudan due to: (i) the expansion of agriculture in the absence of proper land-use and forest management planning, (ii) increased urbanization, (iii) fuel wood production (firewood and charcoal, which constitutes more than 70% of total national energy consumption), (iv) and grazing. The INC reports that in 1958 the Sudanese forest area was between 36% and 43% of the total country area; later in 1990, the forest cover had shrunk to 19% of the total country area (FAO). The 1995/1996 national forest inventory estimated the forest area at 12%. This reduction in the forest stock has caused Sudan's forest to become a source of GHG emission rather than GHG sink. Therefore, the INC indicates that forests could play a vital role in carbon sequestration in the country. In more detail, the analysis carried out for the preparation of the INC suggests that

³ Include project preparation funds that were previously approved but exclude PPGs that are awaiting for approval.

⁴ It was declared but not yet published

⁵ Source: Economist Intelligence Unit. Sudan country report. December 2008.

⁶ The traditional rainfed sector encompasses here the traditional rainfed agriculture, the animal resources and forestry.

⁷ Source: Sudan Forest National Corporation

⁸ The figure does not take into account illegally harvested timber used for rural housing, furniture, utensils, arts and crafts, and fuel and fodder.

afforestation and rehabilitation of rangelands are the most suitable options to achieve GHG emission reduction objectives in the country.

A.3 Proposed IFAD/GEF intervention.

Project area. The proposed project would target the Butana region, an area lying between the River Atbara and the Blue Nile. Butana is one of the areas prioritized by the Government to receive focused support. The area falls under five States (River Nile, Khartoum, Gezira, Gedaref, and Kassala), and 10 localities (Sharg El Nil, Shendi, Shamal shendi, Kaboshiya, Eddamer, Es Soubagh, Um el Gura, Rufa'a, Satit, River Atbara). The Butana area is an extensive, monotonous flat plain. The northern areas are part of the desert/semi-desert zone and rainfall rarely exceeds 100 mm/year. In the central parts of Butana, which is part of the semi-desert, rainfall reaches 250 mm. Further south in the poor savannah, rainfall reaches 400 mm. The greater part of the Butana is, however, drained by numerous *khors* into inland deltas. Sorghum is cultivated in these deltas.

Due to the geological and hydrological conditions prevailing; the provision and supply of water could be achieved through three main supplies, namely groundwater, surface water harvesting and perennial sources. Each of these sources addresses the problem of water supply in varying degree. These different sources of water are tapped through 5 water utilization systems in the Butana region for drinking and irrigation purposes: (i) perennial streams and canals; (ii) open hand – dug wells and hand pumps; (iii) water yards; (iv) water harvesting surface structures (hafirs and dams); (v) traditional water system (natural pool and depressions). These depressions or wadis drain the rainfall into northwest and southwest directions. The surface runoff draining southwest can form major wadis that join the River Nile System in River Rahad or the Blue Nile. Under normal range of rainfall, most of those wadis end up spreading into deltas. The deltas are terraced and cultivated for the production of sorghum, while the flat land is used for grazing of livestock. The wadis, washing towards river Nile and Blue Nile, form numerous *mayaa'* that hold water for months thanks to the thick clay layers on the surface of the soils.

The region is characterized by a variety of vegetation and plant cover. The northern part is characterized by the growth of dwarf *Salam* trees (*Acacia ehrenbergiana*) on the impoverished clay and sand soil, and *Marakh* (*Leptadenia pyrotechnica*) and the perennial grass *Panicum turgidum* on sand dunes. On the clay soil in the semi-desert and poor savannah to the south, the tree vegetation typical consists of stands of Acacia thorn tree (*Acacia millifera*, *A. raddiana*, *A. nubica*, *A. seyal*, *A. tortilis*). These are presently confined to *wadis*, where there is sufficient moisture to support their growth. The continuous expansion of sorghum cultivation, whether lawful or otherwise has resulted in the devastation of the vegetation. The ground layer of vegetation, which provides grazing, has also deteriorated through the years because of excessive grazing and the breakdown of the traditional system.

Target population. The total population of Butana is estimated at 1 million inhabitants most of them are farmers and nomads. The local economy is characterized by agro-industrial production driven by the installation of large irrigated and mechanized agricultural schemes and agro-processing industries as well as by increasing urbanization of main settlements on the riverine borders of Butana. Livelihoods, especially of the poorest, are hence a combination of subsistence production and migration in pursuit of wage labour. The project area comprises approximately 100,000 households; expected project beneficiaries are estimated at 10 000. The project target group is composed of settled farmers, agro-pastoralists and pastoralist households.

Project objective: to promote a climate-friendly rural development path in Central and Eastern Sudan by increasing the carbon stock and reducing net GHG emissions in the country, while at the same time sustaining rural development in the project area.

To achieve this objective, the IFAD/GEF project will be articulated around five components, namely:

1. Afforestation/reforestation activities to increase the national carbon sequestration potential.
2. Carbon stock management and maintenance.
3. Capacity building at the national level for monitoring and reporting on carbon stock and changes and awareness raising on biocarbon stock at the local level..
4. Promotion of sustainable energy production at the community level.
5. Project management.

In more detail, the proposed GEF intervention will be articulated as follows.

- Component 1: Afforestation activities to increase the carbon stock. The activities undertaken under this component will aim to increase the carbon sequestration potential in the project area through afforestation investments in the ground. Plantation will be mainly rainfed, but irrigated plantation will be applied on small scale in irrigated farms (shelterbelts and windbreaks). Underground water is available through the Nubian and Gezira aquifers. Rainfed plantation will be carried out ensuring that suitable tree species are selected and that water harvesting techniques are adopted. According to data from the Forest National Corporation (FNC), survival rate of afforestation in Butana ranges between 65% and 77% depending on the States. FNC will provide tractors and Delfino plough to adopt the most successful water harvesting techniques that are expected to increase the survival rate up to 85%. This component will aim to increase: (i) the total forested area (additional 10,000 ha of land is forested in sites with less than 40 % of canopy cover); (ii) the production capacity and diversity of existing forest cover; (iii) the long-term carbon sequestration potential from land use change and reforestation. Activities under this component will be differentiated, depending also on the agro-ecological conditions of the targeted zones and would include:
 - the plantation of *Tuman* and *Marakh* and other drought resistant indigenous tree species seedlings in the dunes area following rain showers;
 - the promotion of social and private forests (particularly in those areas where the baseline will support investments in water facilities and water harvesting) that may be also linked to the voluntary carbon market (in this case a consortium of small-holders may be also created). This component will require working with both agro-pastoralists and the Forest National Corporation to find the adequate incentives and establish the appropriate legal framework;
 - the promotion of arboriculture and agroforestry practices by: (i) supporting organic agriculture and fruit production and training farmers (with a focus on women that will represent 50% of the target group) on organic fruit production; and (ii) carrying out agro-forestry practices on a pilot basis on in all targeted states (micro payment for environmental services (PES) schemes could be promoted to provide incentives to the farmers).

IFAD, through the Butana Integrated Rural Development project, will finance: investments in technology transfer in terms of improved water use (e.g. minimum tillage techniques and small scale pump irrigation that are particularly adapted to the promotion of agroforestry and arboriculture), community irrigated shelterbelt and construction and rehabilitation of water facilities; development of community resource management plans to avoid conflicts over natural resources; surface and groundwater studies, a groundwater monitoring system and a rangeland study. Afforestation costs include seedling production, tree planting, weeding, beating up land preparation, supervision and protection. Also, at least 20% of the plantation programme in the targeted area will constitute community forests, reducing the risks associated with plantation establishment, protection and management. A thorough analysis of the survival risk of trees, as well as of the environmental characteristics of the project area will be carried out during the project formulation phase.

While contributing in the long term to climate change mitigation, afforestation activities will contribute to the achievement of other environmental benefits, particularly in terms of reduced land degradation and sand dune fixation, increased adaptive capacity of rural population to negative impact of climate change (also economic vulnerability is reduced through the promotion of arboriculture and agroforestry), and increased potential of ecosystem services.

- Component 2: Forest and carbon stock management and maintenance. This component will address the issue of maintenance by adopting an approach centred on sustainable forest management to protect the biomass and ensure the maintenance of the carbon stock in the long-run. The Government and particularly the Forest National Corporation are already undertaking several activities to conserve forests in the project area (see also section B below). Many factors contributed to the continuous degradation of the natural forest in the project area including lack of management, illegal felling, over grazing and poor regeneration. Therefore monitoring and arresting the degradation of the natural forests is one of the highest priorities in Butana area. Moreover, forest fire represents an important factor of forest destruction and due to climate change the frequency of these events is expected to increase. This project component will undertake activities aiming at: (i) conserving the vegetation cover and thus protecting the existing carbon stock; (ii) adoption of proper sustainable management system based on participatory approach; (iii) improving the current fire management system, including introducing post-fire management practices. Improved fire management would entail a combination of improved use of space₅

technology to monitor fires, adequate forest management techniques, strengthened organizational and institutional capacity to minimize risk of fire, community awareness and development of participatory approaches to ensure participation of communities into forest management plans. Involvement of local people through agro-silvo-pastoral systems in reserved areas is expected to increase protection of carbon stock. The project will also test and introduce ad-hoc post-fire management plans. These activities are also expected to generate multiple environmental benefits, particularly in terms of biodiversity protection and conservation, and climate change adaptation. In already forested areas and particularly for private forests, micro-insurance schemes may be tested on a pilot base to reduce the risk of loss of the carbon stock. In a long-term perspective this would make the forest asset more competitive on the carbon market. Linkages with financial institutions that already exist in rural areas will be considered to keep the operational costs of the insurance scheme as low and as efficient as possible. The details of the micro-insurance scheme will be determined during the project formulation phase.

- Component 3: Capacity building at the national level for monitoring and reporting on carbon stock and changes and awareness raising on biocarbon stock at the local level. This component will be developed at two levels: national and local.
 - At the national level, monitoring and reporting on carbon stock and changes will aim to increase the capacity of both decision makers and technicians on LULUCF mapping techniques (including ground survey and remote-sensing techniques), as well as on measurement of carbon stock and fluxes in the land use systems. Under this component, relevant information and data, including GIS, will be collected, updated and disseminated to improve estimation and accounting of carbon stock change for UNFCCC reporting, CDM and possible REDD activities. In order to achieve these objectives, the project will carry out the following activities: (i) training sessions for policy makers and technicians; (ii) analysis and processing of relevant time series data for monitoring land use change and carbon fluxes and stocks; (iii) test at the local level state-of-the-art GIS for LULUCF monitoring and up-scale the outcomes at the national level; (iv) conduct specific studies to generate local data and parameters (e.g. emission factors) for better estimation of carbon stock change and GHG fluxes; (v) establishing a baseline and monitoring system for deforestation and forest degradation, based on the evolving work under the REDD agenda of the UNFCCC. A national carbon stock inventory will be also established. This will be supported by a forest carbon accounting model that generates district-level and national-level estimates of carbon stocks in forest biomass, litter and soil.
 - At the local level, promotion of forestry awareness among nomads, farmers, women and school children to motivate their participation in: (i) rehabilitation, conservation and sustainable management of their natural resources, and (ii) establishment of community forests, village woodlots, farm forestry and school forestry program.

Targeted capacity building activities will take place at the beginning of the project implementation to ensure that mitigation activities are: (i) undertaken in a cost-effective way and with the full involvement of the local population; (ii) mitigation benefits are monitored and reported correctly. These activities will build on capacity building efforts by the IFAD project; their incremental value will be linked to the climate change mitigation aspects. This component will create the appropriate enabling environment to implement the investment activities in the most efficient way.

- Component 4: Promotion of sustainable energy production at the community level. Biomass (wood fuel, animal wastes and agricultural residues) is the most consumed type of energy in Sudan (87%). However, its use – mostly direct burning of fuel-wood - is not efficient and it has led to illegal cutting of forests area to satisfy the fuel-wood demand. A study on the biomass energy potential in Sudan⁹ indicates that Sudan has a high potential of using biomass residues for energy production in a more efficient way. This component will promote biomass technologies for energy production at the community level. These include: (i) briquetting¹⁰, (ii) improved stoves, including solar stoves and (iii) biogas production. By diversifying the inputs for biomass energy production and by adopting modern and sustainable technologies, this component will make sure that while producing mitigation benefits, natural resources will be used sustainably and without conflicting with biodiversity, forest management and land degradation objectives. In more detail, the project will provide about 6,000 households with improved stoves. The Berkerly Darfur stoves are a possible option, as they have proven to be four times more efficient than traditional three-stone fires and two times more efficient than clay stoves, at a unit cost of approximately 20\$.

⁹ Elsevier, “Biomass energy potential and future prospect in Sudan”,

¹⁰ “Briquetting is the formation of a char from otherwise wasted agricultural and forestry residues” Abdeen M. Omer, 2003.

Also, solar stoves may be introduced and tested in the project area (their cost ranges between 10-20\$). These activities are expected to lead to an estimated amount of avoided GHG emissions of 18,000 tCO₂¹¹. Furthermore, this component will pilot the construction of 250 small-scale digesters for the production of biogas that will target about 200 households. This will further generate an additional emission reduction of 1000 tCO₂e/yr¹². Local communities will be trained and organized to carry out the proposed activities. Market linkages and extension services will be strengthened to support the development of this activity. The activities supported in this component will also have the co-benefit of engaging the local population in a rentable activity and to diversify their income.

- **Component 5: Project management.** This component will cover the costs associated to the project management. Lessons learned will be disseminated through IFAD's regional knowledge network KARIANET and other relevant knowledge vehicles, thereby assuring regional coverage. A dedicated project website and a database on climate change related issues and activities could be established. This would contribute at up-scaling and replicating successful experiences in other regions.

Expected global environmental benefits

The proposed project is expected to generate multiple benefits:

- a) **Climate change mitigation benefits.** These are expected to be achieved in terms of reduced net carbon emissions in the country through conservation of existing carbon stock, expansion of carbon stock, increase in the use of alternative energy sources, and increase in the soil organic carbon and in the plant storage capacity.
- b) **Climate change adaptation benefits.** The adaptation benefits will be delivered through economic diversification (agroforestry, social and private forestry, biomass production) and reduced pressure on critical natural resources. These activities will reduce the vulnerability of the local population to climatic changes.
- c) **Biodiversity conservation benefits.** The proposed activities will also contribute to maintain ecological processes and not damage other ecosystems.
- d) **Desertification control benefits.** Afforestation/reforestation activities will contribute to soil formation and erosion control, reducing sand dune formation and advancement. The proposed activities will also improve watershed functions.
- e) **Improved sustainable forest management.** The IFAD/FNC/GEF intervention will also contribute to strengthen sustainable forest management and increased forest regeneration capacity, vitality and health.

B. DESCRIBE THE CONSISTENCY OF THE PROJECT WITH NATIONAL/REGIONAL PRIORITIES/PLANS: The proposed project is fully in line with the overall objective of Sudan's national implementation strategy for climate change, namely to promote sustainable development paths that improve Sudan's adaptive capacity and limit the growth in GHG emissions through integration of climate change issues and concerns into national policies, strategies and development plans. The present proposal is consistent with the indications contained in the Sudanese Initial National Communication to the UNFCCC, where forests are acknowledged to play a crucial role in mitigating climate change in the country. Afforestation and rehabilitation of rangelands are indicated as the most suitable activities to achieve GHG emission reduction objectives in the country. A major effort has been carried out by the Forest National Corporation to conserve the existing forest in the project area. To date more than 100 natural forests have been demarcated and declared as forest reserves in accordance with the current Forest Law, which gives them protection against irrational use, whilst not impeding access to the local communities. However over the past 25 years there has been a rapid deterioration and reduction in the forest carbon stock of Butana area due to continued deforestation and forest degradation which in turn resulted in the accelerated environmental degradation and desertification in the area. The proposal is also aligned with the climate change-related activities supported by the Higher Council for Environment and Natural Resources, particularly with regard to the assessment of GHG sources and sinks and GHG mitigation options that are relevant to the preparation of Sudan's National Communication. Also, the proposed activities will contribute to the objectives of other environmental conventions, namely the United Nations Convention

¹¹ This estimation is based on the study "Development and testing of the Berkeley Darfur Stoves", Amrose et al., March 2008. With a 72% savings in fuelwood due to the introduction of improved stoves, the potential avoided emissions are calculated using 0.15TJ/ton as the net caloric value of wood (IPCC default value for wood) and 109.6 tCO₂ emitted/TJ (IPCC default for biomass).

¹² Estimation based on the study "Development of sectoral CDM project: a case study for small scale biogas project". A 2m³ digester is estimated to produce 4.93 tCO₂e per year.

to Combat Desertification (UNCCD) to which Sudan became Party in 1992 and the United Nations Convention on Biodiversity (UNCBD) signed by Sudan in 1995.

- C. DESCRIBE THE CONSISTENCY OF THE PROJECT WITH [GEF STRATEGIES](#) AND STRATEGIC PROGRAMS:** The proposal is consistent with the GEF strategy on climate change. In particular, the present proposal is in line with the GEF-4 strategic objectives of (i) reducing GHG emissions from land-use, land-use change and forestry (LULUCF), and (ii) promoting sustainable biomass energy production. The focus of the intervention is on LULUCF activities; energy production from biomass will be supported in the context of an integrated approach that will ensure the sustainable production and use of energy from this source. The activities promoting the production and use of energy from biomass will be carried out without conflicting with other environmental and development objectives.
- D. JUSTIFY THE TYPE OF FINANCING SUPPORT PROVIDED WITH THE GEF RESOURCES:**
The GEF resources will be provided in the form of grant and will be mostly co-funded through an IFAD loan to the Government of Sudan.
- E. OUTLINE THE COORDINATION WITH OTHER RELATED INITIATIVES:** Coordination will be ensured with national policies and government activities. As a fundamental condition, coordination will be guaranteed with the activities supported by the IFAD-supported “Butana Integrated Rural Development Project”. In particular, the IFAD/GEF intervention will coordinate activities related to sustainable use of natural resources with those carried out in the baseline. Also, the proposal will be complementary to relevant climate change and non-climate change ongoing and past operations in the country. For instance, the proposed intervention will be complementary to and will build on the lessons learned from the “Community-based rangeland rehabilitation for carbon sequestration and biodiversity” that addresses land degradation as a cause of reduced ecosystem’s ability to sequester carbon and maintain biodiversity. The project aimed to increase carbon sequestration through sustainable management of rangeland and land use. The project will also build on the lessons learned from the UNDP/GEF supported “Conservation and management of habitats and species and sustainable community use of biodiversity in Dinder National Park”. To the extent possible and where relevant, coordination will be also promoted with the UNDP/LDCF NAPA implementation. Concerning the use of biomass energy the project will learn from other experiences in Sudan such as the Practical Action-supported Kassala Smoke and Health Project and the Darfur Efficient Cook-stoves Project, as well as projects carried out in other countries (e.g. the World Bank/GEF supported activities in this fields in Ethiopia, Senegal, Mali, Burkina Faso and Madagascar).
- F. DISCUSS THE VALUE-ADDED OF GEF INVOLVEMENT IN THE PROJECT DEMONSTRATED THROUGH [INCREMENTAL REASONING](#) :**

The GEF intervention will be developed in synergy with the IFAD-supported Butana Integrated Rural Development (BIRD) Project.

Baseline. In Sudan forests experienced severe destruction because with increased populations the needs for fuel wood, for grazing and for speculative cultivation also increased; and these are economic necessities that are often vital means of survival. Plantations were established since the start of forestry practice in the Sudan. Plantations include both indigenous and exotic types. The largest plantations (52227 ha.) are made of *Acacia senegal* raised to compensate for areas damaged by fire, illicit felling and senility. Forest Policy and Laws encouraged local communities, private individuals and organizations to establish plantations. However, in the business as usual scenario the areas annually planted are by far below the strategic and policy targets. The Butana area has been particularly affected by deterioration of the vegetation cover. Increased droughts, reduced government expenditure for basic services and changes in the land law, made the area a cross-road and allowed influx of livestock into the rich grazing resources of the Butana. Little or no investment in the natural resources management, apart from unplanned water investments, took place in the region for a long time. The consequence of the poor investment in natural resource management in the region was severe degradation of the natural vegetation cover (rangelands and forests), regression of the fauna and erosion of soils. Nowadays, overgrazing represent one of the main causes of degradation of vegetation. Also, woodcutting for energy purposes accelerated deforestation. Even if energy alternatives have been promoted to meet the wood-fuel deficit by encouraging the use of other biomass alternatives in order to protect forests and preserve the environment, wood is yet the main energy source, although its combustion for energy production is done in an inefficient way. This further increases the release of carbon emissions. Without any intervention, land use changes and inefficient use of wood for energy production will continue to be the main causes of pressure on the vegetation cover.

The IFAD-supported Butana Integrated Rural Development project mostly addresses problems related to overgrazing, by promoting a sustainable livestock system. Environmental sustainability is supported as a cross-cutting issue given its fundamental role in improving local livelihoods and increasing local communities' resilience to drought. Specific activities include increasing the productivity of livestock husbandry systems through the improvement of productivity of subsistence crops, the introduction of fodder in the farming system, the improvement of carrying capacity of the range, the construction/rehabilitation of water facilities, the development of resource management plans. Also, marketing services will be reinforced and capacity building and institutional support strengthened. Specific activities are tailored to the specificities of the ecosystems and socio-economic settings characterizing the Butana region. The overall goal of the BIRD project is to achieve a sustainable improvement in the livelihoods and drought-resilience of rural poor households. Its specific objectives include (i) establishing a coherent and cost-effective governance framework that ensures regulated access to land and water resources in the region; (ii) improving both women's and men's access to – and bargaining position in – livestock markets; (iii) developing the capacity of community-based organizations to engage in environmentally sound development initiatives that are gender- and socially equitable.

While building the basis for a sustainable use of natural resources in Butana, the BIRD does not address other environmental issues that contribute to increasing the sustainability of rural development efforts in the country. While seeking to provide remedial action to improve the livelihoods of rural poor household, the activities supported in the baseline do not take into account the potential of increasing the carbon stock in the project area, while at the same time generating other economic and environmental benefits.

Incremental reasoning. The GEF intervention will cover the incremental costs associated to the Government efforts to reduce the national GHG emission balance. In more detail, the GEF intervention will be articulated around 5 components.

1. Afforestation/reforestation activities to increase the national carbon sequestration potential. Under a business as usual (BaU) scenario, the LULUCF sector will continue to be a main source of carbon emissions in the country. Baseline activities will focus on the development and improvement of rangelands, including by developing in consultation with the Pastoralist Union and the Framers Union community resource management maps and range management plans. The GEF intervention will support afforestation activities that counterbalance possible negative impacts of range development activities. Afforestation activities will be developed in a synergistic manner with the baseline activities developed along the BaU scenario. As a result of the GEF intervention, vegetation cover will be increased of approximately 10,000 ha in the Butana region, leading to an incremental carbon uptake of 380 KtC¹³ (or 1,393.46 KtCO_{2e})¹⁴. Significant co-benefits will be generated in terms of increased resilience of the ecosystems, including to climatic shocks, and biodiversity conservation.
2. Carbon stock management and maintenance. Without the GEF intervention, the drivers of deforestation and forest degradation will continue. This may hamper the long-term sustainability of the project outcomes in component 1. With the GEF intervention, the forest management system will be improved, including through the development of a cost-effective methodology to measure carbon stocks and fluxes and improved post-fire management systems. Micro-insurance schemes may be tested on a pilot base to reduce the risk of loss of the carbon stock. In a long-term perspective this would make the forest asset more competitive and appealing in the carbon market.
3. Capacity building at the national level for monitoring and reporting on carbon stock and changes and awareness raising on biocarbon stock at the local level. BaU capacity building activities focus on developing community-based organizations; locality and state staff is trained on planning, budgeting skills, gender analysis and in formation of community and apex organizations. Experts at the national and local level are not trained on methods for GHG emission reporting from the LULUCF sector. Also, data on carbon stock and fluxes are not available and local population use natural resources in an inefficient manner, ignoring the carbon sequestration potential/benefits deriving from LULUCF activities. The GEF alternative will support capacity building at the national level to enable national experts in concerned institutions to monitor and report effectively on carbon sequestration changes and improvements. Also, a national carbon stock inventory will be created and relevant national climate change policies will include effectively information related to changes in carbon emissions from the LULUCF sector. In addition, the GEF alternative will increase the awareness of the local communities on the potential of sustainable resources management for carbon mitigation and the benefits they may get from involving and maintaining these activities.

¹³ This amount has been estimated using as reference the IPCC Special Report on Land Use, Land-use change and Forestry.

¹⁴ The conversion ratio from carbon to carbon dioxide equivalent is 44/12.

4. Promotion of sustainable energy production at the community level. Under a business as usual scenario, energy production from biomass is undertaken in an unsustainable manner. The GEF intervention will stimulate biomass energy production from a diversified set of sources and through the adoption of modern environmentally-friendly technologies. This will be carried out in an integrated way with the other project activities.

The table below summarizes the two scenarios (without and with GEF intervention).

Components	Without GEF intervention	With GEF intervention
1. Afforestation/ reforestation activities to increase the national carbon sequestration potential.	Emissions from LULUCF continue to increase and forestry remains the primary source of carbon emissions in the country. Sudan continues to generate GHG emissions and follows a non-carbon neutral rural development path. Agriculture and range development do not consider climate change mitigation potential of LULUCF activities.	Contribution of forestry sector to carbon –emissions reduction increased. Incremental carbon uptake of 380 KtC (over –10,000 ha) generated. Vegetation cover in the Butana area is increased over 10,000 ha, generating relevant co-benefits for the environment (CC adaptation, biodiversity, –and desertification).
2. Carbon stock management and maintenance.	Deterioration and reduction in the forest carbon stock of Butana region due to continued deforestation and forest degradation, which in turn result in the accelerated environmental degradation and desertification in the area.	Carbon stock is managed and maintained in a –sustainable manner. A cost-effective methodology to measure carbon –stocks and fluxes is developed and used. The forest management system is improved and –post-fire management practices are introduced. Innovative carbon loss risk sharing/transfer –mechanisms are tested on a pilot base.
3. Capacity building at the national level for monitoring and reporting on carbon stock and changes and awareness raising on biocarbon stock at the local level.	Only a limited number of experts is trained on methods for GHG emission reporting from the LULUCF sector. Policy makers and technicians are not able to use existing methods and data are not available. Local population uses natural resources in an inefficient manner and is not aware of the carbon sequestration potential/benefits deriving from LULUCF activities. Capacity building activities focus on developing community-based organizations; locality and state staff is trained on planning, budgeting skills, gender analysis and in formation of apex organizations.	Sudanese government enabled to integrate –climate change issues into the LULUCF sectors Policy makers and technicians are trained in the use of relevant LULUCF mapping techniques –and measurements. A national carbon stock inventory is created and national CC policies are more receptive of –changes in land use/forestry. Local communities are aware of the potential of sustainable resources management for carbon mitigation and participate in the management of the natural resources
4. Promotion of sustainable energy production at the community level.	Biomass is the most consumed type of energy in Sudan (approx. 87% of the national energy needs). Direct burning of fuel-wood and crop residues are largely used in the country, but their inefficient use causes economic losses and affects adversely human health. In a business as usual scenario biomass will continue to be use inefficiently and traditional stoves will continue to be used.	Modern and sustainable practices and technologies for biomass energy production, – conversion and use are promoted. Use of improved and modern climate-friendly – stoves is promoted. Percentage reduction of GHG emissions through the promotion of sustainable energy production from biomass.

- G. INDICATE RISKS, INCLUDING CLIMATE CHANGE RISKS, THAT MIGHT PREVENT THE PROJECT OBJECTIVE(S) FROM BEING ACHIEVED, AND IF POSSIBLE INCLUDING RISK MITIGATION MEASURES THAT WILL BE TAKEN:** A possible risk is the lack of follow up and participation of the local population. To mitigate this risk, the project has been developed adopting a participatory approach that should ensure the full involvement of the local population in the implementation of the proposed activities. In addition, capacity building and sensitization programmes will be carried out to respond effectively to the mentioned risk.

Also, another risk is that people/local population will continue to over-use forest resources. This risk should be

mitigated by the circumstance that the association of the loan with the GEF intervention will shift pressure on forests and give incentives for diversify income generation activities.

The risk of low survival of the trees will be mitigated through the adoption of suitable planting techniques. FNC will provide tractors and Delfino plough to adopt the most successful water harvesting technique. This is expected to increase the survival rate up to 85%, according to studies carried out by the FNC for the Butana area. The involvement of local communities and the promotion of participatory approaches for natural resource management will reduce costs of protection and management. Nurseries have been established in the country and are available to replace trees, if needed. Forestry extension has been also supported by various donors (i.e the Netherlands, FAO). FNC capacity and experience will ensure the better technical implementation and performance to achieve the project objectives. A more detailed assessment and possible mitigation measures of this type of risk will be done during the project formulation.

Finally, climate change can pose additional risks that might hamper the achievement of the project objectives. For instance, the projected decrease in rainfall and consequent increase of drought in the region could affect in particular agroforestry and arboriculture. The natural resources management and water development activities undertaken in the IFAD baseline project should be able to mitigate this risk. Furthermore, as forest management, afforestation and production of energy from alternative sources are expected to contribute to diversify the income of local population, the project should be able to produce co-benefits in terms of climate change adaptation that would lessen the impact of climate change.

H. DESCRIBE, IF POSSIBLE, THE EXPECTED COST-EFFECTIVENESS OF THE PROJECT: The project has been conceived in a way to promote sustainable development, ensure replicability on a wider scale, and guarantee sustainability in the long-term. In light of this, the project has been designed with cost-effectiveness in mind. The literature on the economic potential of LULUCF activities is still not yet rigorous. However, according to the IPCC, forests and agroforestry offer the highest potential for carbon sequestration in developing countries among different options in the agricultural sector. Over a time-frame of 40 years, the mitigation potential from forest land is 503 MtCyr⁻¹ and from agroforestry 586 MtCyr⁻¹, while other agriculture-related options would offer a carbon sequestration potential ranging between 13-137 MtCyr⁻¹ depending on the option. Afforestation/reforestation mitigation options are also cost-effective with prices ranging between \$15–30 per tonne¹⁵. On the basis of the data contained in the Sudanese Initial National Communication, afforestation and rehabilitation activities are able to generate an average incremental carbon uptake of 38.8 ktC/ha.

Agroforestry and arboriculture are considered particularly cost-effective because they are able to generate synergies with climate change adaptation by reducing the vulnerability of small-scale farmers to climatic variability. Also, assessments of different energy technologies demonstrate that biomass and biogas systems generate the lower amount of emissions per TJ of energy produced, at an average generation cost of 24\$/GJ.

Baseline activities will contribute at minimizing the costs (institutional set up, monitoring and evaluation, capacity building, etc.) while maximizing the outcomes. Considering the expected multi-direct/indirect-results of the proposed approach, the value of the global project benefit can overwhelm the implementation costs. In addition, a common management structure will contribute at reducing the transaction costs. Further cost-effectiveness analysis will be provided at CEO endorsement.

I. JUSTIFY THE COMPARATIVE ADVANTAGE OF GEF AGENCY: For more than 20 years the Sudan has been a priority country for IFAD. Since 1979 the organization has helped rural poor people in the Sudan by funding a total of 15 projects for a loan amount of US\$211.8 million. A further US\$316.5 million has been contributed for the projects by the government, cofinanciers and project participants.

The Government, with support from IFAD, has developed relevant and effective investment models for rural poverty reduction in both drought prone and conflict affected areas.

All of IFAD's projects in the Sudan feature community-based and community-driven processes, working with local people to ensure food security and income from agriculture within a framework of sustainable natural resource management. Establishing self-reliance is an essential aim of all projects. Community members are encouraged to form organizing groups to manage newly introduced credit services. The projects tend to bring together a broad range

¹⁵ *Fondazione Eni Enrico Mattei*, F.Bosello, C.Giupponi, A. Povellato (2007).

of community members representing different socio-economic groups, and they actively involve women in the development process.

Projects financed by IFAD have helped increase agricultural production and provide crucial infrastructure while significantly contributed to sustainable natural resources management.

PART III: APPROVAL/ENDORSEMENT BY GEF OPERATIONAL FOCAL POINT(S) AND GEF AGENCY(IES)

A. RECORD OF ENDORSEMENT OF GEF OPERATIONAL FOCAL POINT (S) ON BEHALF OF THE GOVERNMENT(S):

(Please attach the country endorsement letter(s) or regional endorsement letter(s) with this template).

NAME	POSITION	MINISTRY	DATE (Month, day, year)
Mr. Yassin Eisa Mohamed	GEF political focal point	Ministry of International Cooperation	02/10/2009
Mr Elfadil Ali Adam	GEF operational focal point	Ministry of Environment and Physical Development	02/10/2009

B. GEF AGENCY(IES) CERTIFICATION

This request has been prepared in accordance with GEF policies and procedures and meets the GEF criteria for project identification and preparation.

This request has been prepared in accordance with LDCF policies and procedures and meets the LDCF criteria for project identification and preparation.

Agency Coordinator, Agency name	Signature	Date (Month, day, year)	Project Contact Person	Email Address Telephone
Dr Rodney Cooke Acting Coordinator Global Environment & Climate Change (GECC) Unit Programme Management Department (PMD) IFAD			Mr Naoufel Telahigue Programme Manager GECC Unit PMD, IFAD	n.telahigue@ifad.org Tel: +390654592572