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THE GLOBAL ENVIRONMENT FACILITY
(Least Developed Countries Fund)

THE REPUBLIC OF SUDAN

LIVESTOCK AND RANGELAND RESILIENCE PROGRAMME

PROJECT DOCUMENT

September 2014

THE REPUBLIC OF SUDAN

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Currency Equivalents

Currency Unit	=	Sudanese Pounds (SDG)
USD 1:00	=	SDG 5.70
SDG 1:00	=	USD 0.175

Weights and Measures

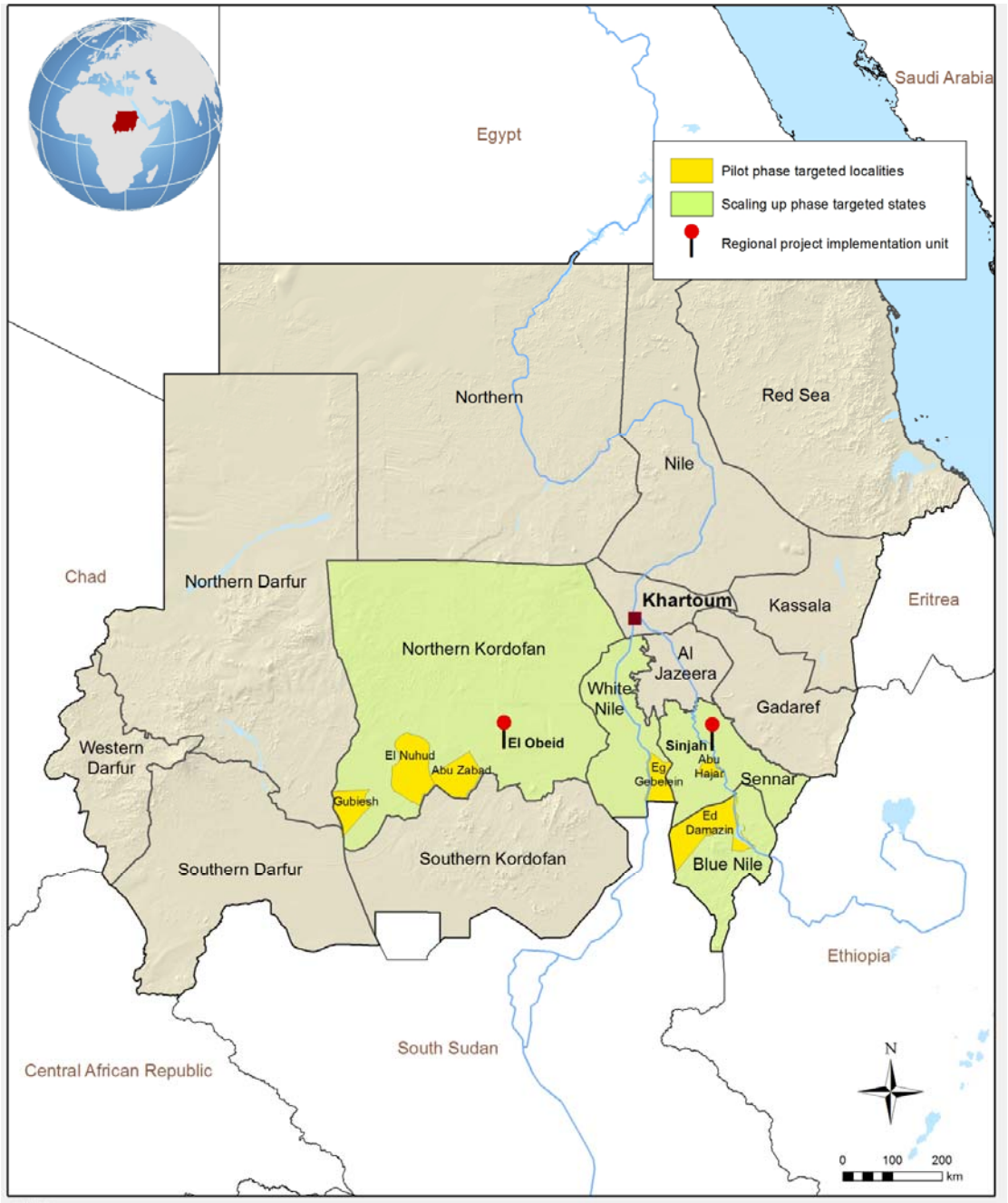
1 Kilogram (kg)	=	1,000 gram
1.00 Kg	=	2.204 lb.
1 kilometre (km)	=	0.62 miles
1 metre (m)	=	1.09 yards
1 square metre (m^2)	=	10.76 square feet
1 feddan	=	0.42 ha = 1.03 acres
1 acre (ac)	=	0.405 hectare
1 hectare (ha)	=	2.47 acres

Abbreviations and Acronyms

ARP	Agriculture Revival Programme
CAP	Community Action Plan
CC	Climate Change
CILSS	Permanent Interstate Committee for Drought Control in the Sahel
CPP	Country Programme Paper (Drought Emergencies in the Horn of Africa)
DMPERS	Drought Monitoring Preparedness and Early Response System
DRM	Disaster Risk Management
ECCA	Environment and Climate Change Assessment
ENRM	Environment and Natural Resource Management
EPA	Environment Protection Act
ERP	Emergency Response Plan
FAO	UN Food and Agriculture Organisation
FMNR	Farmer- Managed Natural Regeneration
FNC	Forest National Corporation
GCM	Global Circulation Model
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Green House Gases
HCNER	Higher Council for Environment and Natural Resources
ICS	Improved Cook Stoves
IES	Institute of Environmental Studies
ILPM	Improving Livestock Production and Marketing (project)
IMWG	Information Management Working Group
IPCC	International Panel on Climate Change
IPRSP	Interim Poverty Reduction Strategy Paper
ITCZ	Inter Tropical Conversion Zone
LEGS	Livestock Emergency Guidelines and Standards
LULC	Land Use/Land Cover
MEFPD	Ministry of Environment, Forestry and Physical Development
MICT	Media and Information Communications Technologies
NAP	National Adaptation Plan
NAPA	National Adaptation Programme of Action
NGO	Non Governmental Organisation
NRAC	Nature Resource & Adaptation Coordinator
NRAS	Natural Resources and Adaptation Specialist
NSAS/LS	National Sectoral Adaptation Strategy/Livestock Sector
NTFP	Non Timber Forest Products
PDD	Project Design Document
PPP	Public-Private Partnerships
PRSP	Poverty Reduction Strategy Paper
RCM	Regional Climate Model
RPA	Rangeland and Pasture Administration
SDAT	State level Development and Adaptation Team
SEC	State Environmental Council
SECS	Sudanese Environment Conservation Society
SIU	State Implementation Unit
SLSC	State Level Steering Committee
SMA	Sudan Meteorological Authority
SNC	Second National Communication to the UNFCCC
SRES	Special Report on Emissions Scenarios
TA	Technical Assistance
TST	Technical Support Team
UNDAF	UN Development Assistance Framework
UNDP	UN Development Programme
UNFCCC	UN Framework Convention on Climate Change
UNEP	UN Environment Programme
VDC	Village Development Committee
VPC	Village Programme Committee

WB	World Bank
WFP	World Food Programme
WSRMP	Western Sudan Resource Management Project

Map of the Project Area



The designations employed and the presentation of the material in this map do not imply the expression of any opinion whatsoever on the part of IFAD concerning the delimitation of the frontiers or boundaries, or the authorities thereof.

Map compiled by IFAD | 02-08-2013

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Executive Summary

Rangelands cover about 46% of the total area of Sudan, and encompass different ecological zones of the country, extending from desert and semi desert in the north, to low and high rainfall savannah in the south parts. The rangelands of Sudan contribute to significant income and subsistence of large sectors of the population and provide more than 80% of the total feed requirements of the national livestock herd. They play a vital role in soil and watershed protection, biological diversity, ecological balance and environmental conservation. Over the last three decades, the rangeland cover in Sudan has been severely degraded, particularly in semi-arid areas. After the independence of South Sudan, Sudan's arid land increased to 90% of its total area compared to 65% before the secession, while the range resources and forest cover decreased by 60%.

The livestock sector has consistently contributed the largest share of agricultural GDP of Sudan, and in 2012 it accounted for approx 60% of agricultural exports in terms of value. Nomadic or semi-nomadic pastoralists raise livestock practicing transhumance. Traditional patterns of livestock migrations included long distance north–south movements of camel herders and shorter north–south and east–west migrations of cattle herders. In general, livestock productivity is low and varies significantly from year to year because production is predominantly under natural rangeland systems, which are subject to erratic climate and influenced by stocking rates. After secession, the livestock population fell by only 28% to 104 million head, while the range resources and forest resources on which they depend fell by 40%. Northern pastoralists can no longer access traditional grazing areas in the South, exerting more pressure on the already stressed pastures. This has resulted in increased tensions and conflict over access to natural resources, particularly between mobile and settled communities.

Average rural poverty rates in the Sudan are estimated at 58%, much higher than the national average and the urban poverty rate. The analysis of the factors for poverty indicate that rural poverty and food insecurity are closely associated with the rain-fed sector, particularly in areas affected by conflict and drought and in those areas which are isolated from markets and services due to poor infrastructure.

The IPCC Fourth Assessment characterized Sudan as a "Hotspot of key future climate impacts and vulnerabilities in Africa". The climate scenario analyses conducted as part of the preparation of the First and Second National Communications to UNFCCC indicate that average temperatures are expected to rise significantly compared to baseline expectations. An environment and climate change assessment (ECCA) for Sudan was carried out by IFAD in July 2013. The study analyzed environmental and climate change challenges and opportunities affecting local communities and produced recommendations to enhance the sustainability of IFAD's investments in the agriculture and rural development sector.

In Sudan, as well as in the whole Sahel belt of Africa, pastoralists are on the frontline of climate change. The combination of increased climatic shocks, policies that hinder mobile pastoralism, and a lack of other viable livelihood options are posing an increasing threat to their livelihoods. The availability of ecologically healthy and climate resilient rangelands is even more important in the light of the fact that the traditional balance between pastoralists, agro-pastoralists and crop farmers has been altered significantly in recent times, and disputes over the ownership and use of the dwindling natural resources are widespread and increasing.

The GEF/LDCF Livestock and Rangeland Resilience Programme will be concentrated on the heartland of the semi-arid livestock producing areas in the south of Sudan, building on the

activities of previous and on-going initiatives in five contiguous States: West Kordofan, North Kordofan, White Nile, Sennar and Blue Nile. The Programme will start in 300 clusters of villages in 16 contiguous localities, which have been selected on multiple criteria, including poverty and vulnerability to climate change and climate-related risk. The primary beneficiaries of the GEF/LDCF project will comprise those economically marginalised and excluded households residing in pastoralist and agro-pastoralist communities who: (i) have inadequate incomes from all sources to support a decent standard of living, and (ii) are potentially mostly affected by, and vulnerable to the impact of climate change.

The LDCF project has been designed keeping in mind the strategic priorities of the Sudanese Government on NRM and climate change adaptation, as well as the findings and recommendations of relevant studies and research, including IFAD's ECCA (July 2013). The project will be shaped around three main lines of work, or Components.

The LDCF Project Goal is**:** Increased food security, incomes and climate resilience for poor households in pastoralist communities. By the end of the project, 60,000 households in the project area will have increased climate resilience and will have sustainably moved out of poverty. Furthermore, 100,000 households will have improved asset ownership index compared to the baseline.

The LDCF Project Development Objective is: Improved livelihoods and natural assets in livestock-based communities. This objective will be achieved through increasing by 50% the average incomes of rural poor household engaged in livestock value chains at project completion, with 20% of the target households participating actively in commercial farming by the end of the project.

Component 1: enhanced capacity for community adaptive planning, will focus on the development of participative community plans (CAPs) in the 300 clusters of villages. Baseline assessments including CC vulnerability of socio-ecosystems will be completed, while the members of the 300 Village Development Committees and 126 governmental technical staff at the Locality and State levels will be capacitated to steer the process with knowledge, organizational, and management skills on CC adaptation, CRR and NRM. At the end of this process, 300 CAPS will be available, setting priorities for vulnerability reduction investments.

Component 2: Vulnerability reduction investments based on adaptive management of NRM, is strictly linked to the previous one, and shall consist of the identification and implementation of priority investments and support to sustainable NRM-based business opportunities and livelihoods diversification in the project area and along a network of stock routes in the five target states, with a strong focus on rangeland and water management and conservation. Through this component, the project will support community-based natural resource management and remediation to reduce the vulnerability of 100,000 households of settled and nomadic pastoralists in the 300 clusters of villages, by: (i) achieving a 25% increase in rangeland productivity in the target areas; (ii) rehabilitating 334,000 ha of rangelands in the five target States; (iii) providing water harvesting equipment for storing up 500,000 m3 of water for livestock and people; and (iv) establishing 12,000 ha of improved agriculture land (tree-crop-livestock system). Within this Component, LDCF will also follow up the work on stocking routes started by previous projects and will engage in: (i) Maintenance/improvement for previous the demarcation investments; (ii) Mainstreaming livestock routes into inter-communities adapted plan; (iii) Production of final and approved maps of the routes and legalization of the routes at the state level; (iv) Facilitation of the setting up of an agreed, participatory management system; and (v) Support the development of small businesses along the routes. LDCF will target a representative network of at least 1,100 km of stocking routes in the five states.

Component 3: climate change preparedness and policy facilitation responds to the need identified through national policy processes, such as the NAP, the SNC and the Interim PRSP, for the introduction and piloting of innovative response systems that contribute to reducing the vulnerability of poor herders and farmers to the increasing economic and social threat posed by climate change and environmental degradation, and for enhanced policy dialogue and strategic development in these fields. The project will support the Ministry of Livestock, Fisheries and Rangelands (MoLFR) in the development of a Drought Monitoring and Early Response System

(DMPERS), which will produce timely and accurate information on forage, water level conditions and other drought forecast information, and will disseminate this information to the users through the most appropriate and available tools. Under this component, the LDCF intervention will also engage in a policy dialogue at both federal and state level for mainstreaming CC adaptation and NRM into policies and workplans at the different layers of the administration. The project will support the production of a National Sectoral Adaptation Strategy for the Livestock Sector (NSAS/LS), facilitating a consultation process and organising national workshops that will eventually lead to the finalisation of the Strategy. The project will also facilitate the organisation of State-level workshops aimed at settling land disputes, and identifying new arrangements that can lead to satisfactory agreements regarding user and access rights among for all the concerned parties.

The Livestock Marketing and Resilience Programme (LMRP), the baseline for the LDCF intervention, will support the Government's priority to convert the livestock sector from passive accumulation to a more productive and sustainable business-oriented mode. LMRP will seek to tackle intractable poverty by raising the incomes of poor households through the transformation of the rural economy from subsistence to an increasingly efficient market-based system, in particular the small-scale livestock sector. LMRP shall indicatively start in 2015 for a period of 7 years. The programme's objective is increased livestock productivity, value addition and marketing. Key outcomes will include improved animal health and access to animal health services and increased marketing of primary and secondary livestock products. The GEF/LDCF funding represents an opportunity to increase the scope of the objectives pursued through the LMRP in light of the expected negative impact of climate change on the already fragile livestock and rain fed agriculture sector in Sudan. The LDCF contribution will cover the incremental cost related to the production of the adaptive and participatory plans, the capacity building work needed for their development and implementation of the CAPS, the field investments for adaptation and vulnerability reduction, and the enhanced preparedness to climate risk, both at field level (Drought Monitoring, Preparedness, and Early Response System) and through the policy dialogue at the Federal and States level. Without the LDCF funding, the baseline intervention could turn out to be a "business-as-usual" livestock support development project, and not tackle the root of the most important constraints facing rural development in Sudan.

The sustainability of the flow of benefits from the LDCF intervention depends on: (i) the buy-in of local communities and the beneficiaries, and their capacity to run, manage, and benefit of the structures, business and services created through the project investments; (ii) the development of a more conductive policy environment and dialogue to mainstream climate change adaptation and disaster risk reduction into rural development and NRM; (iii) the delivery of high-quality, timely technical assistance; (iv) the creation of solid synergies between the LDCF intervention and the baseline programme. The sustainability of the investments in rangeland restoration and improved management will be guaranteed by the economic return that would accrue from the increased quantity and quality of fodder produced, the introduction of grazing fees, and the subsidiary wealth generated by the healthier agro-ecosystem. The project will guarantee the sustainability of the investments in water conservation and management by introducing or strengthening the principle of water fees and payment for services. LMRP will build the capacity of the beneficiaries to design proper management and business plans to run the water-related business, including the development of public/private enterprises.

The LDCF will be implemented as an integrated component of its baseline programme LMRP, under the leadership of the Ministry of Livestock, Fisheries and Rangelands (MoLFR) of the Government of Sudan. The MoLFR shall have the overall responsibility for the implementation of the project and shall ensure linkages to other relevant Ministries, States and Agencies. IFAD will be responsible for the coordination and supervision of LDCF, in accordance with GEF standarts and procedures. Supervision and implementation support will involve ongoing communication and engagement with the GoS, the project team, the managers of the baseline programme, and other relevant stakeholders. The presence of an IFAD Country Office in Khartoum will expedite these processes.

LDCF funding will cover the salary of a full-time Natural Resources & Adaptation Manager (NRAM) who will be appointed to lead the implementation of the project. The NRAM will be part of the LMRP Programme Management Unit. As part of its matching contributon, IFAD will cover the cost for the hiring of five Natural Resource & Adaptation Specialists (NRAS), who will be

based in the State Implementation Units, which will be established by the State Minister of Agriculture, Animal Resources and Irrigation in each of the five target States.

National Technical Assistance will be made available through service providers (NGOs, CBOs, partner organisations) to lead the production of baseline assessments and participatory mapping of the natural resource base of rural communities, support the preparation of the CAPs, deliver technical training, and provide backstopping and technical support for the assessment and implementation of the CAPs. With respect to the completion of the stock route network, TA will be provided to support the five states in undertaking GIS mapping and demarcation of the stock routes as well as legalisation. LDCF will also contract an international provider of TA to develop the Drought Monitoring, Preparedness & Early Response System (DMPERS) and deliver the necessary training for its management and maintenance.

Project monitoring and evaluation will be conducted in accordance with established IFAD and GEF procedures. In line with the GEF/LDCF operational principles, the M&E activities will be country driven and provide for consultation and participation in a decentralized manner, actively involving target groups and service providers, who will be duly informed about the plans, implementation and the results of the evaluation. The LDCF intervention will be fully blended with the IFAD baseline operations, so they will share the monitoring and evaluation system. The overall responsibility for M&E activities will rest with two Knowledge Management/M&E Specialists based at the Programme Management Unit, who will develop their workplan in close liaison and interaction with the NRAM and the NRAS.

Periodic monitoring of implementation progress will be undertaken by IFAD. This will allow parties to take stock and to troubleshoot any problems pertaining to the project in a timely fashion to ensure smooth implementation of project activities. A part of the participatory M&E will be devoted to ascertain the extent of women's participation in programme activities, constraints faced, benefits gained, aspirations met and impact on women's status in the family, their involvement in community affairs and the climate-proofing of their agriculture. Harmonized programme progress reports will be produced quarterly, semi-annually, and annually. Reporting progress will be made available for each of the five target States as well as consolidated for the whole project area.

The LDCF operations will create valuable knowledge in climate resilience and adaptation on natural resources management, rangelands and livestock management, income diversification, community empowerment, infrastructure development and food security improvement, which will be captured and utilized to generate lessons and best practices. The project will promote: (i) knowledge networking through periodic seminars/workshops; (ii) publication of ‘how-to’ leaflets on restoration of nature assets, and (iii) audio-visual material that capture lessons learnt and impact. Special emphasis will be placed on knowledge regarding climate change adaptation and disaster-risk development planning. The project will also promote: (i) in-country knowledge networking through periodic seminars/workshops; (ii) regional knowledge networking, such as the regional network on Knowledge Access for Rural Inter-connected Areas; and (iii) regional research networks.

An independent Mid-Term Evaluation will be undertaken at the end of project year 3 and project year 5 of implementation, which will take the form of a qualitative study to determine the progress being made towards the achievement of outcomes and will identify course correction if needed. An independent Final Evaluation will take place three months prior to the terminal tripartite review meeting, and will focus on the same issues as the mid-term evaluation. The final evaluation will also look at impact and sustainability of results, including the contribution to capacity development and the achievement of global environmental goals. The Final Evaluation should also provide recommendations for follow-up activities.

I. Situation Analysis

a) Country Context

Geography, Climate, and Environment

1. Sudan is a large African country with an area of 1,861,484 km^2. The majority of Sudan is a gently sloping plain covered by rangelands, pasture and dry forests. The north of the country is largely desert, shifting progressively to semi-desert, low rainfall savannah and high rainfall savannah towards the south. Rainfall varies, north to south, from 25-700mm and falls in 2-3 months between June and October, with temperatures ranging from 30-40ºC in summer and 10-25ºC in winter. The Nile water basin contributes most of Sudan's available surface water, transporting over 93 cubic metres of water per year on average, though only a fifth of this may be used in accordance with the 1959 water use treaty with Egypt. The following estimation of land cover in Sudan was released in 2012 by FAO, based on interpretative work by the Sudanese Remote Sensing Authority:

Table 1. Land cover classes in Sudan

Land Cover Class	Area (ha)	%
Agriculture in terrestrial and aquatic/regularly flooded land	23,710,025	12.6
Trees closed-to-sparse in terrestrial and aquatic/ regularly flooded land	18,733,182	10
Shrubs closed-to-sparse in terrestrial and aquatic/ regularly flooded land	22,231,327	11.8
Herbaceous closed-to-sparse in terrestrial and aquatic/ regularly flooded land	25,982,720	13.8
Urban areas	730,331	0.4
Bare Rocks and Soil and/or Other Unconsolidated Material(s)	95,277,727	50.7
Seasonal/perennial, natural/ artificial water bodies	1,290,000	0.7

2. Rangelands, which constitute an important natural resource, cover about 46% of the total area of Sudan. They encompass different ecological zones extending from desert and semi desert in the north, to low and high rainfall savannah in the south parts. These variations support diverse vegetation and production systems.[1] The rangelands of Sudan contribute to significant income and subsistence of large sector of the population and provide more than 80% of the total feed requirements of the national herd.[2.] They play a vital role in soil and watershed protection, biological diversity, ecological balance and environmental conservation.

3. After the independence of South Sudan, Sudan's arid land increased to 90% of its total area compared to 65% before the secession, while the range resources and forest cover decreased by 60%.

The Agriculture Sector

4. Agriculture in Sudan can be divided into the rain-fed, irrigated, mechanised, livestock and forestry subsectors. Livestock as a system is actually intermingled within the three categories, although mostly associated with the rain-fed agriculture areas. Since 2011, the loss of oil resources has caused the economy to revert to its reliance on agriculture and the sector accounted for 31% of GDP in 2012. Livestock accounts for the largest share of agricultural GDP. Sesame, watermelon and hibiscus production are important export crops, while forestry provides a range of goods and services, the most important output is production of gum Arabic. Agriculture provides employment for 70-80% of the labour force in rural areas. The Government has adopted a three-year Economic Recovery Program (2012–2014) to respond to the challenges of the secession. Two decades of unrest have cost the lives of about 1.5 million people and had a devastating effect on rural livelihoods through destruction of assets and restrictions on access to farmland. Conflicts between

[1] Zaroug, M G, *Country Pasture/Forage Resource Profiles, Sudan,* FAO Crop and Grassland Service, 2000.
[2] *Assessment of Capital Building Needs related to Managing Access to Genetic Resources and Benefit Sharing Sources*, Ministry of Environment and Physical Development, High Council for Environment and Natural Resources, Khartoum, 2003.

pastoralists, agro-pastoralists and crop farmers are widespread and rooted in disputes over ownership and use of natural resources.

5. Livestock has consistently contributed the largest share of agricultural GDP of The Sudan, and in 2012 it accounted for approx 60% of agricultural exports in terms of value. The total livestock population is estimated to be about 104 million head of goats, cattle and camels. Herd sizes range from just a few animals to thousands, with most rural households, including poor households having at least a few small stocks, particularly sheep, goats or poultry. In 2012 livestock accounted for 56% of agricultural exports in terms of value, mainly comprising live animals, especially sheep, exported to Saudi Arabia, Gulf States, Libya, Egypt and Jordan. Livestock produces not only meat but provides a whole range of services including milk, draught power, transport and a mobile source of capital and insurance. The global demand for leather far exceeds supply and there exists considerable potential to increase product value through better hide preservation and storage, improved secondary processing and better marketing.

Table 2. The livestock population of Sudan, 2010 (millions) (*)

	Sheep	***Goats***	***Cattle***	***Camels***	***Total***
Number of head	39.137	30.452	20.357	4.623	103.570
Share of total	37.8%	29.4%	19.7%	4.5%	100.0%

Source: Ministry of Animal Resources and Fisheries

(*) The numbers might actually be larger. Quote IGAD LPI Working Paper No. 01/12: "*No one knows how many livestock there are now in Sudan, the last census having taken place 36 years ago*"

6. Nomadic or semi-nomadic pastoralists raise livestock practicing transhumance within Sudan or crossing borders into neighbouring countries. Traditional patterns of livestock migrations included long distance north–south movements of camel herders and shorter north–south and east–west migrations of cattle herders. In general, livestock productivity is low and varies significantly from year to year because production is predominantly under natural rangeland systems, which are subject to erratic climate and influenced by stocking rates. Productivity is also influenced by disease and parasites, suboptimal breeding, herd management practices which focus on herd size rather than quality, declining availability and access to traditional range resources, stock routes, crop residues, and water sources. After secession, the livestock population fell by only 28% to 104 million head, while the range resources and forest resources on which they depend fell by 40%. Northern pastoralists can no longer access traditional grazing areas in the South, exerting more pressure on the already stressed pastures. This has resulted in increased tensions and conflict over access to natural resources, particularly between mobile and settled communities.

7. Forestry is a significant resource in some areas, and it supports the rural communities through provision of employment in forestry operations (planting, thinning, guarding and harvesting of tree crops), as well as a supply of non-timber forest products, fuelwood production, shelter and recreational purposes. Employment for both government and private sector in plantation activities, forest protection and related industry estimated at 15% of employment in rural areas. Generally, NTFPs provide the main employment and income sources for the elderly, women and children. The poor rural communities largely depend on wood fuel as source of energy. The government estimates that 78% of the energy consumption in the country is in the form of firewood and charcoal. The main commercial forest product is gum arabic that contributed 8% to the value of agricultural exports in 2012. Sudan produces 80 percent of the world's supply of this commodity, which is used widely in industry for products ranging from mucilage to foam stabilizers to excipient in medicines and dietetic foods.

Population and Poverty

8. The Sudan's current population is approximately 35.1 million, of which 67% is rural and 6 million reside in the greater Khartoum area. The population is expected to increase from 32 to 45 million by 2030 and 67 million by 2050 with and increasing rate of 2% according to WB 2012 medium projection.

9. The Sudan is one of the poorest countries in the world. In 2012, the country had a Human Development Index (HDI) of 0.414 and was ranked 171 out of 187 countries with comparable data. The GDP of the Sudan in 2013 was US$64.05 billion (WB 2011). Gross National Income per capita was US$1310 per annum, annual growth rate of 4.7% and inflation rate of 12.9% (WB 2010, 2011). The country's socio-economic indicators (WB 2012) indicate that about 70% of the population live on around US$1.25/day. Adult illiteracy levels stand at about 30%. Between 70% and 80% of economically active people are engaged in agricultural or pastoral activities, although only 7% of the country's land is cultivated. Women are among the majority of the poor and extremely poor in the country. Their poverty is closely linked to the absence of economic opportunities, and inadequate access to productive resources, including credit, land ownership, skills and support services. Due to relatively high birth rates, children and young people constitute a large proportion of the poor in The Sudan. In 2008, almost 60% of the poor were under the age of 20. Further, 55% of youth aged 15 to 24 is poor.

10. The 2008 census found that 3,510,481 households in Sudan (52.8%) are engaged in cultivation/plantation, and 3,936,131 households (59.2%) are engaged in animal husbandry. If a conservative 50% of the households engaged in animal husbandry according to the census rely on pastoral production strategies, the number of households enjoying subsistence services and other economic services from pastoral livestock increases to 1.96 million.

11. Average rural poverty rates in the Sudan are estimated at 58%, much higher than the national average and the urban poverty rate (47% and 27% respectively). Small-scale farmers and livestock herders in the traditional rainfed sector, the landless and internally displaced people, households without assets and people in areas affected by drought and conflict are the rural groups most at risk of poverty. The main constraints on rural livelihoods are access to markets, access to financial services, unpredictability of rainfall and water shortages, barriers on migratory routes for livestock, pest and disease outbreaks, and conflicts. Unemployment is higher in rural (19.8%) than in urban (12.1%) areas, and higher for women (24.7%) than for men (13.9%). Food and nutrition security is fragile and undernourishment is widespread.

12. Analysis of the factors for poverty in these areas indicate that rural poverty and food insecurity are closely associated with the rain-fed sector, particularly in areas affected by conflict and drought and in those areas which are isolated from markets and services due to poor infrastructure. The root causes of poverty and food insecurity include persistent conflicts, urban bias of development, poor productivity of rural factors of production, lack of employment opportunities and the concentration of socio-economic development in a few areas. Environmental degradation is also a major root cause of poverty: the loss of fertility caused by deforestation and unsustainable land management practices, and the recurrence of extreme events such as droughts and floods threaten all rain-fed agricultural systems and the livestock sector. 100% of poor households and 25% of borderline households are considered vulnerable to drought (WFP 2006).

The Policy Framework

13. Livestock rearing has been seen as the main rural livelihood mechanism to address poverty and malnutrition for the rural poor, as it forms the rural saving and reserve or assets for survival.

14. This strategic orientation is not new and was already promoted by GoS following the signature of the Comprehensive Peace Agreement in 2005. Agriculture at that time was

seen as a key component of peace and development. The Agriculture Revival Programme (ARP) embodied this strategic orientation and was set to mobilize approximately SDG 10 billion for the development of the sector, particularly rainfed agriculture. Its main objectives for the period 2012-2016 were to achieve: (i) increased agricultural exports; (ii) increased productivity; (iii) improved food security and agricultural incomes; (iv) reduced rural poverty; and (v) redressed regional imbalances and increase productive assets and resources in rural areas. The Agricultural Revival Program (ARP), currently in its second phase (2012-2016) is addressing past weakness is adaptation in the agriculture sector.

15. The 2003 National Water Policy brings together aspects of water resources management, utilization, and protection in the context of a single policy and covers sectors including agriculture, industry, health, energy and transportation.

16. The Forest Law (2002) stipulates that trees should be left standing on 5% of lands mechanically cropped and 10% on rain-fed lands. However, mismanagement has led to desertification and destruction of watersheds, especially in central and northern Sudan. Contributing factors include the expansion of agriculture (mainly semi-mechanized) into forestlands, uncontrolled tree felling for charcoal production, overgrazing, forest fires, prolonged drought periods and erratic rainfall.

17. Most of Sudan's strategies and plans incorporate poverty reduction targets. The Sudan's Long-Term Strategy 2007-2031 has strong commitments to the MDGs. The second Five-Year Development Plan 2012-2016 aims to provide a foundation for the Poverty Reduction Strategy Paper (PRSP) and the Agriculture Revival Programme (ARP). The Interim-PRSP (I-PRSP), under development since 2004 was approved by the Parliament in June 2012 and by the World Bank in March 2013. The "full" PRSP is currently under preparation.

18. The United Nations Development Assistance Framework (UNDAF, 2003-2016), in line with the draft Interim Poverty Reduction Strategy Paper (IPRSP) for Sudan, explicitly outlines four inter-related pillars of cooperation, started with Poverty Reduction, Inclusive Growth and Sustainable Livelihoods, with particular attention to youth, women, groups in need and communities at most risk of the impacts of environmental hazards, climate change and recurrent disasters. For the Country Programme Framework (CPF, 2012-2016), the main four priority areas are (a) policy development and strengthening of agricultural statistical systems; (b) enhancing productivity, production, and competitiveness; (c) conservation and development of natural resources; and (d) Disaster Risk Management (DRM).

19. Sudan started mainstreaming climate change in its policies, strategies and action plans in 1992 through a National Comprehensive Strategy (NCS, 1992-2002) adopted after the signature of the UNFCCC. The Sudan Higher Council for Environment and Natural Resources (HCENR) is the government agency specializing in sustainable development and environmental issues. Established in 1992, the HCENR's work has steered the policy work on climate change in the country:

    - *Sudan's First National Communication under the UNFCCC*, released in 2003, developed the country's first greenhouse gas inventory, an initial assessment of the vulnerability of water resources, agriculture, and public health to climate change, and an analysis of greenhouse gas mitigation strategies.
    - *NAPAssess: A Decision Support Tool for Use in the NAPA Process.* This tool (2005) aimed at helping establish country-driven criteria by which to evaluate and prioritize adaptation initiatives, and to help make consensus-based recommendations for adaptation activities. The tool was presented at a COP side event in Montreal.
    - *National Adaptation Programme of Action (NAPA).* The NAPA, released in 2007, focused on a stakeholder-driven process to prioritize potential adaptation strategies across the various ecological zones of the country for water resources, agriculture and public health.
    - *Sudan's Second National Communication (SNC) under the UNFCCC:* The HCENR is coordinating the development of the country's second national communications, with a focus on the vulnerability to climate change impacts on water, coastal zones,

agriculture, and public health.

20. In September 2011, the Heads of States and governments of the Horn of Africa gathered in Nairobi for a summit, and endorsed the Nairobi Strategy that calls for enhanced partnerships to eradicate drought emergencies in the region. One year later, the Government of Sudan issued a Country Programme Paper to end Drought Emergencies in the Horn of Africa (CPP Sudan). The objective of the CPP is to improve livelihoods and increase productive capacities of the different economic sectors of the drought-prone communities in the rainfed and irrigated areas of the country. The CPP recognises that the livestock sector constitutes the rural livelihood gear for food production, credit, savings, and nutrition for vulnerable households, and therefore, should be the focus for adaptation and water management interventions. The CPP planned to enhance livelihoods capacities, strengthen resilience, and emergency preparedness through: (i) Rehabilitation and development of water and arable land resources network in drought prone regions, to increase water availability for domestic, livestock, agriculture, and energy use; (ii) Development of livestock infrastructure to improve productivity, access to markets and the livestock export routes; (iii) Rehabilitation and development of rangelands and forests to enhance availability of forage in a sustainably managed environment; and (iv) Capacity building for individuals and institutions dealing with water resources and livestock value chain development, and review of associated policies.

21. For the period 2013-2018 the Government responses to climate change are predominantly focused on: (i) infrastructure investment, in particular to control flooding; and (ii) policy and planning including assessment of climate change impacts on agriculture, integration of climate change into planning and policies; and (iii) the development of projects for mitigation and adaptation, including both 'hardware' adaptation measures to protect assets and infrastructures, 'software' interventions to build local capacity for adaptation and enhanced resilience of vulnerable communities to climate risk. Development partners including UNDP, UNEP, GEF, WB, FAO, IFAD and WHO are all involved in implementing projects with explicitly focus on climate change and environmental management.

II. Threat Analysis

a) Anthropogenic Threats

22. Sudan has just emerged from a long civil war, which brought to the secession of South Sudan in 2011. Two decades of unrest have had a devastating effect on rural livelihoods through destruction of assets (livestock, roads, markets, and water points), restrictions on access to farmland, and the critical degradation of environmental resources, namely rangelands and forests.

23. Over the last three decades, the rangeland cover in Sudan has been severely degraded, particularly in semi-arid areas.[3] This deterioration in rangelands is attributed greatly to the expansion in agricultural activities and seasonal fires, and to the impact of desertification caused by the combined effect of unsustainable management practices and an aridification trend in climate. Mechanized agriculture increased from about 3,150 km2 in 1941 to about 26,000 km2 in 2002, and has more recently been claimed to be the main factor of land degradation (Babikir, 2011). Conversely, the grazing lands reduced from 78.5% (28,250 km2) of the state's total area in 1941 to 18.6% (6,700 km2) in 2002 (ibid.). The 1970s agriculture development strategy based on large-scale irrigation and mechanization schemes not only placed the government in massive debt, but also caused widespread social and economic problems by appropriating lands in the rain-fed North, displacing pastoralists, and disrupting migratory routes.

[3] Muna, M, Mohamed, F and Teka, T (2004), *Dryland Husbandry in the Sudan - Grassroots Experience and Development*, Dryland Husbandry Project (DHP), Sudan.

24. As a result of the intensified continuous cultivation, soil quality and crop yields are declining rapidly. Farmers and pastoralists both recognize that land degradation is taking place as a result of improper agriculture practices associated with extreme drought.

25. Most of adopted rangeland management approaches were developed under the concept of increasing and sustaining livestock production by decreasing the inherent variability associated with rangelands and grazing. This rangeland management approaches are incapable of providing an ecological framework for alternative management objectives that have become more important recently especially under climate change forecasts. In Sudan rangelands at the semi-arid conditions are not at equilibrium and for this management practices should adopt eco-system based approaches including involvement of the local communities in the management processes.

26. Deforestation is significant in Sudan. UNEP (2007) estimated the increase in deforestation at an annual rate of over 0.84% at the national level, while at the regional level two-thirds of the forests in north, central, and eastern Sudan disappeared during 1972–2001. UNEP indicates that forest cover could decline by >10% per decade, with total loss expected within the next 10 years in high-pressure areas.

27. The traditional balance between pastoralists, agro-pastoralists and crop farmers has been altered significantly in recent times, and disputes over the ownership and use of the dwindling natural resources are widespread and increasing. The customary practice of allowing nomads to graze crop residues after the harvest has mostly disappeared and herders are often expected to pay lease-holding tenants for grazing and access to water. An additional problem is the degradation of the animal routes, which have narrowed (100/150 m in width) and are bare with very few rest places. The conflict has been made more acute by the secession of South Sudan, and by policies that favour agricultural production at the expense of traditional livestock systems.

28. The evolvement of the former dual land tenure system – including both federal law and customary tenure based on usufruct rights – into an individualized control system, that disrupts claims by multiple users, represents a major policy challenge given the erosion of the customary authorities.

29. Another important challenge is the lack of pastoralism policies. This is particularly evident in the legislation relating to land tenure. At the federal level access to pasture land is weakly defined in law, which particularly penalizes pastoralists. The Unregistered Land Act (1970) placed all land in Sudan under a property regime, with all non-registered land being automatically registered as property of the Government and almost simultaneously abolished customary land use rights in 1971.

b) Climate change trends

30. The IPCC Fourth Assessment characterized Sudan as a “Hotspot of key future climate impacts and vulnerabilities in Africa”. The climate scenario analyses conducted as part of the preparation of the First and Second National Communications (FNC/SNC) indicate that average temperatures are expected to rise significantly compared to baseline expectations. By 2060, project warming ranges from 1.5ºC to 3.1ºC during August to 1.1ºC/2.1ºC during January (NAPA). In most regions of Sudan, the number of days in which the temperatures exceed 25^{o}C will increase notably while those in which the temperatures drop below 20^{o}C will decrease significantly. Projections of rainfall show sharp deviations from baseline expectations, as well. Results from some of the models show average rainfall decrease of about 6mm/month during the rainy season.

31. The Sahelian belt that runs through Sudan is on the leading edge of the impacts of climate change in Africa. The forecasted changes pose an immediate and direct threat especially to the communities of poor rural pastoralist and agro-pastoralist that rely upon increasingly erratic rainfall and rangelands threatened by degradation and desertification. Increased temperatures and declining rainfall have shifted the boundary between desert and semi-

desert zones south by 50-200km over the past 80 years. The current trend of changes in temperature and precipitation are likely to lead to desertification, and to the spread of vector-borne diseases, causing shifts in the distribution of ecological zones, in the productive capacity of rainfed agriculture, and in the security of the food supply. The country's inherent vulnerability is best captured by the fact that food security is mainly determined by rainfall, particularly in rural areas, where 70% of the population lives.

Vulnerability to extreme weather events

32. The geography and climate of Sudan make it one of the most climate hazard-prone countries in Africa. The FNC and SNC highlight that extreme climate events such as drought, flash floods, dust and sand storms are all common and increasing occurrences. Limited state and local government resources available for disaster reduction and response exacerbate the population's high vulnerability to natural disasters. Annual variability and relative scarcity of rainfall are strongly linked to displacement and related conflicts. Drought events also change the environment, as dry spells kill otherwise long-lived trees and result in a general reduction of the vegetation cover, leaving land more vulnerable to overgrazing and erosion. Together with other countries in the Sahel belt, Sudan has suffered a number of long and devastating droughts in the past decades. All regions have been affected, but the worst impacts have been felt in the States of Northern Kordofan, Northern state, Northern and Western Darfur, and Red Sea and White Nile. The most severe drought occurred in 1980-1984, and was accompanied by widespread displacement and localized famine.

33. Sudan has experienced many devastating floods during the past several decades. There are two major types of flood events that regularly plagues Sudan: (i) floods occurring during torrential rains when high levels of water overflow the Nile River and its tributaries; and (ii) flash floods occurring from heavy localised rainfall during the rainy summer season or over the Red Sea area in winter, due to mountain runoff.

Climate Change Impact on Rangelands and Pastoralists

34. Pastoralist communities are being adversely affected by the social, economic, political and ecological crises in Sudan (Manger, 2001). The combination of increased climatic shocks, policies that hinder mobile pastoralism, and a lack of other viable livelihood options are posing an increasing threat to the livelihoods of pastoralists. A study examining the changes in climate and land-use/land-cover (LULC) along the livestock seasonal migration routes in eastern Sudan[4] reported a clear increment of both agricultural land and bare land, coupled with a diminution of natural vegetation from 65.28% in 1979 to 9.69% only in 2006. These trends put pastoralism, which depends on the productivity of rangelands, on the frontline of climate change. The availability of ecologically healthy and climate resilient rangelands is even more important in the light of the fact that the traditional balance between pastoralists, agro-pastoralists and crop farmers has been altered significantly in recent times, and disputes over the ownership and use of the dwindling natural resources are widespread and increasing.

35. The table below summarises potential climate change impacts to pasture and livestock in Sudan, and recommended adaptation measures:

Table 3. Climate change impacts and recommended adaptation measures in Sudan

Climate induced change	Impacts	Adaptation Measures
Altered water availability	• Pasture productivity is closely associated with water availability. • Increased evapotranspiration combined with reduced precipitation is likely to lead to a	• Introduction of water harvesting and conservation measures, including hafirs, small size dams, water harvesting systems, boreholes, sub-

[4] (Sulieman/Elagib -Journal of Arid Environments, 2012).

	drying of pastures and decreased pasture productivity, changes in species composition, decreased biomass, an increase in bare ground, and land degradation.	surface and sand dams. • Introduction of drought tolerant plant species • Increase shade through planting live shelterbelts
Drought	• Drought causes decreased pasture productivity and reduces the water sources livestock rely on. • Decreased pasture productivity affects both grazing and fodder production.	• Introduction of heat/drought tolerant, early maturing and high yielding varieties of crops • Conservation agriculture and agro-forestry measures • Introduction of water harvesting and conservation measures • Increase tree and shrubs density through afforestation and reforestation • Fire prevention measures
Erosion from heavy rain, strong wind, and sand storms	• Heavy rain events, stronger wind, and sand storms cause wind and water erosion in pastures, leading to pasture degradation, landslides, and flash floods.	• Measures to control soil erosion, floods and runoff • Sand dune restoration • Creation of shelterbelts and live fences • Fire prevention measures
Infectious diseases	• Higher temperatures could contribute to the spread of vector borne diseases. Increased disease spread among livestock can also contaminate humans.	• Improve veterinary care • Improve general conditions of pastures • Introduce adapted breeds
Changes in plant communities	• Changes in climate will favour some species and discourage others leading to changes in native pasture plant composition and diversity. • Changes in spatial and temporal vegetation patterns have important implications for grazing management.	• Rangeland and woodland restoration and enrichment • Rotation, resting, fencing • Eradication of invasive species • Introduction of drought and salt tolerant varieties
Heat stress	• Decline in physical activity of livestock and associated declines in eating and grazing. • Heat stress can also limit milk production and reduce conception rates.	• Improve shading through afforestation and reforestation • Improve water supply through water harvesting and conservation

IFAD's Environmental and Climate Change Assessment

36. An environment and climate change assessment (ECCA) for Sudan was carried out by IFAD in July 2013. The study analyzed environmental and climate change challenges and opportunities affecting local communities and produced recommendations to enhance the sustainability of IFAD's investments in the agriculture and rural development sector. The assessment delivered the following, main conclusions:

o Temperature: noticeable increases in temperatures have occurred over the past 50-100 years, ranging from +0.6^{o}C to +2.1^{o}C in different parts of the country. A forecast increase of 1.5^{o}C – 2.5^{o}C is projected throughout Sudan by 2050, with the largest increases in West Kordofan and South Darfur. The greatest increases above average will occur in the autumn (+3.0^{o}C) and the lowest increases in winter (+1^{o}C).

o Rainfall: Both increases and decreases in annual rainfall are already visible in Sudan: since 1970 rainfall has declined in the north by 5% and by 10-20% in the west and southwest. Rainfall has increased in the southeast by 10%. By 2050 average annual rainfall is

expected to increase in most areas but with significant changes in the seasonality of the rainfall. Declines in rainfall are expected in Red Sea, Nahr El Nile, Northern State, and North Darfur.

- o Extreme events will increase in both quantitative and qualitative terms, especially: (i) droughts with loss of crops and livestock, food shortages, displacement of rural populations and wildfire; (ii) floods and flash floods, with loss of life, crops, and livestock; spread of insect and plant diseases, and epidemic/vector diseases in humans and animals, (iii) hurricanes and dust storms, with further land degradation, desertification and harvest loss.

37. More information on the ECCA is included in Annex 5 to this document.

III. Baseline Analysis

38. Since 1979, IFAD has funded 19 projects for a total cost of USD 596.2 million, of which 42% were IFAD loans, reaching 455,500 poor households (some three million people). With an integrated rural development approach, IFAD's focus has been on the main following thematic areas: (i) capacity building of producer's organizations; (ii) access of poor rural people to markets and microfinance services; (iii) access of poor rural people to agricultural services (input supply and technical advice); (iv) strengthening of community-based organizations; (v) natural resource management and conflict resolution; and (vi) access to social services.

39. The country programme during 2009-2012 included eight projects implemented in 13 of the 17 States of the current Sudan, as well as one project in South Sudan, for a total cost of USD 217.7 million. Total outreach during the last RB-COSOP period was close to 886,000 direct beneficiaries. IFAD also grant-funded four small activities in Sudan: (i) Restructuring Community-level *Sanduqs* into a professionally-managed and sustainable central Sanduq named Al Garrah for support and follow up with saving groups formed by earlier IFAD projects (ongoing); (ii) Scaling up the Agricultural Bank of Sudan Microfinance Initiative (ABSUMI) (ongoing); (iii) Supporting Agricultural Extension in South Darfur State (SAID); and (iv) Preparation of Strategy for Rainfed Agriculture in Sudan. The ongoing regional activity Alternative Animal Feed Project implemented in both Sudan and Somaliland, has been testing new grounds and/or addressing urgent needs in the country programme.

40. Impact data collected from completed projects as well as the ongoing RSGAMP revealed positive changes in HH incomes: in the Gash Sustainable Livelihoods Regeneration Project (GSLRP) average HH daily income increased from USD 1.0 in 2005 to USD 7.6 in 2011; in RSGAMP, annual incomes increased from SDG 5,105 in 2009 to SDG 8,416 in 2011; and in South Kordofan Rural Development Project (SKRDP), income increased by more than 200% from 2004 to 2012. In the GSLRP area, the percentage of beneficiaries with a hunger season decreased between 2008 and 2010 and the prevalence of chronic malnutrition was considerably lower in 2011 compared to 2008 levels and lower than non-beneficiaries levels.

41. The IFAD programme mainstreamed extensive focus on gender and youth groups throughout. Over 2,600 community groups have been formed or strengthened, 115 groups created to manage infrastructure, 903 NRM groups formed or strengthened, over 140 environmental management plans for rangelands and pasture formulated, more than 600 community action plans included in local government plans, and three apex organizations mandated to engage in policy dialogue, formed/under formation, strengthened and/or registered (Bara'a and Al Garrah rural financial institutions and Higher Council for Water User Associations). Support to communities provided through CBOs included trainings on topics such as literacy home economics, nutrition and midwifery. Special attention has been paid to sustainability. Significant focus was given to women membership and effectiveness in these organizations.

42. Access of rural poor women and men to agricultural services, were substantial: farmers' access to decentralized agricultural services increased by 60%, benefitting over 422,000 farmers. The programme supported formation of 136 water user associations (WUAs) which benefited over 61,600 households representing about 340,000 people. The

GSLRP boosted average herd sizes by 43% and increased fodder yields by 35% through water conservation techniques, and grazing yields on rangelands by 2-3 mt/feddan through reseeding. The cultivated area covered by the SKRDP increased by two-thirds and yields also increased – sorghum yields for example rose from 270 kg to 900 kg/feddan. WSRMP has been successful in protecting rangelands against degradation and desertification through sand dune fixation, treating 15,000 feddans with land conservation measures, establishing 8,000 feddans of agro-forestry, developing Hema rangeland management systems, and increasing access to water through construction of hafirs totalling 330,000 m^3. It also demarcated 4,220 km of stock routes. Significant focus has been given to women membership and effectiveness in these organizations

43. In terms of increased access of rural poor women and men to markets and finance, has had mixed outcomes. For instance, all Gum Arabic producers were able to sell their products profitably, whilst the 54 producers' organizations set up under WSRMP have ceased to function despite significant capacity-building in marketing. Rural road construction was delayed due to issues related to project design or insufficient funding. Outcomes for microfinance have been substantial and exceeded expectations given a relatively limited amount of IFAD investment: 37,135 beneficiaries were engaged, the accumulated volume of savings and credit reached USD 3.9 million with repayment rates close to 100% in the three microcredit models successfully piloted: (i) Agricultural Bank of Sudan Microfinance Initiative (ABSUMI) piloted in 2011 in North and South Kordofan; (ii) Bara'ah, a community-owned and licensed microfinance institution started in South Kordofan in mid-2010; and (iii) Women's Savings and Credit Groups in North and South Kordofan.

44. The completion of SKRDP and GSLRP in 2012, and the transfer of one project to the South Sudan country programme, reduced the IFAD portfolio to six projects in 2013: Western Sudan Resources Management Project (WSRMP), Seed Development Programme (SDP), Rural Access Project (RAP), Support for Small-scale Traditional Rainfed Producers in Sennar State (SUSTAIN), Butana Integrated Rural Development Project (BIRDP) and Revitalizing Sudan Gum Arabic Production and Marketing Project (RSGAMP).

45. Recent country grants support the development of a National Strategy for the rainfed sector and scaling up of rural microfinance by the ABSUMI and restructuring community-level Sanduqs (credit and saving group) into a professionally-managed and sustainable central Sanduq (Al Garrah). The rainfed strategy developed over 2012 and finalized in 2013, involved extensive consultations with the main stakeholders all over Sudan. Synergies exist among different projects with regard to geographical coverage and building joint and subsequent efforts. The Sudan programme is also benefiting from regional initiatives in the area of knowledge management, such as KariaNet.

46. LMRP, the baseline programme for the LDCF intervention, will support and develop further the Government's priority to convert the livestock sector from passive accumulation to a more productive and sustainable business-oriented mode. Building on the successes of IFAD-funded previous and ongoing projects entailing livestock, natural resource development and income diversification initiatives, LMRP will seek to tackle intractable poverty by raising the incomes of poor households through the transformation of the rural economy from subsistence to an increasingly efficient market-based system, in particular the small-scale livestock sector. The programme is build according to three components, each of them concentrated on resolving three closely-interlinked problems hindering the sustainable socio-economic rural development of Sudan:

- the poorly-developed domestic and export value chains that generate very low real (cash) demand for livestock (Component 1);
- the limited and declining productivity and economic carrying capacity of lands used for rainfed farming and extensive livestock husbandry (Component 2);
- the very real barriers to the poor building up viable enterprises by mobilising their own and communal resources (Component 3).

47. LMRP shall indicatively start at the end of 2014/early 2015 for a period of 7 years. The programme's objective is increased livestock productivity, value addition and marketing. Key outcomes will include improved animal health and access to animal health services and increased marketing of primary and secondary livestock products. The LMRP IFAD funded

cost is estimated at USD 31.47 million over the seven-year implementation period (2015 to 2021).

IV. Stakeholders Analysis, Target Group and Project Area

a) Stakeholder analysis

Rural Population

48. In Sudan, the rural population has been divided into “rural” and “nomadic” since the first census in 1955-56 (UN, 1964). In the 2008 Census, the division into “urban”, “rural” and “nomadic” population was maintained. Nomads are defined against the background of a rural/sedentary population. However, rural/sedentary population associated with permanent villages includes semi-nomadic people that also practice seasonal livestock migrations and sedentary agro-pastoralists that practice open range grazing with some more limited movements of herds (Krätli et al, 2013).

49. All livestock producers keep mixed herds with a main species backed up by another two or three. Producers of camels and producers of cattle also keep sheep. Producers of sheep and producers of cattle sometimes keep a few camels. All keep goats as “pocket money” livestock. All species are regularly marketed, whenever possible within a strategy aimed at either sparing or increasing the capital stock of the main species. Within each group of specialization, changes in wealth/security are associated with growing or shrinking of capital stock in the main species. A drop in security/wealth leads to shifting the focus of production to the back up species ‘next-in-the-line’: from camels and cattle to sheep, from sheep to goats. A focus on goat rearing amongst these specialized groups is an indicator of vulnerability. All households – including the ‘less secure’ groups – claimed that animal production provides the main source of livelihood.

Table 5. Local livelihood security/wealth indicators at household level (Krätli et al, 2013)

	Camel specialists	Sheep specialists	Cattle specialists
more secure	Between 150 and 200 camels and between 400 and 500 sheep.	About 500 sheep and 100 goats.	More than 100 cattle, 100 to 150 sheep and 40–50 goats.
moderately secure	Between 50 and 100 camels and maybe 150–300 sheep.	About 200–300 sheep and 100 goats.	About 40–60 cattle, 50 sheep and 50–60 goats.
less secure	Between 5 and 25 camels and between 50 and 100 sheep; most likely also 10–20 goats.	A few sheep and up to 50 goats.	About 5–10 cattle, 3–4 sheep and 5–10 goats (the poverty line was defined as owning 7 sheep plus a fine ram)

50. Sedentary livestock producers are also engaged in rainfed agriculture: sheep and cattle specialists cultivate groundnuts, millet, sesame, hibiscus and watermelons. Sheep specialists occasionally harvest gum Arabic, and some cattle specialists also cultivate sorghum.

Gender concerns

51. Women are among the majority of the poor and extremely poor in the country. In the pastoralists groups, all women of different age groups have long daily household routine duties, including preparation of the meals, and responsibility for firewood and water for the household and the animals kept at the camp. When living in a village, women have the extra burden of the small group of ‘household’ milking animals, as well as supportive

services to those who are taking care of the main herd. Women and children also assist the men in sowing at the beginning of the rainy season. Children between seven and 15 years old take full responsibility for the herd during the wet season, reducing expenditures on hired labour and freeing men for other occupations (including salaried work).

52. Women's poverty is closely linked to the absence of economic opportunities, and inadequate access to productive resources, including credit, land ownership, cattle, skills and support services. However, women's groups are known for their strong traditional emphasis on solidarity and mutual assistance. They also have proven ability to exercise peer pressure and, reportedly, many employ a mentoring approach to ensure inclusion of the most vulnerable women in their community.

Institutions and Organisations

53. Sudan has a federal system of Government with three levels of authority – national, state, and locality level. The seventeen states of the federation hold significant levels of autonomy over legislation, budget execution, development programming and service delivery. Two different ministries oversee the agriculture sector at the federal level: the Ministry of Agriculture and Irrigation, and the Ministry of Livestock, Fisheries and Rangelands (MoLFR). The Federal Ministry of Agriculture (MoA) retains certain powers over land tenure, water management, environmental conservation, trade, input supply, pest and disease surveillance and control, while the State ministries of agriculture are usually responsible for agriculture, animal resources and irrigation. Federal-level ministries have their equivalents at State level supported through small amounts of federal funding. Other stakeholders in this field include the National Council for Strategic Planning, the General Secretariat of the Agricultural Revival Programme, the Agricultural Research Corporation, and the National Drought and Desertification Control, Coordination and Monitoring Unit under the General Directorate of Natural Resources. The Rangeland and Pasture Administration (RPA) is the main GoS authority responsible for the rangelands management and involved in pastoralism activities. After decentralization and introduction of the federal system this administration became decentralized with a limited connection with National RPA. The Ministry of Livestock, Fisheries and Rangelands (MoLFR) will be designated as the Lead Programme Agency for the implementation of the GEF/LDCF and its baseline programme, LMRP.

54. The Ministry of Environment, Forestry and Physical Development (MEFPD) was established in 2003 with a mandate that is derived from the Environment Protection Act (EPA) of 2001. The Higher Council for Environment and Natural Resources (HCNER) is a coordinating and supervisory body affiliated to MEFPD under the chairmanship of the Minister. State Environmental Councils (SEC) have been set up in Gedarif, River Nile, North Darfur, Sinnar, and Khartoum States. The Forest National Corporation (FNC) is in charge for the management of forestlands, the development, execution and coordination of forest policy, the development of Gum Arabic and other NTFP, awareness and research, and has the task of increasing the reserved forest areas up to a minimum of 20 per cent of the country's total area. The FNC answers directly to the MEFPD.

55. The Ministry of Water Resources has the responsibility of setting national water policies, strategies and plans, applying water-related research, coordinating and monitoring the utilisation of surface and groundwater, and contributing to environmentally sound socio-economic development.

56. The mission of the Sudan Meteorological Authority (SMA) is to provide weather and climate information and services of quality to help decision-makers to plan and take action to ensure food security, poverty reduction and a sustainable development. The SMA furthermore works on the development early warning systems for disaster prevention, environmental conservation, and adaptation to climate change and to stop the degradation of forests and land. In the 1980s the country had as many as 46 stations, reduced in recent years to 36 due to prolonged civil war. After separation of South Sudan, the Authority is left with 28 stations and around 300 rain gauges. The Meteorological Authority runs a joint project with the University of Reading UK for a Climate Early Warning System in Sudan,

with the objective of developing an early warning system for pastoralist herders and farmers in three areas within Sudan (Darfur, Kassala and Blue Nile.

57. The University of Khartoum, through its Institute of Environmental Studies (IES) has been generating knowledge on environmental issues, especially on climate and desertification for the last forty years, although it currently suffers acute underfunding. The Geography Department has been leading research projects on drylands and desertification, undertaking masters and doctoral studies on land degradation, pastoralism, land tenure and ENRM. The Agricultural Research Corporation (ARC) is the most active research institute regarding the intersection between climate change and environment/natural resources. The El Hudeiba Research Station, one of the oldest stations of the ARC, has had a research program since 1972. In Kordofan, the ARC is the main actor for research through its two stations in El-Obeid and Kadugli.

58. At the non-governmental level, the Pastoralists Union was created in 1994 to represent and promote the interests of livestock keepers to the government and non-governmental organizations. Its membership includes mainly traders, veterinarians, and large-scale herders. Among national NGOs concerned with ENRM and CC, the Sudanese Environmental Conservation Society (SECS), based in Khartoum with several local branches, is the oldest and largest. SECS is also leading the creation of a network of NGOs to address climate change issues. Another high-profile NGO is Practical Action, which is involved in carbon-sequestration projects in Darfur.

59. At the private sector level, recently some Sudanese companies have started to undertake serious steps towards implementing environmental (including climate change) and cooperative social responsibility policies and measures. Three leading examples are: (i) the Haggar Group - group of seven companies working on food and beverages, engineering, oil services and other enterprises – that conducted a GHG inventory of all its activities with the aim of implementing internal GHG reduction measures as well as working with other partners, e.g. civil society organizations, to offset GHGs and reduce the Group's overall carbon footprint through mitigation and adaptation interventions such as forestry, improved stoves and water harvesting; (ii) DAL Group, which operates across six business sectors - food, agriculture, engineering, real estate, medical services and education - organizes periodic Environmental Fora, to raising environmental awareness among business communities and promoting dialogue between business communities, government and other stakeholders, including research and civil society, on issues including climate change impacts on food security and water, the clean development mechanism (CDM), and the role of business community in climate change adaptation and mitigation; (iii) . In 2011, DAL launched the so-called Go Green project, a tree planting initiative for its employees, and also has a project called The Green Bakery, which contributes to GHG mitigation and improving the cost effectiveness of the traditional bakeries through promoting the use of LPG as a fuel instead of wood; (iii) Kenana Sugar Company, the largest of six sugar companies in Sudan, is working in the development of carbon offset projects targeting both the voluntary and CDM market to reduce emissions through cogeneration technology, waste management for animal feed, the reduction of methane generation, and energy efficiency improvements.

b) Target Groups and Project Area

60. The primary beneficiaries of the GEF/LDCF project will comprise those economically marginalised and excluded households residing in pastoralist and agro-pastoralist communities who: (i) have inadequate incomes from all sources to support a decent standard of living, and (ii) are potentially mostly affected by, and vulnerable to the impact of climate change. Secondary stakeholders will include private sector value-adders, service providers and operators in the field of NRM, and public sector managers and technical cadres. These mainly non-poor players are necessary contributors to the realization of the overall project goal.

61. As the landholding varies greatly between targeted States, the criteria for identifying agro-pastoralists are less than 15 feddans of cultivated land and engaging in traditional rainfed agricultural activities on which most of the rural poor depend for their livelihoods. The target agro-pastoral HH will include those growing staple food and cash crops as well as own small herd of livestock, but having limited access to inputs, assets and services. It will target both agro-pastoral HH engaging directly in farming through groups and the whole farming communities that are expected to increasingly use certified seeds and benefit from them. The Programme will also target smallholder agro-pastoral HH with entrepreneurial experience and skills that can be the key drivers of the seed commercialization process and whose involvement will also benefit the poorer agro-pastoral HH.

62. The existing, tribal-based community structures that constitute the backbone of governance in the rural areas of the country will be the basis of the LDCF during the development and implementation of the Community Adaptive Plans (CAPs). Although the set up may vary from place to place, the tribal system in Sudan is organised under the authority of the Sheikh, and is governed by Village Public Committees (established by the GoS) and Village Development Committees (VDCs). The Sheikhs usually lead/host public assemblies that elect the members of VPCs and VDCs. The membership of both committees often overlaps, and representation cuts through the economic and social fabric of the community, with women playing an increasingly important role.

63. The targeting mechanism for LMRP will build on the the IFAD gained experiences through the BIRD, SUSTAIN, and WSRMP in reaching the more vulnerable categories of the rural population in the Sudan. The gender approach of the Western Sudan Rural Development Programme (WSRMP), implemented in the Kordofan States and a winner of the IFAD gender award, will guide the gender strategy of LMRP. A participatory M&E system will be directed to monitor targeting performance and reflect poverty, gender and youth perspectives of impact.

64. Gender mainstreaming will be achieved by focusing on women's and men's interests, participation and benefits in the project design, implementation and management. Minimum quotas will be established to ensure and support women (at least 50%) and youth (at least 40% men and women younger than 30 years) active participation in activities and project-related decision-making bodies and committees.

65. In the Sudanese context and within the framework of current IFAD experience in the country, a number of measures and mechanisms would be implemented for supporting women's involvement, including:

- the selection of service providers with proven capacity in working with women, including the use of female facilitators if required;
- during awareness raising in the initial stages of the Programme and in subsequent village meetings, there would be separate sessions held with women to ascertain their opinions and needs;
- on a demand-driven basis, women would be given preferential access to appropriate Programme activities;
- gender mainstreaming responsibilities would be integrated into the terms of reference of all Programme staff as a principle to be respected; and
- the M&E and knowledge management systems of the Programme would be gender-disaggregated and would enable lessons to be learned on how to support women's social and economic empowerment.

66. Women will be targeted through women and rural development structures as these institutions facilitate independent access to land, farm equipment, credit and training for their members. Leaders at grassroots levels will be trained in understanding and overcoming gender and youth issues that hinder development, in particular related to business development. The Programme will support advocacy, knowledge sharing and policy dialogue on rural youth inclusion in enterprise development, including the organisation of exchange visits using a youth peer-to-peer approach.

67. The project will be concentrated on the heartland of the semi-arid livestock producing areas in the south of Sudan. The GEF/LDCF and its baseline will build on the activities of previous and on-going initiatives in five contiguous States, namely West Kordofan, North Kordofan, White Nile, Sennar and Blue Nile. The Programme will start in 16 contiguous localities, which have been selected on multiple criteria including: (i) vulnerability to climate change and CC-induced risks according to the ECCA produced by IFAD in early 2013; (ii) high malnutrition/poverty levels; (iii) low level of assistance from donors; (iv) high frequency and intensity of conflicts between transhumant livestock producers and sedentary farmers over land and water; and (v) livestock density (number of animals/ha); (vi) proximity to secondary markets. Sixteen Localities have been selected as follows:

    - Blue Nile: (1) Al-Damazin and (2) Al-Tadamon;
    - Sennar: (3) Abu Hugar, (4) Al-Dali & Al-Mazmoum and (5) Al-Suki;
    - White Nile: (6) Al-Gabalein and (7) Al-Salaam;
    - West Kordofan: (8) En-Nuhood, (9) Al-Khewei, (10) Abu Zabad, (11) Al-Salam and (12) Al-Sunut; and
    - North Kordofan: (13) Shaikan, (14) Bara, (15) Al-Rahad and (16) Um-Rawaba.

68. Within the target localities, the GEF/LDCF will intervene in 300 clusters of villages. The selection of these cluster villages will be based on: (i) a cluster-based approach, based on geographic continuity for the Community Adaptive Plans (CAP) for natural resource management; (ii) access to markets and stock routes; (iii) willingness to co-invest in the NRM interventions; and (iv) high poverty level and sufficient numbers of potential beneficiaries, particularly women and youth. The direct beneficiaries, while representing the poor segment of the community, will have potential to enhance the productivity of livestock production and value addition along the value chain, and to contribute to the implementation of the NRM investments within each CAP.

69. The GEF/LDCF will mainstream adaptation priorities within the Community Action Plans and subsequent investments to enhance the resilience of communities. These measures were further fine-tuned during the final Programme design phase, and will be informed by the additional data that will be generated at the early stages of the Programme in the framework of the DMPERS. In this respect, the project will ensure that climate change adaptation priorities are integrated within the CAPs and in the National Sectoral Adaptation Strategy for the Livestock Sector developed with the Ministry of Livestock, Fisheries and Rangelands.

70. The beneficiaries in each village cluster will be in charge of implementing the project investments. The State-level Adaptation Teams including civil servants from the relevant sectors of the public administration and the technical assistance contracted by the project will provide the necessary assistance to ensure effective implementation of the investments at the village cluster level. The project will contract international Technical Assistance to develop the DMPERS system and to to facilitate a consultation process and organise a series of national workshops that will eventually lead to the formulation of the National Sectoral Adaptation Strategy for the Livestock Sector (NSAS/LS).

V. Project Strategy

a) Project rationale and GEF added value

71. Sudan has a long history of reliance on livestock production. Despite major droughts in 1983-84 and 1994-6, conflicts and other natural and man-made disasters, animal numbers have continued to rise, imposing mounting pressures on the fragile physical environment. By 2008 (before the separation of South Sudan), the country held an estimated 51 million sheep (5th largest holding in the World), 43 million goats, 41 million cattle and 4.3 million camels, a vast combined national herd size of 139 million head. It is not yet known what proportion remains in Sudan post-separation, but the numbers are quoted in tens of millions. Paradoxically, although total numbers have risen and even the poorest households

have some smallstock, livestock turnover and cash returns remain very low, and the owners asset rich but income poor.

72. What has become abundantly clear is that the present direction of livestock development is not sustainable either environmentally or economically. Competition for pasture and water has already led to conflict. Despite the huge aggregate livestock numbers, animal husbandry alone does not provide an adequate income to the majority of poor households with prevailing livestock production systems. Most operate on a low-input/low-output subsistence level with only infrequent/opportunistic sales in times of particular need. The outcome is widespread rural poverty, particularly among women and youth.

73. The LMRP baseline programme will seek to tackle intractable poverty by raising the incomes of poor households through the transformation of the rural economy from subsistence to an increasingly efficient market-based system, in particular the small-scale livestock sector. The programme will invest in the transformation of national livestock business and the enabling of rural economic growth. Although LMRP is focusing on the livestock sector, its activities will cover rangeland, agriculture and forest landscapes, as pastoralism in Sudan is across these landscapes and not only confined to rangelands.

74. In spite of LMRP efforts to overcome food insecurity and income gaps amongst poor pastoralist and agro-pastoralist communities, the targeted areas that extend over large distances with varying semi-arid to arid agro-ecological conditions are already showing the adverse effects of climate change that may eventually jeopardize the expected programme results in the absence of CC adaptation measures. For that reason, and for the programme to have sustained impact on the target groups, a real need emerges for complementing its activities with actions that enhance the resilience of the communities to climate change, reducing their risk and rehabilitating the natural resource base upon which they depend.

75. The GEF/LDCF funding represents an opportunity to increase the scope of the rural development objectives pursued through the LMRP in light of the expected negative impact of climate change on the already fragile livestock and rain fed agriculture sector in Sudan. The LDCF contribution will cover the incremental cost related to the production of the adaptive and participatory community plans (CAPs), the capacity building work needed for their development and implementation of the CAPS, the investments for adaptation and vulnerability reduction, and the enhanced preparedness to climate risk, both at field level (Drought Monitoring, Preparedness, and Early Response System) and through the policy dialogue at the Federal and States level.

76. Without the LDCF funding, the baseline intervention could turn out to be a “business-as-usual” livestock support development project, and not tackle the root causes of the most important climate-related constraints facing rural development in Sudan. The LDCF intervention will complement IFAD's baseline programme by introducing an innovative participatory planning process involving smallholder farmers, pastoralists and other natural resource users in the development of Community Adaptation Plans (CAPs) aimed at strengthening resilience, reducing vulnerability, increasing productivity and conserving or restoring the natural resource base. This will be followed by the implementation of investment plans for adaptation and vulnerability reduction technologies and management systems, based on the priority measures identified by the communities through the planning exercise.

Table 6. Baseline components and “with”/”Without” GEF interventions

LMRP Baseline Components	Without GEF Intervention	With GEF Intervention
Component 1: Livestock business development	• 40,200 direct beneficiaries in approximately 447 villages, of which approx. 20,100 beneficiaries would be involved in schemes for improved fattening of lambs and cattle and approx.	• A Drought Monitoring, Preparedness & Early Response System (DMPERS) will support livestock value chain actors in decision-making e.g. planning livestock migration routes depending on the availability of water and fodder within the territories; annual/seasonal identification

	20,100 livestock owners would receive general animal advisory and health services support. • Participants in the intensive fattening schemes would receive advisory and animal health services, and be linked up with veterinary services, credit and supply of feed through public and private veterinaries, partnering commercial banks and feed suppliers.	of vulnerable hotspot areas affected by drought for a rapid response intervention in terms of water/fodder provision; monitoring water and fodder availability to improve the organization of livestock production, transportation and marketing. • Climate-resilient small businesses around watering and fodder marketing will provide services throughout the livestock VC; • Restored rangelands and woodlands will increase biomass and productivity, improving carrying capacity for livestock.
Component 2: Community-led NRM	• Investments provided for 1,000 target villages for water harvesting, restoration of stocking routes, and agriculture and livestock management inputs and equipment.	• 300 Community Adaptation Plans (CAPs) mainstreaming climate resilience in community development in the 1,000 target villages, and proposing selected adaptation measures, identified through a multi-stakeholder process involving all local actors; • Climate-proof water harvesting infrastructures and technologies will reduce water losses, increase water availability in critical areas, and abate the risk of vector-borne diseases affecting livestock and people; • Farmers and pastoralists trained and equipped on climate-resilient soil and water management within an integrated tree-crop-livestock system, leading to increased soil organic carbon, fertility and soil moisture, and improved crop/fodder yields with reduced water requirements; • Involvement of settled farmers and pastoralists in the planning, demarcation and equipment of stocking routes with water and fodder provision points, and other goods and services supporting migration movements, based on the DMPERS.
Component 3: Rural enterprise and social development	• Households in target villages would participate in 5,000 Savings & Credit Groups with at least 60,000 members. Amongst these, at least 30,000 households would start small income-generating activities and approximately 5,000 micro- and small-scale enterprises would be established through business promotion and the provision of microcredit.	• Income diversification and small business development, especially for women and youth, based on the CC adaptive interventions identified in the CAPs; • Local associations and enterprise members trained on CC adaptation to reduce the environmental risks affecting their businesses.

77. The enhancement of the quality and availability of the natural resources - specially water and fodder - achieved through the LDCF intervention will contribute to reduced vulnerability and support the target for improved community livestock productivity and value chains of

Component 1 of the baseline. Adaptation investments in water harvesting and tree-crop-fodder production will help secure the necessary natural resources in adequate locations in the territory and migration routes to cover feedlotting and watering needs in primary production, when newly purchased animals are assembled waiting for transportation, during the long-distance journey to the terminal markets, and as part of the routine operation of markets themselves. The payment for the provision of water and fodder will support the trend for reduced numbers and increased quality of the livestock and will favour the creation of service-based jobs and business for the local communities, including the implementation of priority investments generated by the CAPs.

78. The community adaptation plans will help understand climate change impacts on natural resources and incorporate adaptation technologies in tree-crop-fodder production and natural resource management. This will contribute to the baseline Component 2 in selecting the right management systems and technologies to improve livestock and agriculture productivity in the long-term.

79. The restoration, protection, and sustainable management of the degraded rangelands and pasturelands will be carried out through community-based natural resource management arrangements combined with the principle of equitable user payments for public resources consumed. The rationale for the LDCF component supporting the LMRP baseline is that the restoration and protection of the natural resource base only makes sense if the demand for environmental commodities (mainly water and fodder) is gradually reduced by "right-sizing" the national herd to a number commensurate with the carrying capacity of the agro-ecosystems. This balance will also be achieved through the diversification of the rural economy and the support to service-oriented micro enterprises for the livestock sector, and by supporting business based on the sustainable use natural resources such as NTFP (honey, gums, oils etc) and diversified crop production. In this way, LDCF interventions will also contribute to generating demand for the financial services established under Component 3 of the baseline regarding the establishment of sustainable microenterprises.

80. The design and implementation of the community adaptation plans will be coupled with enhanced preparedness to climate risk, responding to the need identified through national policy processes for the introduction and piloting of innovative response systems that contribute to reducing the vulnerability of poor herders and farmers to the increasing economic and social threat posed by climate change and environmental degradation. The LDCF intervention will develop a Drought Monitoring and Early Response System (DMPERS), which will produce timely and accurate early warning information on forage, water level conditions in the target regions and other drought forecast information, and will disseminate this information to value chain actors through the most appropriate and available tools to support decision. This will support local and regional water/fodder monitoring, and decision-making among value chain actors (e.g. planning migratory movements based on availability of water and pasture; supporting marketing livestock transportation and decisions) and help in resolution of conflicts between tribes over issues pertaining to water and fodder resources.

81. Finally, the LDCF intervention will enable IFAD to engage in a policy dialogue at both federal and state level for mainstreaming CC adaptation and NRM into policies and work-plans at the different layers of the administration. The project will support the production of a National Sectoral Adaptation Strategy for the Livestock Sector (NSAS/LS), under the leadership of the Ministry of Livestock, Fisheries and Rangelands, facilitating a consultation process and organising national workshops that will eventually lead to the finalisation of the Strategy. The project will also facilitate the organisation of State-level workshops aimed at discussing and settling land disputes, and identifying new arrangements that can lead to satisfactory agreements regarding user and access rights among for all the concerned parties.

b) Consistency with GEF policies and strategies for LDCF

82. This project has been developed in conformity with the LDCF eligibility criteria. The project proposal respects the principle of country ownership having been developed in consultation

with national stakeholders, as well as by taking into account all the latest and relevant studies and reports available on climate change adaptation requirements in Sudan. Also, the project has been designed to fully address the priority activities identified by the Government of Sudan in the NAP, NAPA, FNC, and SNC and it has been developed with the aim of ensuring sustainability and replicability beyond project completion. The project design criteria have been respected by including a list and description of the project components as well as by describing the added value of the GEF intervention (additionality). The GEF component will build directly on past and ongoing investment projects from IFAD and other agencies, and it will complement activities and achievements in light of the expected impact of climate change. Co-financing requirements are satisfied and cost-effectiveness aspects have been carefully considered. The project will be mainly investment-oriented and aims at encouraging replication and scaling-up at national level.

c) Country Eligibility, Ownership and Driveness

83. Sudan has recognised the importance of natural resources management since the beginning of the 20th century and first passed legislation relating to forests and wildlife in 1902. Sudan also participated in the Stockholm Conference (1972) on Environment and Human Development, and established the first committee dealing with the environment in the National Council for Research in 1977. After Stockholm, Sudan signed and ratified more than eight conventions covering issues such as cultural heritage, endangered species, law of the sea, conservation of the Red Sea and Gulf of Aden, combating oil pollution, the Vienna Convention for the Protection of the Ozone Layer etc. Sudan was also a party to the Earth Summit in 1992 and committed itself to its recommendations and decisions. In the same year, Sudan signed the United Nations Framework Convention on Climate Change (UNFCCC). Hence, an enabling activity for climate change was funded by the Global Environment Facility (GEF) and UNDP, and implemented by the Higher Council for Environment and Natural Resources (HCENR), which was a precursor to the National Adaptation Plan of Action (NAPA) for Sudan. Sudan also signed and ratified the International Convention on Biological Diversity (CBD) and received funding for the preparation of National Biodiversity Strategy and Action Plan (NBSAP). Sudan also signed and ratified the United Nations Convention to Combat Desertification (UNCCD) and prepared a National Action Plan to combat Desertification. Sudan also ratified the Kyoto Protocol as well as Cartagena Protocol on Biosafety and the Stockholm Convention on Persistent Organic Pollutants.

84. The Expert Review on Environmental Governance in Sudan published by UNEP in 2012 shows that international conventions, to some extent, have influenced policies, especially those articulated around environmental issues, which emerged as a result of the various international conventions. It also shows that, in some cases, national activities initiated under those conventions were also adapted at local level, with strong community participation, albeit to a limited extent. The review stresses the need to translate the directives of the conventions into a larger base of interventions at the state and locality level. The start made by the NAPA and NAP on climate change must be supported and expanded to include other areas and its approach provides a model to be replicated by other conventions and strategies developed.

85. The proposed LDCF intervention builds on the findings, and is closely aligned with recommendations of the NAPA prepared in 2007 by the Ministry of Environment and Physical Development. It integrates key recommendations for adaptation activities in agriculture and water resource management and is fully relevant with the priority projects identified by the NAPA, and mainly: Community-based rangeland management and rehabilitation; Drought early warning systems for disaster preparedness and; water and soil conservation measures. The intervention is also aligned with the FNC to UNFCCC (2003), SNC to UNFCCC (2014), and is based on the priorities and recommendations of Sudan's Long-Term Strategy 2007-2031 and its second Five-Year Development Plan (2012-2016), the Poverty Reduction Strategy Paper (PRSP), the Agriculture Revival Programme (ARP), and the Interim-PRSP approved by the Parliament in 2012, which provides the basis for the full PRSP that is currently under preparation. The project also perfectly responds to the

priorities identified in the Draft NAP that is already developed in Sudan, which is being planned based on State vulnerability and adaptation assessments and hotspot maps, and calls for the development of early warning systems and suitable technology that can build on the vulnerability assessments carried out within the NAP exercise to forecast the impact of future climate change on rangelands and natural resources, and inform the elaboration of livestock emergency response plans.

86. The Ministry of Livestock, Fisheries and Rangelands (MoLFR), which is the designated Lead Programme Agency, played a pivotal role in the development and design of the LDCF project. Representatives of MoLFR actively participated in the workshops and field missions that helped shape the project, providing input on the priorities and requirements on CC adaptation and NRM identified through previous strategic exercises. The MoLFR shall have the overall responsibility for the implementation of the project and shall ensure linkages to other relevant Ministries, States and Agencies. A Programme Steering Committee (PSC) which shall orient the strategy of the project, as part of the wider LMRP baseline programme, oversee planning, review progress and impact and ensure linkages with related projects, government services and relevant VC stakeholders. The PSC shall be chaired by the MoLFR and shall meet at least twice a year. The PSC will comprise: the Under Secretary of MoLFR as Chairperson; the Under Secretary of Ministry of Agriculture and Forestry; the Under Secretary of Ministry of Finance and National Economy; the Director-Generals of SMAARI of North Kordofan, Blue Nile, White Nile, and Sennar States; a representative of the Sudan Veterinary Council; and the Secretary General of the Pastoralists Union. In each of the States, there will be a State Steering Committee (SSC). The SSC will be responsible for facilitating Programme implementation and ensuring that impediments to the implementation of Programme activities are eliminated, as well as reviewing progress.

d) Project goal and objectives

87. The LDCF project has been designed keeping in mind the strategic priorities of the Sudanese Government on NRM and climate change adaptation, as well as the findings and recommendations of relevant studies and research, including IFAD's ECCA (July 2013).

88. The LDCF **Project Goal** is to increase food security, incomes and climate resilience for poor households in pastoralist communities. By the end of the project, 60,000 households in the project area will have increased climate resilience and will have sustainably moved out of poverty. Furthermore, 100,000 households will have improved asset ownership index compared to the baseline.

89. The LDCF **Project Development Objective** is to improve livelihoods and natural assets in livestock-based communities. This objective will be achieved through increasing by 50% the average incomes of rural poor household engaged in livestock value chains at project completion, with 20% of the target households participating actively in commercial farming by the end of the project.

90. The LDCF project is fully embedded in the IFAD LMRP baseline programme in a synergetic fashion that will ensure that GEF funding covers additional costs associated with CC adaptation needs, in line with the governmental priorities on climate change. The planned duration of the project is 7 years starting in early 2015. The time frame of the LDCF has been adjusted to ensure full overlapping with the IFAD baseline programme, and take advantage of a shared institutional and management framework.

91. In order to maximise chances of success, the project will build on the achievements and best practices from past and on-going projects carried of by IFAD or other agencies in the project area, especially ILMP and WSRMP, and will establish synergies with ongoing initiatives led by agencies such UNDP, UNEP, WFP, FAO and others. The project will also benefit from models and case studies from neighbouring countries, such as the Livestock Early Warning Decision Support System (LEWS/DSS) of Ethiopia and Kenya.

92. The enhancement of the quality and availability of the natural resources -namely water and fodder - achieved through the work of LDCF this will contribute to the target for improved community livestock productivity and value chains of Component 1 and Component 2 of the baseline LMRP programme. Furthermore, the payment for the provision of water and fodder will support the trend for reduced numbers and increased quality of the livestock and will favour the creation of service-based jobs and business for the local communities, including the implementation of priority investments generated by the CAPs. LDCF will thus contribute to generating demand for the financial services under Component 3 of the baseline programme for the establishment of sustainable microenterprises. The Drought Monitoring and Early Response System (DMPERS) will support local and regional water/fodder monitoring, and decision-making among value chain actors of Component 1 and Component 2 of the baseline programme (e.g. planning migratory movements based on availability of water and pasture; supporting marketing livestock transportation and decisions), and help in resolution of conflicts between tribes over issues pertaining to water and fodder resources.

e) Project components

93. The project will be shaped around three main lines of work, or Components:

94. Component 1: enhanced capacity for community adaptive planning, will focus on the development of participative community adaptation plans (CAPs) in the 300 clusters of villages targeted by LDCF. Baseline assessments including CC vulnerability of socio-ecosystems will be completed in 16 target Localities, while the members of the 300 Village Development Committees (VDCs) and 126 governmental technical staff at the Locality and State levels will be capacitated to steer the process with knowledge, organizational, and management skills on CC adaptation, CRR and NRM. At the end of this process, 300 CAPS will be available, setting priorities for vulnerability reduction investments.

95. Component 2: Vulnerability reduction investments based on adaptive management of NRM, is strictly linked to the previous one, and shall consist of the subsequent identification and implementation of priority investments and support to sustainable NRM-based business opportunities and livelihoods diversification in the project area and along a network of stock routes in the five target states. Through this component, the project will support community-based natural resource management and ecological restoration interventions to reduce the vulnerability of 100,000 households of settled and nomadic pastoralists in 300 clusters of villages, and along at least 1,100 km of stocking routes, by: (i) achieving a 25% increase in rangeland productivity in the target areas; (ii) rehabilitating 334,000 ha of rangelands in the five target States; (iii) providing water harvesting equipment for storing up 500,000 m3 of water for livestock and people; (iv) establishing 12,000 ha of improved agriculture land (tree-crop-livestock system); and (v) demarcating and restoring 1,100 km of stock routes.

96. Component 3: climate change preparedness and policy facilitation responds to the need identified through national policy processes, such as the NAP, the SNC and the Interim PRSP, for the introduction and piloting of innovative response systems that contribute to reducing the vulnerability of poor herders and farmers to the increasing economic and social threat posed by climate change and environmental degradation, and for enhanced policy dialogue and strategic development in these fields. The project will support the Ministry of Livestock, Fisheries and Rangelands (MoLFR) in the development of a drought monitoring preparedness and response system (DMPRS), and in the formulation of a sectoral adaptation strategy for the livestock sector. It will also support the facilitation of conflict resolution between nomadic herders and settled population by setting up platforms for dialogue at the state levels.

Component 1: enhanced capacity for community adaptive planning

OT 1.1: *Community adaptation plans (CAPs) incorporating needs and priorities of poor women and men are developed.*

97. The project will lead a participatory process to develop Community Adaptive Plans for Resource Management and Utilization (CAPs) in 300 clusters of villages within the target areas of the five States, as a necessary preliminary step towards the implementation of investments for disaster risk reduction, climate change adaptation, natural resource management, and economic diversification. An approved CAP would be a precondition of any locally supported investments by the LDCF project.

98. The project team, in collaboration with the State governments, will support the creation of State-level Development and Adaptation Teams (SDAT), which will include appointed specialists from the State administration in the fields of rangeland/pastures, forestry, agriculture, water, and social development (one each for women and men). The State-level Natural Resources and Adaptation Specialists (NRAS) employed by the project and integrated within each State Implementation Unit (SIU) will lead the work of the SDATs, which will have the following tasks: (i) guide and oversee the production of the CAPs; (ii) facilitate the participatory selection of priority investments with the VDCs; and (iii) deliver a tailor-made community training and capacity building programme to enable the beneficiaries to design and implement the planned activities, including facilitating access to financial services for the implementation of the CAP priority investments.

99. The project will also contract Technical Assistance (TA) to: (i) lead the production of the baseline, including vulnerability assessment at the cluster level; (ii) undertake participatory mapping of the natural resource base of rural communities, identifying risk, hot spots and investment gaps to inform the preparation of each CAP; (iii) support the SDAT in the delivery of technical training; (iv) provide backstopping and technical support for the assessment, preparation and implementation of the CAPs; and (v) ensure that climate change adaptation and vulnerability reduction are solidly embedded in the plans and priority investments. The TA will be made available through service providers (NGOs, CBOs, partner organisations…) who will make sure that the CAPs are produced and finalised within the first 12 months of implementation. During the design phase, the IFAD has identified a number of potential partners with a good track record of work in these fields (i.e. ECS, Plan-Sudan, Practical Action, SOS-Sudan, WFP etc), who will be consulted for involvement at start-up of the project. The procurement of these service providers will be done based on specific terms of reference and include expertise on: (i) climate change modelling; (ii) socio-economic development, including community-business support; (iii) adaptive management of land and water resources, including traditional knowledge and innovation; (iv) ecosystem-based NRM and restoration; (v) economic valuation of NR goods and services, (vi) renewable energy. These service providers will be procured based on presence within the different states, and should facilitate the development of the CAPs in a participatory manner, including within the exercise the local representatives of the different administrations in an effort to build their capacities and make them able to later support the communities and build their adaptive planning capacity to repeat these exercises whenever necessary.

OP 1.1.1: *Community organizations and governmental staff at local and state levels are capacitated with knowledge, organization and management skills on CC adaptation and risk reduction in NRM.*

100. As a preliminary step, the SIU/NRAS, with the support of the TA, will undertake a capacity assessment to identify knowledge and capacity gaps of the SDAT members in the domains of ENRM, DRR, and CC adaptation with a focus on integrated rangelands-crop-woodland systems, as well as an assessment of suitable adaptation needs and technologies in terms of required equipment and infrastructures. International TA will be recruited on a short-term basis to lead the design of a sound “training-of-trainers” capacity building plan that should be comprehensive, tailor made, practical, flexible, and spread throughout the life time of the programme. The plan will also include training on community mobilisation, to build the capacity of trainees in applying Participatory Learning and Action (PLA) tools. After the completion of the first segment of the plan, soon after the start of the programme, the State-level teams will have acquired the capacity to engage in the CAPs exercise.

101. The SDAT will develop and deliver a tailor-made community awareness raising and capacity building programme aimed at empowering the beneficiaries to carry out the planning and prioritization of adaptation investments efficiently, ensuring the active participation of the more vulnerable households and the involvement of women in planning and decision making. The risk that CAPs fail to capture and prioritise measures for climate change adaptation and vulnerability reduction due to low awareness of the communities on these topics will be mitigated by the SDAT extension agents, whose task will be to ensure that climate adaptation, DRR, and ENRM capacity is built in the communities as from the early stage of the participatory process, and that CAPS adequately capture: (i) the community members' perception of climate risks and their coping strategies, disaggregated by gender and age; (ii) the existing and potential issues/areas of conflict between farmers and herders, and measures for their mitigation.

OP 1.1.2: *300 Community Adaptation Plans (CAPs) for vulnerability reduction investments are developed*

102. The existing, tribal-based community structures will be the programme's main target in the development of each CAP. Although the set up may vary from place to place, the tribal system in Sudan is organised under the authority of the Sheikh, and is governed by Village Public Committees (established by the GoS) and Village Development Committees (VDCs). The Sheikhs usually lead/host public assemblies that elect the members of VPCs and VDCs. The membership of both committees often overlaps, and representation cuts through the economic and social fabric of the community, with women playing an increasingly important role.

103. The CAP development process will start with a baseline assessment and participatory resource mapping exercise in each cluster of villages, including a rapid CC vulnerability assessment. The mapping will integrate traditional community knowledge and new information generated through the IFAD Environmental and Climate Change Assessment (ECCA), NAP State-based vulnerability and adaptation assessments and hotspot maps, and the land use/land change maps produced by the Unit of Planning, MoA and others.

104. Once this step is finalised, the TA service providers, SDAT, institutional stakeholders, and local communities will agree on the territorial needs to cover gaps (e.g. the identification of critical areas for establishing new water points, for creating firebreaks, for restoring vegetation cover, etc) and select suitable adaptation responses and prioritise investments that will constitute the basis for the CAPs. The exercise will be enhanced by the use of available, state of the art tools such as satellite imagery, latest available data and GIS support, that will enable the community members to repeat these exercises whenever necessary.

105. In order to facilitate the adoption of adaptation and risk reduction measures in the CAPs, a predefined open list of eligible options for investment will be put together, that can strengthen the adaptive management of rangelands and promote a more strategic and sustainable use of key resources such as water, soil and fodder. These options will build on the successful achievements and the pilot activities tested through previous projects, such as IFAD's Western Sudan Resource Management Project (WSRMP). The measures will include, *inter alia*:

- Rehabilitation and restoration of rangelands and woodlands as a way to enhance habitat resilience and availability of forage through rotation and fencing, and improvement of vegetation cover/pasture yield/ha with highly diverse native plant species/genetic varieties (grasses, leguminous plants, small bushes), tolerant to climate constraints, (drought, pests and less prone to causing forest fires).
- Support the creation of *"Hemas"*, to conserve and manage sustainably rehabilitated rangelands through community agreements of social fencing. The *Hema* is a traditional system of resource tenure that has been practiced for more than 1400 years in the Arabian Peninsula, and the most widespread and longstanding indigenous/traditional conservation institution in the Middle East. The Arabic word *"Hema"* literally means "a protected place" or "protected area". The principles of *Hema* are in harmony with the key concepts of ecosystem management, which include 1) building consensus and a

sense of ownership with stakeholders; 2) dealing with the natural system as one integral unit that includes socio-economic and ecological governance; and 3) ensuring a process of feedback and social learning evident in local knowledge, culture and religion.

- Measures to prevent soil erosion and floods, including the setting up of live fences of trees and construction of micro-fences using dead stems to build barrier fences that reduce sand encroachment and mitigate the impact of dust and windstorms.
- Fire control and management measures such as the creation of fire-lines for the protection of rangelands.
- Measures for water conservation and storage and improvement of pasture, agriculture and drinking water supply through traditional methods and innovative low cost technology including *hafirs*, small size dams, boreholes, sub-surface, sand dams, and other water harvesting systems, including micro-structures to collect runoff from infrastructures such as roofs, road surfaces, etc.
- Protection of water reservoirs, dams, and water catchments areas through the creation of live shelterbelts with trees and shrubs.
- Promotion of adaptive farm management systems (including conservation agriculture), introducing permanent soil cover, direct seeding (no tillage/reduced till), crop rotation crop sequence that conserve/restore fertility, and integrated pest management.
- Introduction of heat/drought tolerant, disease/pest tolerant, salt tolerant, early maturing and high yielding varieties of crops.
- Tree-crop-livestock integrated management systems, to promote multiple environmental (e.g. improvement of soil architecture, water infiltration and fertility; creation of microclimate conditions for crops and natural vegetation; providing habitat requirements for wild fauna), and socio-economic (e.g. improvement of crop yields and provision of complementary source of revenues) benefits.
- Measures to decrease the dependency on biomass energy, control and management of charcoal production and marketing through organised and planned cutting of firewood from replacement operations of the aged forests and introduction of efficient energy saving stoves.
- Promotion of non-fossil fuels and energy efficiency, and provision of butane gas units for domestic energy. Support to improved use of animal waste (biogas, composting), as well as other solutions such as portable biogas pioneered by IFAD.
- Measures to encourage livelihood diversification and the development and expansion of products from acacias and natural forests, including gums and resins, honey, dairy and milk by-products.
- Encourage the creation of kitchen or women gardens for improved nutrition *(Gabareek)*.
- Encourage the creation of mini-enterprises for the setting up of community mills and the production of supplements and concentrates (by-products of groundnuts, sorghum, cotton and broad beans, with addition of minerals) to reduce the dependence of livestock on natural resources and overcome scarcity in drought periods.
- Creation of small ponds for aquaculture use, whilst managing mosquito breeding by biological control.

106. The project team, with the TA, will develop criteria for the evaluation and screening of the CAPs, and a checklist to make sure that they include a balanced mix of investment activities, and that they properly capture the need for specific interventions on climate change adaptation, disaster risk reduction, and income diversification. Once the CAPs are validated, the menu of investment options will undergo a participatory exercise of prioritisation ranking, and each option will be analysed to identify the best modality for implementation. The long-term sustainability of each investment vis-à-vis the expected impact of climate change will be a key criterion in the ranking exercise. It is anticipated that while some investments might benefit of direct programme funding (GEF/LDCF or other sources within LMRP), others might be eligible for loans or Public Private Partnerships. Those measures that are more directly related to the setting up of small-size business for

income generation and diversification will be included in, and financed through the business plans developed within Component 3 of the baseline programme.

Component 2: Vulnerability reduction investments based on adaptive management of NRM

OT 2.1: *Community adaptation investments increase the resilience of settled and nomadic pastoralists*.

107. Once the CAP development process and parallel CB exercise are finalised – approximately one year after project start-up – the investment implementation phase will start. The TA and SDAT will provide the required backstopping and technical assistance for the implementation of each CAP, feeding relevant information and new findings from existing best practices and case studies at the national and international level. Besides the direct, positive impact on rangelands, these measures will bring environmental benefits that are locally and globally valuable, such as carbon sequestration, water cycling, and the enhancement and conservation of local biological diversity.

OP 2.1.1: *Priority adaptation measures supporting the restoration and sustainable use of NR implemented in the framework of the Community Adaptation Plans*

108. The project will allocate a sum of approximately USD 37,850 to each of the 300 Village Development Committees (VDCs) to cover financial needs for the implementation of the prioritized adaptation measures within each CAP. The works will be undertaken by local and regional public institutions - depending on type of intervention – and this will represent the Government contribution. The cash amount will be for the acquisition of the necessary equipment and inputs. The required farmers' contribution will be mostly in-kind through labour and materials. Smallholders will also be supported for the development of small businesses to ensure that maintenance and sustainability of the interventions, such as water filtration around water harvesting infrastructure. The Project Management Unit (PMU) and State Intervention Units (SIU) will define procedures, criteria and procurement conditions for the funds allocation, keeping in mind climate resilience and gender requirements. The investments will enable the generation and introduction of innovative technologies and will support the delivery of environmental services.

109. Although it is not possible to anticipate what each CAP will look like at this stage, based on the survey carried out during programme design, discussions with local experts and stakeholders, and the review of available strategic documents and work plans, the following priority interventions for enhanced resilience have been identified, which are likely to form the bulk of the investments:

110. Rangeland restoration and management: The ecological health of rangelands will be improved by enriching vegetation cover through the planting of seeds, seedlings and/or cuttings and introducing specific positive remedial actions to improve soil and water conditions. About 334,000 ha of rangelands would be rehabilitated, some under community-led Hema schemes. Active restoration involves: (i) enriching vegetation cover by planting seeds, seedlings and/or cuttings; and (ii) introducing specific positive remedial actions to improve soil and water conditions - such as soil preparation methodologies to avoid erosion and increase water harvesting, infiltration and water availability, installing water-harvesting facilities for the watering of restored sites, and rebuilding deteriorated soil protection infrastructures such as bench terraces - in the restored area.

111. Wherever appropriate, the CAPs will also support the eradication of invasive species such as *Prosopis spp,* which lead to the degradation of the quality and nutrition value of pastures, and may cause animal injury and infection. Within the last twenty years, invasive plant species have started to encroach on the natural rangelands of Sudan, as reported in a number of sites throughout the Sahel belt. Many have been introduced and promoted as an economic opportunity in poor areas, (such as fast growing trees to produce wood and fodder). These species are characterized by having high competitive ability for water and

nutrients, thereby substituting indigenous and more palatable flora. All of them lead to a disturbance in the ecological balance and change in the vegetation composition.

112. The Rangeland and Pasture Administration has realized the need to eradicate *Xanthium* in areas intensively invaded and to enrich these areas with other species to favour competition. The pasture authorities have taken measures, with limited means, to control these and other alien flora, mainly using chemical herbicides and physical eradication. The programme will support the eradication effort in the target rangelands, using a careful and ecosystem-conscious approach and assessing the advantages and disadvantages of different options in each case. The provision of adequate machinery for physical eradication will be combined with other techniques to control the spread/growth of seedlings, such as the harvesting of *Prosopis* pods in order to process them into fodder supplement, cutting off the stem 10 cm below ground together with the application of fire, trenching around trees to decrease lateral roots, and other measures.

113. An important aspect of the restoration work will be the support to the integration of trees/crops/livestock systems and to farmer-managed natural regeneration. The Forest Law (2002) stipulates that trees should be left standing on 5% of lands mechanically cropped and 10% on rainfed lands in Sudan. In practice, tree coverage is much lower, in spite of the fact that trees can greatly enhance the productivity and value of agriculture lands. The programme will support farmer-managed natural regeneration (FMNR), which involves favouring the regeneration of trees and their sustainable management to turn crop fields into tree/crop/livestock systems – a management system that is widely used in the Sahel region. Enrichment by direct seeding or the planting of seedlings may be incorporated in the FMNR management practice when sprouts are scarcely present and the soil seed bank in agriculture land is very poor.

114. Woody perennial plants and shrubs interact with the soils and crops to create an agro-ecological system that reinforces multiple ecosystem services to increase overall crop productivity. For example, planting leguminous plants such as *Acacia Senegal* or *Faidherbia albida* in agro-pastoral land fertilizes the surrounding soil by fixing nitrogen through the tree roots (over 100 kg nitrogen fixed per ha), increasing the yields of crops and grasses grown in the vicinity of the tree. They also provide significant soil moisture in the crop root zone and mulch cover that can suppress weed growth. Besides contributing to soil fertility and providing products such as wood and fruits, plants with their different heights and shapes slow the movement of wind and reduce its velocity. Furthermore, they absorb the kinetic energies of raindrops and smooth their infiltration in the soil, improving water absorption and reducing run-off.

115. Another measure the CAPs will support in the domain of rangeland restoration and management is the fixation and stabilisation of sand and loose soils. Loose sandy soils have a negative impact on the loss and the fertility of rangeland, and contribute to the siltation and pollution of water harvesting structures, such as the *hafirs*. Several measures are used to stabilise dunes: (i) Area closure by wire fencing and guarding to prevent exploitation during the two/three year rehabilitation phase needed to establish the vegetation; (ii) Construction of millet stalk palisades arranged in 'checker-board' squares, which act as windbreaks and as barriers to sand dispersion by wind; and (iii) Natural regeneration, planting and seeding of annual and perennial plants (i.e. *Leptadenia pyrotechnica* and *Acacia* spp.) for soil stabilisation. As soon as the vegetation cover is established on the denuded surfaces, the dunes can be used for grazing or for harvesting of herbs and fuelwood. Pasture on the dunes can also be used as a 'reserve' for late dry-season grazing, depending on vegetation development and herd size. Additional income for land users comes through the planting of multipurpose tree/shrub species on the dunes.

116. After protecting degraded areas and achieving natural regeneration, it is necessary to implement rangeland management practices that guarantee the sustainability and conserve/ improve the restoration outcomes in the long term. The principles of rotation and resting – adjusting the utilisation needs according to climate and ecological conditions – are relevant to most rangelands in drylands. The programme will negotiate agreements with partners and land users (FNC, pasture departments, local communities) to make sure that

the investments for restoration/rehabilitation are enhanced and made sustainable through proper post-restoration management of the rangelands. This will include the identification of rangeland plots that will be rested each year, to allow the vegetation to stock up energy reserves and rebuild shoot systems, while herds are moved to fresh rested areas with the intent to maximize the quality and quantity of forage growth in the long-term. The size of herds and the time needed for resting should be established according to the environmental conditions of each area.

117. Rotation and resting grazing also allows for more even distribution of dung and urine that can enhance soil organic matter and nutrients for plant productivity, thus regenerating grasslands – species composition, biomass and litter accumulation – and improving livestock production simultaneously. Resting plots will be demarcated and protected with mobile fencing.

118. The project will introduce fencing as an important complementary measure in rangeland restoration, building on the numerous successful examples and case studies available within Sudan and in the region (Ethiopia, Kenya). Fencing and resting is usually a much more effective measure of rangeland restoration than seed broadcasting, although it requires a number of prerequisites to be effective: (i) involving and enabling local communities in planning, implementing, monitoring and evaluation of enclosures; (ii) creating incentives for local people to get their buy-in, based on the positive experience of the WSRMP project, on food-for-work for guards protecting the enclosure areas, or building on customary laws and Hema regulations; and (iii) identifying alternative sources of fodder/wood and introducing measures to reduce pressure and contribute to the sustainable use of enclosures. LDCF will also promote the use of improved cook stoves to decreased demand for fuel wood among target households.

119. The sustainability of the investments in rangeland restoration and improved management will be guaranteed by: (i) the economic return that would accrue from the increased quantity and quality of fodder produced, the introduction of grazing fees, and the subsidiary wealth generated by the healthier agro-ecosystem – including fuelwood and other biomass, NTFPs, etc; (ii) the improvement of the health conditions of the herd due to decreased injury and infection caused to the animals by invasive species.

120. Water Conservation and Management: The project will invest in the making water available at the community level for human, livestock, and agriculture purposes. Examples of water conservation systems that are already in use in Sudan are: (i) *hafirs*, excavated reservoirs in natural depressions, where the excavated soil is used to form banks around the reservoir to increase its capacity; (ii) Small earth dams constructed either on-stream or off-stream, where there is a source of significant quantities of channel flow; (iii) pans and ponds, to harvest floodwater and groundwater; and (iv) Sand and subsurface dams in seasonal sandy rivers subject to flooding during the rainy season. Additional measures are the collection of rainwater from roofs of houses or road surfaces.

121. The project will also increase the availability of groundwater sources, typically boreholes equipped with hand pumps and shallow wells for human water supplies. Boreholes can be drilled to greater depths, more efficiently and more quickly, tapping into deeper aquifers and avoiding the challenges facing traditional 'hand dug' open wells, which are at risk of not consistently providing water during the dry months. Boreholes can also provide a safe and reliable source of water for the whole community and avoid the risk of cross contamination of water-borne diseases and livestock. Boreholes are safe for all community members to use: women and children can gain easy and quick access to water, without the risk of accidents and deaths from falling into the water source. They can be drilled very quickly and safely, as dangers to workers constructing traditional hand-dug wells are minimised. A hand-dug open well, can take many weeks to dig, whereas a borehole can be drilled (depending on the depth) within 48 hours.

122. Innovative technologies will be introduced to ensure better water quality, reduce loss through evaporation, and abate the risk of vector-borne diseases affecting livestock and people. These will include technologies for water filtering and purification for human

consumption. The protection of water reservoirs, dams, and water catchments areas will be enhanced through fencing, and live shelterbelts with trees and shrubs.

123. The project will guarantee the sustainability of the investments in water conservation and management by introducing or strengthening the principle of water fees and payment for services. Building on existing, successful experiences (i.e. North Kordofan) the village clusters will manage the water points through the VDCs, charging nominal water fees. Where needed, LDCF will build the capacity of the VDCs for the development of proper management and business plans to run the water-related business. As far as the water points located far from the villages, public/private enterprises will be developed for their management.

124. The beneficiaries in each village cluster will be in charge of implementing the programme investments on improved management and restoration of rangelands, creation/restoration of water points, diversification of cropping systems including tree planting and fodder production, and development of local businesses based on NTFP, water provision, renewable energy etc. The SDAT and TA will provide the necessary assistance to ensure effective implementation of the programme investments at the village cluster level.

125. Stock route network completion: The seasonal migratory livestock routes are a key management strategy in Sudan's nomadic pastoral systems, with movements between wet and dry season grazing areas denoted by clearly defined, traditional routes. The migration routes are generally north/south, with southward movements in the dry season and northward movements in the rainy season. However, in recent years, the blockage of stock routes, lack of access to the traditional grazing lands, exacerbated by increased herds and the additional pressure of displaced communities have led to escalating conflicts between farmers and pastoralists. In an effort to solve the problem, the federal and State authorities have engaged in the mapping and demarcation of the stock routes, usually by fixing cement poles as land-marks at intervals of 0.5 km to 3 km apart has also been implemented, to avoid the blockage of the routes and limit the trespassing of herds on cultivated land.

126. LDCF will follow up the work started by the WSRMP and ILMP projects in the five target States, where stocking routes have been demarcated and mapped with the participation of the different stakeholders, and a process has started working at the development of a more a conducive policy framework for the management and maintenance of the routes. So far, the above projects have demarcated 280 km of routes in the state of White Nile, 500 km in Sennar, 300 km in Blue Nile and 4,000 km in North Kordofan.

127. During design phase, the project team met the teams responsible for the wok in both projects, and gathered the following recommendations to follow up the work of the projects that are being phased-out:

- Maintenance/improvement for the demarcation investments carried out by ILMP and WSRMP through erecting damaged marks or posts;
- Mainstreaming livestock routes into inter-communities adapted plan;
- Organisation of workshops in each target state involving concerned institutional decisions makers, community leaders, and representatives of the main categories of land uses;
- Production of final and approved maps of the routes;
- Finalize legalization of the routes at the state level;
- Facilitate the setting up of an agreed, participatory management system;
- Support the development of small businesses along the stock routes.

128. LDCF will target a representative network of at least 1,100 km of stocking routes in the five states. At programme start-up, criteria will be developed, in coordination with the state authorities, to decide on the exact stock routes to be worked on. It is anticipated that priority

will be granted to those routes that are most strategic in connecting production areas to markets (thereby creating synergies with Component 1 of the baseline programme LMRP), and to the routes where the most acute conflicts between users are being observed (answering to a specific request of assistance from the authorities on this issues).

129. The states will receive technical assistance for undertaking GIS mapping and demarcation of the stock routes as well as legalisation. The SIU will facilitate the organisation of consultation workshops at the state level for state decisions makers and leaders of the main land uses and promoting consensus on the management plans of livestock routes.

130. As the rangeland restoration and management work proceed, LDCF will liaise with another GEF project led by IFAD in Sudan, the "Integrated Carbon Sequestration Project in Sudan", which is being implemented in the Butana region by FNC. LDCF and FNC will assess the developments, capacity created, and lessons learned through the Programme, and will evaluate the opportunity to introduce a carbon finance component that could enable the LDCF beneficiaries to access the carbon market and receive additional income for carbon sequestration activities, bring additional value to the investments of the Programme.

131. In terms of Knowledge Management, operational experiences will create valuable knowledge in the target areas, which will be captured by the LDCF and utilized to generate lessons and best practices to be shared with beneficiaries, public institutions, the IFAD country team, partners and others. The results of programme support for rangeland restoration and water management, as well as conservation agriculture and sustainably expanding small businesses in rural areas will be widely publicized. The project will promote: (i) knowledge networking through periodic seminars/workshops; (ii) publication of 'how-to' leaflets relevant to all work undertaken on restoration of nature assets, and (iii) audio-visual material that capture lessons learnt and impact. Special emphasis will be placed on knowledge regarding climate change adaptation and disaster-risk development planning. The vulnerability assessments to be undertaken at village cluster level will be the basis for that, ensuring it guides adaptive long-term planning regarding development work in Sudan. Main anchoring points for knowledge management will be identified, including research institutions, civil society, regional KM networks and specialised service providers.

OP 2.1.2: *Diversification of livelihoods achieved through community level income generation activities and businesses*.

132. LDCF will take advantage of the strong rural enterprise and livelihoods diversification work embedded in its baseline programme LMRP, to promote and support small business linked to NRM and stemming out of the CAP investments, especially on rangeland and water management. The diversification of livelihoods will be pursued by LDCF as an additional factor to enhance community resilience. The imperative to reduce pressure on natural resources will be reflected in the emphasis on economic activities that are not posing additional pressure on the increasingly scarce and depleted land and water resources, but that build on the investments in restoration, improvement, and conservation of the natural resources in the target clusters of villages.

133. The microenterprises promoted by the project will be sustainable-NR based. Demonstrations will be supported for activities which are relatively new and untested for community-level implementation, such as brick-making for low cost housing, flour mills, oil expellers, agro-processing activities and other climate resilience adoptions such as promotion of solar lights, home nurseries and tree planting activities. The profitable management of public goods will also be demonstrated with the participation of financial institutions involved in the baseline programme for wider adoption of the successful models. As the more successful microenterprises grow and build up business skills including a sound credit record, the baseline programme, through its Component 3, will facilitate their scaling up with access to appropriate commercial finance. At every stage and scale, loans would be advanced only against robust business plans.

134. In order to promote the sustainability of the work undertaken in this outcome, the target communities will be coached through Component 3 of the baseline programme LMRP, and

will be empowered to access financial services in order to establish businesses, including also through PPPS, which ensure the return on investment. Some of these would include: drinking water filtration, energy provision through alternative sources (i.e. piloting of the IFAD experience on portable biogas), establishment of Integrated Service Centres for fodder and water along the pasture routes, among others. Another element of sustainability sought by the project will be the support to the set up of complete value chains revolving around products and/or services that will be the focus of the CAPs investments (i.e. water, fodder, cook stoves, NTFPs etc.). For instance, if the introduction of improved cook stoves (ICS) is identified as a priority need, the project would support the setting up of saving and credit women groups for the creation of small business for the manufacturing, sale, and distribution of the ICS.

135. The work of LDCF on livelihood diversification will also be part of the project's engagement in the improvement of the stock routes in the five target states. Besides demarcation, and legalisation, a key aspect of the work of LDCF in this domain will be the investment in ENRM interventions, and the restoration of livelihood systems along the routes. Smallholder farmers in the areas crossed by the routes will benefit from the facilitation provided by LMRP to set up micro-enterprises for goods and services – mainly water, fodder, food, and other commodities demanded by herders. The stimulation of business will contribute to the mitigation of conflicts between the settled and transhumant communities, turning the routes from a space of conflict into a space of trade where win-win situations can be successfully introduced. Component 3 of the baseline programme will deliver the financial services for the setting up of these small businesses.

Component 3: climate change preparedness and policy facilitation

OT 3.1: *Response systems and innovative solutions for climate risk mitigation are developed*.

136. This outcome will revolve around three different actions built into the same preparedness and policy overarching framework: (i) development of an effective and sustainable Drought Monitoring, Preparedness, and Early Response System (DMPERS); (ii) production of a National Sectoral Adaptation Strategy for the Livestock Sector, and (iii) contribution to the reduction of disputes between nomadic and settled communities regarding access to natural resources in the 5 target areas.

137. **OP 3.1.1:** *A Drought Monitoring, Preparedness and Early Response System (DMPERS) supports decision-making to mitigate climate risks in rangelands and livestock production is developed and operational in the target States.*

138. The NAP and the SNC recently released by the Government of Sudan (2013) call for the development of new technology to forecast the impact of future climate change on rangelands and natural resources, and inform climate-risk rangeland fodder and water monitoring systems supporting livestock preparedness and response plans. These systems will build on the vulnerability assessments carried out within the NAP exercise, as well as the remote sensing technology, mapping and lessons learned through projects in Sudan, the Horn of Africa and the Sahel region.

139. During the LDCF design mission, the issue of the long-term sustainability of the livestock sector in Sudan often emerged, especially in relation with the ongoing, fast degradation of rangeland resources. Furthermore, the Comprehensive National Strategy (1992-2002) recommends including the consideration of the carrying capacity in the management of the rangelands, together with the improvement of pastures, the adoption of suitable grazing systems, and the protection of rangelands against fires.

140. The project will address these recommendations by supporting the Ministry of Livestock, Fisheries and Rangelands (MoLFR) developing a Drought Monitoring, Preparedness and Early Response System (DMPERS) that can help increase the resilience of the livestock sector to the main hazard caused by the combined effect of climate change drought exacerbation and pasture degradation, which are causing a serious decrease of available fodder/biomass and water resources in traditional pasture areas and along

transhumance routes. LDCF will contract an international provider of TA to develop the DMPERS system. The international TA will be responsible for leading the development and delivering the outputs of the DMPERS over a foreseen period of three years, through the following, step-wise exercise:

- Review and assessment of existing information, tools, and experiences in the field of early warning, with a special focus on the Sahel/Horn of Africa, in cooperation with partners and making use of existing resources (monitoring of the production of biomass set up by ACF/West Africa Regional Office; 2012 FAO land cover database; UNDP Sudan Crisis and Recovery Mapping and Analysis Project/IMWG).
- Analyse the livestock value chain in the target States to identify key entry points for the development of DMPERS.
- Interview and discuss with all potential partners and stakeholders and agree on a participatory work plan for the development of the DMPERS for the five target States.
- Identify key CC drought-related factors that have a critical impact on the sustainability of the livestock sector; elaborate sets of indicators for the measurement of these factors, and develop a simple and effective system to monitor and forecast the seasonal/yearly productivity evolution of rangelands and pastures; identify a methodology to calculate the seasonal carrying capacity of rangelands, based on the calculation of critical thresholds; develop a system for the elaboration of seasonal maps to inform decision making on the spatial and temporal distribution of herds in a given territorial unit; and – upon consultation with the State-level authorities - identify effective and simple mechanisms to ensure the timely transfer of the critical information to grassroots beneficiaries (herders, local communities).

141. As a first step, the international TA will develop suitable statistical downscaling techniques to simulate robust future climate scenarios for the five target states. The methodological process will be based on the three stages necessary to address climate change adaptation: (i) description of potential future climate conditions; (ii) evaluation of how this future climate will impact the pastures and livestock management, including a baseline analysis outlining the exposure of livestock and pasture systems to prevalent climate shocks and stresses; (iii) recommendation on how to reduce climate risks for Sudan's livestock sector and increase the resilience of pastoralist communities.

142. The DMPERS will (i) identify key climate change related factors that have a critical impact on the sustainability of the livestock sector; (ii) elaborate sets of indicators for the measurement of these factors, and develops a simple and effective system to monitor and forecast the seasonal/yearly productivity evolution of rangelands and pastures; (iii) identify a methodology to calculate the seasonal/yearly carrying capacity of rangelands, based on the calculation of critical thresholds; (iv) enable the elaboration of seasonal maps to inform decision making on the spatial and temporal distribution of herds in a given territorial unit; and (v) ensure effective and timely transfer of the critical information to the local authorities, and from these to the final, beneficiaries (herders, and farmers' communities).

143. The system will be shaped along four main components: (i) A forage characterization model, based on a hydrological plant growth model intended to simulate daily available forage, to produce periodical estimates of forage conditions and generate forecasts of forage conditions; (ii) a water resources monitoring module, for monitoring small waterholes, boreholes, hafirs etc, which will compute runoff and evaporation, and thereby estimate the change in volume of water, providing water level fluctuations information in near-real time with a day-lag; (iii) an operational data and product-processing module, through which the satellite data will be processed and the forage conditions and water-resources data will be produced; and (iv) a product dissemination system, shaped on the most convenient tools for the Programme area (radio, community organisations, MICT, THABIT service of the Sudanese Mobile Company etc).

144. The DMPERS will serve multiple purposes, including:

- Inform the planning of new investments on water and fodder enhancement needs to cover territorial gaps, especially along the migration routes;

- Monitor seasonal trends and changes in water points' water levels on daily basis, and pasture conditions, providing early warning for potential herd migration in search of fodder and water;
- Help plan migratory movements based on the availability of water and pasture;
- Facilitate early warning access to critical information about drought-related risks (e.g. predicted shortage of water and fodder; predicted livestock disease risk) through media information and communication technologies (MICT) and SMS message services to support decision-making in the sanitary and veterinary sector, and in trading operations between pastoralists and markets.
- Link with the marketing and extension information system to be developed within Component 1 of the baseline LMRP programme.

145. The international TA will implement a training programme to ensure that users (e.g. MoLFR and other federal, state and locality governmental staff, extension agents, NGO/CBO, and community/pastoralists groups) have the capacity on downscaling approaches to develop future climate scenarios, and can take full advantage, and make proper use of the DMPERS. The programme will build on existing materials and methodologies including the LEGS Project, and will include training of trainers to ensure long-term sustainability.

146. At the inception phase of the programme, MoLFR and the project team will agree on the most appropriate arrangement for the outsourcing of the DMPERS management and hosting to a private operator (or through PPP arrangements, involving a suitable governmental agency, such as a the National Meteorological Agency), which will guarantee the sustainability of the system by taking over its management– including update, maintenance and the transfer of data and information to the final users – upon the payment of a nominal fee.

147. The DMPERS will also support the MoLFR in terms of monitoring and predicting seasonal trends and changes of resource availability, drought-related risks (e.g. risk of livestock diseases) and marketing information to enable the development of preparedness and response policies, strategies and plans at the central and state levels, involving all the concerned branches of the administration and other stakeholders (livestock and farmers associations, representatives of local communities, NGOs).

148. **OP 3.1.2:** *A National Sectoral Adaptation Strategy for the Livestock Sector (NSAS/LS) is produced*.

149. The recently released National Adaptation Plan (NAP) implemented by the GoS through a cooperation agreement between UNEP and HCENR recommends the development of sectoral adaptation strategies for all the key vulnerable sectors of the Sudanese economy. Responding to a specific request by the Rangeland and Pasture Administration, LDCF will support the production of a national adaptation strategy for the livestock sector (NSAS/LS). MoLFR will hire international and national TA to facilitate a consultation process and organise a series of national workshops that will eventually lead to the formulation of the Strategy.

150. The NSAS/LS will include a portfolio of priority Programme concepts for its translation into practice, and will be published and disseminated in Arabic and English. Once the document is ready, LDCF will support the MoLFR in the organisation of a series of workshops in the five target States, to identify ways and opportunities for the adoption and follow up of the findings and recommendations at the State level. The NRAC will play a pivotal role in supporting MoLFR in the production of the NSAS/LS, ensuring coordination with the relevant government agencies and partners, both at central and state levels. For that, technical assistance for the preparation of the strategy will be procured.

151. **OP 3.1.3:** *Effective conflict resolution measures reduce land disputes between nomadic and settled communities in the target States.*

152. Questions over the control and distribution of resources is generating disputes regarding user and access rights to water, land and grazing. The shrinking of the natural resource base as a consequence of land degradation and climate change is further exacerbating land disputes, confronting the different categories of users – mainly pastoralists and farmers, and the authorities.

153. Equitable and secure access to land is a critical factor for the rural poor, especially livestock owners, who depend on agriculture and animal-related activities for their livelihood. Having secure access to land for agriculture and pastoral activities reduces their vulnerability and enhances their opportunities to invest in land for agriculture and livestock activities. Indeed, it contributes to the development of more equitable relations among sedentary groups (farmers) and nomadic and semi-nomadic communities (livestock owners and pastoralists). Fostering investments in sustainable livestock development as well as in equitable and secure access to land for rural poverty reduction is recognized by IFAD as a key objective to be supported through its projects and programmes.

154. LDCF will facilitate the organisation of State-level workshops aimed at discussing and settling land disputes, and identifying new arrangements that can lead to satisfactory agreements among for all the concerned parties, including user and access rights. At project start-up, the NRAC and NRAS will meet the State authorities and will jointly identify: (i) a number of priority, land dispute-related issues that the project will help solve through the workshops; (ii) the key stakeholders that need be involved in effort to settle the disputes. If needed, TA will be hired to compile information and produce independent reports that will be used as baseline documents for discussion during the workshops. The program will also appoint professional, neutral facilitators to run the workshops, which will be attended by representatives of the Federal and State administrations, the settled communities, and the nomadic/semi-nomadic pastoralists.

155. The main purpose of this exercise is to promote policy dialogue relevant to the following issues:

- Ensuring equitable land access to nomadic, semi-nomadic and sedentary communities, including women and youth.
- Promoting the participation of pastoralists and ensuring the inclusion of their views in land policy decisions at appropriate local and State levels
- Linking land use with rural poverty reduction as failure to address these issues undermines the impact of other investments in the livestock and rangeland sector.
- Scaling up participatory methodologies for securing user and access rights in order to avoid possible conflicts among land users.

f) Expected Adaptation Benefits

156. The GEF project represents an opportunity to increase the scope of the poverty reduction and food security objectives pursued through the IFAD LMRP baseline programme in light of the predicted negative impacts of climate change on the very fragile natural resources on which the livestock sector depends. The GEF financing will aim at increasing the climate resilience of natural resources – rangelands and woodlands - through sustainable management practices and ecological restoration techniques, an enhancing the adaptive capacity of pastoralist and agro-pastoralist communities and other value chain actors to address climate risks, benefiting a total of 100,000 households in about 1,000 villages in 5 States.

157. The actual numbers of investments and balance of activities will derive from the CAPs. However, an estimate of the adaptation benefits produced by the GEF project interventions through the implementation of the 300 CAPs is the following: by the end of the project would have restored 334,500 ha of rangelands and woodlands, constructed about 15000 km of firebreak lines, implemented sand fixation in about 1,200 km, improved soil and water management in about 12,000 ha of mixed tree-livestock-cropping systems, increased the water harvesting capacity by about 516,000 cubic meters, and to introduce about 1,200 LPG improved cook stoves (ICS) and 12,000 ICS based on improved wood consumption.

158. The project adaptation benefits will also have a national-wide impact at the policy level, through the production of a National Adaptation Strategy for the Livestock Sector, and through the development of a Drought Monitoring, Preparedness and Early Response System (DMPERS) to inform the territorial planning of new investments on water and fodder enhancement needs, especially along the migration routes, monitor seasonal/daily changes in water availability and pasture conditions, help plan migratory movements based on the availability of water and pasture, and facilitate early warning access to critical information about drought-related risks through media information and communication technologies (MICT) such as SMS message services to support decision-making in the sanitary and veterinary sector, and in trading operations between pastoralists and markets.

159. The implementation of 300 Community Adaptation Plans (CAPs) integrating climate adaptation priorities based on vulnerability assessment will enable the target 100,000 HH to participate in the planning of their own development. Users' associations, including women and youth associations, with responsibility for operation and maintenance of water harvesting equipment and infrastructures, for marketing fodder resources, for restoring natural resources, for promoting small scale businesses, and for supporting the spread of renewable energy equipment for cooking will be established.

Table 7. Expected adaptation benefits from LDCF activities

LDCF Activity	Expected Adaptation Benefit
1) Rangelands and woodlands restoration and sustainable management	• Increased fertility and carbon sink effect in improved rangelands, woodlands and mixed tree-crop-range systems (there is greater carbon accrual on optimally grazed lands than on un-grazed or overgrazed lands); • Increased biomass and rangeland productivity by 25% in target areas; • Reduced wood consumption, CO2 emissions, and in-house pollution through improved cook stoves; • Reduced evaporation, run off and sedimentation; • Improved control of invasive species; • Increased biodiversity; • Diversification of multi-purpose native plant species, providing environmental, social and economic benefits; • Improved natural regeneration; • Prevented sand encroachment and break-up of hard soil crusts.
2) Climate-proof water harvesting and management systems	• Increased water availability in drought-prone sites, reduced water losses, and reduced risk of vector-borne diseases affecting livestock and people through the use of climate-proof water harvesting technologies; • The use of innovative portable water bags (filled by a commercial cistern truck) strategically placed enables animals to exploit unreachable good-quality pastures; additional costs for water are compensated by improved nutrition of high quality pastures and saving on fodder; • Generation of jobs and a range of auxiliary business in the livestock value chain (e.g. workers supplying auxiliary markets such as water for livestock through the management of water points and truck transportation to grazing grounds)
3) Climate-resilient mixed tree-crop-fodder production systems, based on soil and water conservation management practices (e.g. conservation	• Increased soil fertilization by improving content of organic matter and fixing nitrogen through the tree roots; • Increase by 50% of crops and fodder yields; • Significantly higher soil moisture in the crop root zone through permanent vegetation and mulch cover that can reduce crop water requirements by 30%; mulch cover also helps limit weed growth; • Soil erosion reduction by 60-90% in the intervention areas;

agriculture; Vallerani system)	• Generation of jobs and a range of auxiliary business in the livestock value chain (e.g. farmers supplying auxiliary markets such as fodder/crop residues; workers in feedlotting), with special focus on women and youth; • Reduced workload of women as a result of improved farming systems, water harvesting and improved cook stoves, with more time available for education, training, and the development of small businesses.
4) Income diversification through a mixed economy based on livestock-cropping-NWFP production and marketing	• At least 30,000 households would start income-generating activities and approx. 5,000 micro- and small-scale enterprises on climate-resilient economic activities identified in the CAPs. • Higher and more diversified income from livestock production combined with sales of NWFP (honey, leaf products, gums, resin) and engagement in complementary activities (watering and fodder marketing; rangeland and woodland restoration); • Diversified livestock-cropping-NWFP production system that may buffer against income risk associated with climate variability.
5) Restoration of stocking routes	• 1,100 km of demarcated stoking routes with restored, positive interactions between herders and farmers on a seasonal basis along the stocking routes (e.g. livestock manure of harvested fields; livestock feeding on crop residues; clear demarcation of livestock routes and seasonal movements); • Compensated livestock mobility restrictions due to socio-political problems and climate-risks with increased water and fodder availability along stocking routes; • Diversified economy of beneficiary households/villages thanks to the revitalisation of trade and businesses focused on the provision of goods and services to the pastoralists using the stocking routes.
6) Adaptive capacity of pastoralist and agro-pastoralist communities and livestock VC actors	• The members of the 300 Village Development Committees (VDCs) and 126 governmental technical staff at the Locality and State levels are capacitated to steer the process with knowledge, organizational, and management skills on CC adaptation, CRR and NRM. • The members of about 1,000 villages are enabled to assess CC impacts, and identify priority adaptation measures, incorporating traditional knowledge and gender-related specificities, to form the basis of 300 CAPs. • Livestock value chain actors are aware of the Drought Monitoring, Preparedness and Early Response System (DMPERS) developed by the project, and receive timely information about water and fodder conditions to better plan migration movements, requirements for additional water and fodder supply during drought, and production and marketing needs.
Gender and youth inclusiveness	• Minimum quotas established to ensure participation of women (at least 50%) and youth (at least 40% men and women younger than 30 years). • GEF & baseline programme staff and service providers trained on gender and CC issues; service providers with proven capacity to work with women, including the use of female facilitators; • The project will organize groups of producers, with emphasis on women/youth groups. Females would be targeted through women and rural development structures as these institutions facilitate independent access to land, farm equipment, credit and training for their members.

	• The project will develop strategic partnerships with national youth and women associations to strengthen their capacity on CC adaptation issues.

g) Linkages with other related initiatives

160. IFAD will coordinate with other UN agencies working on climate change adaptation and NRM in the country, especially FAO, UNEP, UNDP and WFP. Contacts and exchanges of information with these agencies have already taken place during the project design phase. The project will also coordinate with other regional donors including the Islamic Development Bank (IsDB) and African Development Bank (AfDB). Partnerships with bilateral donors have been hampered by the fact that many bilateral donors are now refocusing on South Sudan and winding down operations in Sudan, although the EU will make small sources of funding that are targeting specific regions available to Sudan. DFID has indicated a willingness to consider a partnership following the recommendations of a country appraisal and programming mission and a partnership is currently being developed with the Turkish Cooperation and Coordination Agency (TIKA). Discussions are currently underway with China Africa Agriculture Investment Company (CCAIC) to develop synergies and explore co-financing opportunities in both livestock and the seed thematic areas with a public-private partnership model in mind. Similar discussions have been started with the Arab Authority for Agricultural Investment and Development (AAAID).

161. Finally, the LDCF intervention will complement other relevant GEF-financed initiatives in Sudan, namely the project "Climate Risk Finance for Sustainable and Climate Resilient Rainfed Farming and Pastoral Systems" initiated by UNDP in 2012, the regional project "GGW Sahel and West Africa Programme in support of the Great Green Wall Initiative", the project "Implementing NAPA Priority Interventions to Build Resilience in the Agricultural and Water Sectors" implemented by UNDP, the project "Sudan Sustainable Natural Resources Management Project (SSNRMP)" implemented by the World Bank, the project "Enhancing the Resilience of Communities living in CC Vulnerable Areas of Sudan, using Ecosystem-based Approaches to Adaptation", which is currently under preparation by UNEP and HCENR and the Regional (Sudan, Somalia): Rural Livelihoods' Adaptation to Climate Change in the Horn of Africa -Phase II (RLACC II) project being prepared by AfDB. The project team will invite representatives of the different GEF-funded projects and other relevant initiatives to the start up workshop, to help identify complementarities and avoid duplications.

162. As the rangeland restoration and management work proceeds, the project will liaise closely with the GEF/IFAD "Integrated Carbon Sequestration Project in Sudan", which is being implemented in the Butana region by IFAD in partnership with FNC. IFAD and FNC will assess the developments, capacity created, and lessons learned through the project, and will evaluate the opportunity to introduce a carbon finance component that could enable the GEF/LDCF beneficiaries to access the voluntary carbon market and receive additional income for carbon sequestration activities, thus bringing additional value to the investments of the project.

h) Risks and Assumptions

163. In Sudan, the negative effects of excessive pressure on finite natural resources is being exacerbated by the negative impact of climate change both on weather patterns and on productive potential with prevailing low input-low output sectoral technologies. The evidence for climate change is incontrovertible in Sudan, with the desert margin advancing year-by-year, increasingly erratic rainfall patterns and more extreme weather events. Even small changes in the predictability of animal feed and water supplies can take marginal producers out of business. In addition for the livestock sector, the 2011 separation of South Sudan has disrupted important traditional transhumance arrangements and reduced significantly the capacity of pastoralists to cope with seasonal and other variations in

rainfall. Cross-border animal movements have not stopped completely, however, and it is likely that commercial imperatives will determine the eventual readjustment to the new reality. While yield-enhancing inputs and technologies have been fairly applied in Sudan's irrigated agriculture, production in the vast rainfed sector has mainly depended on the natural base of available land and natural water sources from rainfall and seasonal rivers and streams. These being under threat and badly managed pose a very high risk to the livelihoods of the smallholders and the rural poor.

164. The main potential risks threatening the LDCF intervention can be grouped under the following categories:

- A policy environment not amenable to enhancement;
- Significant civil unrest and natural disasters in the project area;
- Risks stemming from social norms and existing behaviours, and low level of buy-in from the final beneficiaries.

Table 8. Risks and proposed mitigation measures

Risk	Rating	Proposed Mitigation Measures
Coordination among Federal and State agencies is often problematic and their capacities are limited.	Medium	The intervention will contribute to addressing these issues through a sustained capacity building and engagement effort, seeking a balanced participation of the Fedearl, State, nd locality levels. Policy dialogue will give priority to emphasising the criticality of increased commitment to transhumant livestock raising and NRM to decrease climate change vulnerability, increase productivity, generate government revenues, and contribute to food security.
The volatile policy environment can make implementation difficult if projects are not flexible and responsive.	Medium	The project will be monitored closely during mid-term reviews and supervision missions and adjustments made accordingly.
Conflict and natural disasters: the project areas are vulnerable to conflict and natural disasters such as floods and droughts, which have the potential to delay and disrupt implementation and erode progress made towards the LDCF objectives	High	This risk will be mitigated by supporting inclusive governance, emphasizing participation, gender neutrality, decentralization, transparency and accountability, and by targeted investments. Natural disasters and climate threats will be addressed by: (i) providing support for development of policy, local knowledge, capacity, and awareness raising on climate issues; (ii) investing on adaptation and resilience measures; and (iii) building disaster preparedness and response into the design and implementation of the CAPs.
The participatory approach that drives the intervention is highly dependent on the quality of the staff deployed in the field teams, the provision of adequate incentives and the participation of women in the process. Cultural traditions may prejudice the project's attempts to give women a greater voice, while landowners may resist engaging in a dialogue with livestock herders.	Medium	The intervention will build on effective and efficient project management units established during the previous IFAD projects. The trust and relationships built with communities would increase the likelihood of success in achieving the project' objectives. The approach of seeking win-win situations with investments that can clearly benefit all concerned users will be an incentive for dialogue and conflict resolution among different segments of the rural communities.

The CAPs fail to capture and prioritise measures for climate change adaptation and vulnerability reduction due to low awareness of the communities. The drive towards agreed outcomes, particularly the improvements to shared NR assets to ramp up productivity, is subverted by old habits of dependency that concentrate attention on immediate material benefits.	Low	The SDAT and TA will ensure that climate adaptation, DRR, and ENRM capacity is built in the communities from the early stage of the process. Use of specialist teams to provide intensive support to a manageable number of target communities in negotiating and implementing CAPs. Implementation through existing structures and experienced partners. Interventions are based on proven approaches and/or upscale
Poor maintenance of investments and governance conflicts result in reduced benefits to herders and farmers.	Medium	Creation of robust management and budgetary arrangements for all communal assets and remediated rangelands.
The project fails to capture the interest of final users at the community level.	Low	Stress key strategies such as awareness raising, working closely with the communities to build their capacity coupled with ensuring that economic incentives are well developed, and emphasis on sustainable additional incomes in prospect.
The project fails to expand women's access to and control over fundamental assets.	Low	The Programme is specifically targeting women groups to enhance their access to capital, physical assets, support services and knowledge. Assets accumulated under the Programme will be owned by women groups to enhance equitable access by all women, including the poorest, and the protection of their access from usurpation.

i) Sustainability and Replicability

165. The sustainability of the flow of benefits from the LDCF intervention, assuming technically appropriate investments, depends on: (i) the buy-in of local communities and the beneficiaries of the CAP, and their capacity to run, manage, and benefit of the structures, business and services created through the project investments; (ii) the development of a more conductive policy environment and dialogue at both Federal and State level, to mainstream climate change adaptation and disaster risk reduction into rural development and NRM; (iii) the delivery of high-quality, timely technical assistance to all beneficiaries throughout the project duration; (iv) the creation of solid synergies between the LDCF intervention and the baseline programme.

166. The sustainability of programme interventions is ensured by the integration of lessons learned during implementation of projects being scaled-up, particularly with regard to: (i) empowering communities to drive planning, implementation and monitoring and evaluation to the extent feasible; (ii) ensuring sustainability of infrastructure investments through effective mobilization, training and regular follow-up of user associations by specialized field staff with a deep understanding of communities in which they work and extensive training in conflict resolution; (iii) linking saving and credit groups to microfinance institutions; and (iv) providing incentives to service providers to improve the quality of services offered to clients through performance-based contracting and supporting private agricultural and livestock extension providers. The climate financing and integration of adaptive planning will ensure that investments are more sustainable and contribute to vulnerability reduction.

167. Long-term sustainability will be sought through a broad and deep CB programme, designed to create a critical mass of knowledgeable and skilled experts on CC adaptation for agriculture development at the national level, and among all actors – from institutional to

grassroots. The training of State-level Development and Adaptation Teams (SDAT) will be a key component of this programme. The CB process will integrate strong participatory elements to fully address issues that affect the long-term sustainability of natural resources and the welfare of local communities (continuous training through TA for the implementation of the CAPs' priority investments on adaptive climate-resilient practices and technologies).

168. The sustainability of the investments in rangeland restoration and improved management will be guaranteed by: (i) the economic return that would accrue from the increased quantity and quality of fodder produced, the introduction of grazing fees, and the subsidiary wealth generated by the healthier agro-ecosystem – including fuelwood and other biomass, NTFPs, etc; (ii) the improvement of the health conditions of the herd due to decreased injury and infection caused to the animals by invasive species.

169. The project will guarantee the sustainability of the investments in water conservation and management by introducing or strengthening the principle of water fees and payment for services. Building on existing, successful experiences (i.e. North Kordofan) the village clusters will manage the water points through the VDCs, charging nominal water fees. Where needed, LMRP will build the capacity of the VDCs for the development of proper management and business plans to run the water-related business. As far as the water points located far from the villages, public/private enterprises will be developed for their management.

170. In order to promote and enhance the sustainability of the work carried out through the CAPs, the target communities will be coached through Component 3 of baseline programme to access financial services in order to establish businesses, including also through PPPS, which ensure the return on investment. Some of these would include: drinking water filtration, energy provision through alternative sources (i.e. piloting of the IFAD experience on portable biogas), establishment of Integrated Service Centres for fodder and water along the pasture routes, among others. Another element of sustainability sought by the programme will be the support the setting up of complete value chains revolving around products and/or services that will be the focus of the CAPs investments (i.e. water, fodder, cook stoves, NTFPs etc.). For instance, if the introduction of improved cook stoves (ICS) is identified as a priority need, the programme would support the setting up of saving and credit women groups for the creation of small business for the manufacturing, sale, and distribution of the ICS.

VI. Institutional Framework And Management Arrangements

a) Project Coordination and Supervision

171. IFAD will be responsible for the coordination and supervision of LDCF, in accordance with GEF standarts and procedures. Supervision and implementation support will be a continuous process, involving ongoing communication and engagement with the GoS, the project team, the managers of the baseline programme, and other relevant stakeholders. The presence of an IFAD Country Office in Khartoum will expedite these processes.

172. At inception, IFAD will will review and update the Logical Framework of the project during a LDCF start-up workshop with the participation of representatives from all stakeholder groups, prepare the Overall Work Plan & Budget and fine-tune the first Annual Work Plan & Budget (AWPB), and prepare a supervision plan for the projct's first 12-18 months. Thereafter, the project team will prepare each year a consolidated AWPB incorporating the five State AWPBs generated by SIUs for review and approval by the PSC, to be submitted in advance of the GoS annual budgeting process to ensure that sufficient counterpart funds are made available,

173. The first implementation support mission will take place soon after effectiveness and first disbursement, and will include an M&E specialist. The frequency and composition of subsequent supervision and implementation support missions would be determined in the light of requirements and in accordance with GoS wishes, but would consist of at least one

annual supervision mission complemented by short and focused missions if appropriate. It is envisaged that project features requiring special attention during supervision are: (i) the rigorous and proper conduct of the community awareness raising and NR planning activities; (ii) respect of flexibility in approach and modalities, particularly with respect to the nature and cost effectiveness of the investments stemming from the CAPs, including the establishment and financing of post-investment asset maintenance and protection arrangements; (iii) the development, implementation and sustainability of the DMPERS, and (iv) concentration on the achievement of medium- and longer-term outcomes rather than the deployment of inputs.

174. Alongside the AWPB cycle, a comprehensive Mid-Term Review will be conducted in PY4 to reassess the LDCF design in the light of implementation experience. The reviewers may propose adjustments to the approach, activities and/or implementation arrangements for the remaining life of LDCF and suggest revisions to project scope, objectives, components, Logical Framework, M&E Plan, and budgetc. Towards the end of LMRP implementation, IFAD will carry out a comprehensive Project Final Review, to summarise achievements set against design intentions and assess overall impact and prospects for sustainability of gains in the economic and social resilience of the target population. The final review process would feature a validation workshop to provide an opportunity for stakeholders themselves to evaluate performance, to promote accountability, to identify and elaborate upon factors that would improve sustainability and to lay out key success factors and shortcomings.

b) Project Implementation Arrangements

175. The LDCF will be implemented as an integrated component of its baseline programme LMRP, under the leadership of the Ministry of Livestock, Fisheries and Rangelands (MoLFR). The MoLFR shall have the overall responsibility for the implementation of the project and shall ensure linkages to other relevant Ministries, States and Agencies. MoLFR will have overall oversight of LDCF as part of the larger LMRP programme through the Programme Management Unit (PMU) in Kosti.

176. To ensure that each state mobilises and develops the necessary capacity for the coordination and implementation of Programme activities, five State Implementation Units (SIU) will be established. The SIUs will be established in the SMAARIs at Singa (Sennar State), Damazin (Blue Nile), and El Obeid (North Kordofan) and in the State Ministry of Livestock Fisheries and Rangelands at Kosti (White Nile), and El Fula (West Kordofan). The States would provide the required offices. The Programme would renovate offices and provide furniture and equipment as necessary on a case-by-case basis. Each SIU will be established by a decree from the State Minister of Agriculture, Animal Resources and Irrigation. The SMAARI and SMLFR will monitor Programme activities at State level and represent the State in the PSC.

177. The Programme Steering Committee (PSC) set up for LMRP will orient the strategy of the project, overseeing planning, reviewing progress and impact, and ensuring linkages with related projects, government services and relevant stakeholders. The PSC shall be chaired by the MoLFR and shall meet at least twice a year. The PSC will meet every quarter and will comprise: the Under Secretary of MoLFR as Chairperson; the Under Secretary of Ministry of Agriculture and Forestry; the Under Secretary of Ministry of Finance and National Economy; the Director-Generals of SMAARI of North Kordofan, Blue Nile, White Nile, and Sennar States; a representative of the Sudan Veterinary Council; and the Secretary General of the Pastoralists Union.

178. In each of the States, LDCF implementation will be supported by a State Steering Committee (SSC) set up in the framework f the LMRP implementation arranngements. The SSC will be responsible for facilitating implementation and ensuring that impediments to the implementation of project activities are eliminated, as well as reviewing progress. Secretariat services to the SSC will be provided by the corresponding SIU.

179. LDCF funding will cover the salary of a full-time **Natural Resources & Adaptation Manager** (NRAM) will be appointed to lead the implementation of the project. The NRAM will be part of the LMRP **Programme Management Unit**, which will be located in the town of Kosti and will be established by a decree by the Minister of MoLFR. The PMU will directly report to the MoLFR and the PSC and act as the technical secretariat of the LDCF and the baseline programme. The NRAM will report to the Programme Director of the PMU and will liaise closely with the other members of the Unit, as appropriate. The Detailed TOR for the NRAM are included in Annex 4. Other key PMU positions involved in LDCF implementation will be: a Financial Controller; a Senior Accountant; two Knowledge Management/M&E Officers (East and West); a Logistics/Procurement Officer; and an Administration Officer. All these position will be covered with IFAD funding, as part of the co-financing agreement. The PMU will be supported by the Central Coordination Unit for IFAD Funded Projects (CCU) with procurement under competitive bidding procedures, and liaison with MoFNE, MoLFR and IFAD.

180. IFAD will also cover the cost for the hiring of five **Natural Resource & Adaptation Specialists** (NRAS). Each NRAS will be based in one of the five **State Implementation Units** (SIU), which will be set up by LRMP in the State Ministries of Agriculture, Animal Resources & Irrigation (SMAARI) at Singa (Sennar State), Damazin (Blue Nile), El Obeid (North Kordofan), Kosti (White Nile), and El Fula (West Kordofan). Each SIU will be established by a decree from the State Minister of Agriculture, Animal Resources and Irrigation. The NRAS will report to the NRAM, and will lead the work of the State Development & Adaptation Teams (SDAT), which will include appointed specialists from the State administration in the fields of rangeland/pastures, forestry, agriculture, water, and gender & social welfare. The SDAT will have the following tasks: (i) guide and oversee the production of the CAPs; (ii) facilitate the participatory selection of priority investments with the VDCs; and (iii) deliver tailor-made community training and capacity building programmes to enable the beneficiaries to design and implement the planned activities, including facilitating access to financial services for the implementation of the CAP priority investments. The Detailed TOR for the NRAS are included in Annex 4.

181. For the preparation of the CAPs, the project will contract TA to: (i) lead the production of the baseline, including vulnerability assessment at the cluster level; (ii) undertake participatory mapping of the natural resource base of rural communities, identify risk, hot spots and investment gaps to inform the preparation of each CAP; (iii) support the SDATs in the delivery of technical training; (iv) provide backstopping and technical support for the assessment and implementation of the CAPs; and (v) ensure that climate change adaptation and vulnerability reduction are solidly embedded in the plans and priority investments. The TA will be made available through service providers (NGOs, CBOs, partner organisations) who will make sure that the CAPs are produced and finalised within the first 12 months of implementation. The procurement of these service providers will be done based on specific terms of reference and include expertise on: (i) climate change modelling; (ii) socio-economic development; (iii) management of land and water resources, including traditional knowledge and innovation; (iv) ecosystem-based NRM and restoration; (v) economic valuation of NR goods and services; and (vi) renewable energy. These service providers will be procured based on presence and experience within the different states, and should undertake the development of the CAPs in a participatory manner, including within the exercise the local representatives of the different administrations in an effort to build their capacities and make them able to later support the communities and build their adaptive planning capacity to repeat these exercises whenever necessary.

182. The beneficiaries in each village cluster will be in charge of implementing the Programme investments on improved management and restoration of rangelands including fencing, creation/restoration of water points, diversification of cropping systems including tree planting and fodder production, eradication of invasive species and development of local businesses based on NTFP, water provision, renewable energy and related activities. The SDATs and TA will provide the necessary assistance and support to ensure effective implementation of the Programme investments at the village cluster level.

183. With respect to the completion of the stock route network, TA will be provided to support the five states in undertaking GIS mapping and demarcation of the stock routes as well as legalisation. At Programme start-up, criteria would be developed, in coordination with the state authorities, to decide on the exact stock routes to be worked on and building on the outcome and experience of other projects. The SIU will facilitate the organisation of consultation workshops at the state level for state decisions makers and leaders of the main land uses and promoting consensus on the management plans of livestock routes.

184. Regarding Component 3, LDCF will contract an international provider of TA to develop the Drought Monitoring, Preparedness & Early Response System (DMPERS) and deliver the necessary training for its management and maintenance. The DMPERS will be hosted within the Ministry of Livestock, Fisheries and Rangelands. At inception phase of the Programme, LDCF will agree with the Ministry on the most appropriate arrangement for the outsourcing of the DMPERS management and hosting to a private operator (through PPPP arrangements), which will guarantee the sustainability of the system by taking over its management– including update, maintenance and the transfer of data and information to the final users – upon the payment of a nominal fee. The Detailed TOR for the TA in charge of the DMPERS are included in Annex 4.

185. The NRAM will play a pivotal role in supporting Ministry in the production of the National Sectoral Adaptation Strategy for the Livestock Sector, ensuring coordination with the relevant government agencies, both at central and state levels while working closely with the Ministry of Environment. TA will be procured for the preparation of the strategy. The NRAM and NRASs will support the State authorities in the design, organisation and implementation of the State-level workshops for facilitating land dispute settlement, including user and access rights. The Programme will also appoint professional, neutral facilitators to run the workshops.

VII. Project Cost And Financing

a) Financing and Co-financing

186. The LDCF project will be fully embedded into the baseline LMRP Programme. Total programme costs are estimate at USD 39,970,000 over a seven-year implementation period. The financial sources are: GEF resources of USD 8.5 million; IFAD resources of USD 31,470,000 in the form of two grants. Secured co-financing is higher that at the PIF phase.

187. The following table provides the project costs funded by GEF by components. The total details of co-financing are provided in the project COST TABLES.

Table 9. Project costs funded by GEF

Project components and sub-components	LDCF
Component 1 – Enhanced capacity for community adaptive planning	
OT 1.1 Community Adaptation Plans (CAPs) incorporating needs and priorities for poor women and men	
Sub-total Component 1	753,200
Component 2 – Vulnerability reduction investments based on adaptive management of NR	
OT 2.1 Community-based natural resource management and restoration to reduce the vulnerability of settled and nomadic pastoralists	
OT 2.2 Diversification of livelihoods achieved through community level income generation activities and businesses	
Sub-total Component 2	6,494,800

Component 3 – Climate change preparedness and policy facilitation	
OT 3.1 Response systems and innovative solutions for climate risk mitigation	
Sub-total Component 3	846,000
C 4 - Project Management	
Sub-total Component 4	406,000
Total	8,500,000

b) Financial Management, Procurement and Governance

Financial management

188. The country's inherent control environment is considered weak, as evidenced in the low ranking by Transparency International for perceptions on corruption. Additional weaknesses are noted in the Country Policy and Institutional Assessment (CPIA) (2005-07) on the public financial management environment, specifically high level of fiscal risk through public sector operations, weak internal controls and weak institutional capacities. Inherent Financial Management Risks are therefore rated as High. To determine Programme-specific control risks, a comprehensive FM risk assessment of the proposed Programme and its financial management arrangements has been completed. The main strengths are strong delivery mechanisms established under the Multi Donor Trust Fund and a cadre of staff that are knowledgeable on development partner financial management policies and requirements. The primary weaknesses of the Programme are derived from its geographic spread, insufficient financial accounting and reporting capabilities, and insufficient internal controls and oversight

189. Overall the FM risk is rated as High improving to Medium after conditions for disbursement and proposed mitigation measures have been met.

190. Regarding **Financial Management Organisation**, the PMU will have overall responsibility for Financial Management of the Programme and be supported by SIU, in each State. The PMU and SIUs will be ring-fenced although housed within existing Ministerial bodies. Periodic interventions of independent internal auditors will allow for strong internal controls.

191. **Accounting and financial reporting arrangements.** The Programme will adopt accounting procedures and policies consistent with international accounting standards (cash basis) and Government requirements. Accounts and financial reporting will be consolidated at the PMU, which will also be responsible for assurance that funds have been used for the purposes intended. SIUs will be responsible for their respective expenditures and report on a monthly basis to the PMU. Consolidated quarterly financial statements will be furnished to the Recipient and IFAD. The financial statements will be in formats acceptable to IFAD and will include *inter alia* a Sources and Uses of Funds Statement, with classification of expenditures by categories and components, and comparisons against approved budgets.

192. **Budgeting.** Budgets, facilitated from the beneficiary level, will include all activities for the year, segregated by quarter and by financier. Consolidation and preparation of the AWPB for approval will be under the purview of the PMU. To facilitate transparency in the budgeting, and facilitate implementation and monitoring of the budgeted activities, approved AWPBs will be accessible to all Programme staff on a virtual site.

193. **Disbursement arrangements and Flow of Funds.** A Designated Account (DA) in Euro will be opened by the PMU at the Central Bank of Sudan, with an authorized allocation of approximately 9 months of Programme expenditure, from IFAD, ASAP and LDCF Grant resources, and an initial allocation of approximately 4 months of Programme expenditure. Replenishments to the DA will use the impress modality. Withdrawal applications will be prepared by the PMU every 3 months or when 30% of the advance has been expensed, whichever occurs earlier. Details of the disbursement arrangements, including the amounts advanced to the DA, will be stated in the Letter to the Recipient.

194. **Counterpart contributions.** Counterpart contributions from GoS shall be applied to meet eligible expenditures on Office Accommodation, staff allowances and taxes. These will flow directly into the PMU held local currency operating account, in advance, every quarter.

195. **Internal controls and internal audit.** Given the complexity and geographical spread of the Programme, an internal audit will be carried out in PY3 and PY5 by an independent auditing firm. Additionally, at mid-term a comprehensive financial and performance audit will be conducted by an independent firm. Staffing levels are commensurate with appropriate segregation of duties. A Financial Management and Procedures Manual is a disbursement conditionality. Prior to commencement of implementation, all relevant staff will receive training on all aspects of financial management and fiduciary controls. A complaints handling system for beneficiaries will be prepared and implemented, to be monitored centrally at PMU.

196. **Audit.** The Supreme Audit Institution (SAI), the National Audit Office of the Government of Sudan, will audit the accounts of the entire Programme on an annual basis, following international auditing standards, to provide independent assurance on use of funds. The Terms of Reference for the audit, consistent with IFAD's policy and guidelines, will be agreed with the Recipient. The audited annual financial statements for the entire Programme at Central and State levels, together with a management letter on audit observations on internal controls, will be submitted to IFAD within 6 months after the end of the fiscal year (June 30th).

Procurement

197. Procurement functions for LMRP would be in line with the current Public Procurement, Contracting and Disposal of Public Assets Act of Sudan (issued in 2010). The Sudan has limited experience of competition-based techniques for contracting the supply of goods, works and public service delivery. The legislation contains significant provisions on probity and anti-corruption, including sanctions and penalties in the event of discovery. As part of the design for LMRP, IFAD undertook an assessment of the institutional capacity of the PCU of the previous ILPMP. Under the Act, investment projects financed by an international agency are not required to follow the national procurement procedures. Based on this assessment and given that the Act is not yet fully operational, IFAD Procurement Procedures will be followed for all types of procurement. Any changes that may occur during implementation will be agreed with IFAD. The Programme would follow the procurement thresholds as set out in the Letter to the Borrower and in the approved Procurement Plan. Whenever possible, procurement of goods and works will be bulked into sizeable bid packages to attract adequate competition thus resulting in cost-effective and efficient procurement.

198. The LMRP PMU will be responsible to manage and oversee Programme-related procurement, though it will require considerable strengthening of its capacity. This departs from the previous arrangements in which mainly National Competitive Bidding (NCB) procurement for IFAD-financed projects was handled by the Central Coordination Unit (CCU) in Khartoum. The majority of the procurement activities under LMRP will be small in nature and value, with substantial community participation; relatively few high-value/specialized procurement packages would attract ICB. Rather, most would be within the thresholds of NCB, national shopping (quotations), community procurement and direct procurement. The thresholds governing the procurement methods within the country, (national competitive bidding and local shopping), can impede Programme execution if set too low. Appropriate thresholds that can maximize the efficiency of the procurement implementation but contain the governance risks would be specified in the PIM. Subject to confirmation, the thresholds for IFAD financed procurement of works, goods and consultancy services would be:

199. The Programme would contribute to building up the in-house procurement capacity of MoLFR, instilling best practices and the required approach and methodology, and monitoring the timeliness and quality of the process. IFAD plans an intensive training programme at start-up to familiarise the Programme staff with IFAD Guidelines. The effectiveness of procurement would need to be assessed during supervision and alternate arrangements put in place if necessary.

Governance

200. In Transparency International's Global Corruption Perception Index (CPI) for 2013, the rating of Sudan is 11. Consequently, good governance measures built in to the Programme design include: (i) undertaking all necessary measures to create and sustain a corruption-free environment for financed activities; (ii) instituting, maintaining and ensuring compliance with internal procedures and controls for activities under the Programme, following international best practice standards for the purpose of preventing corruption, and requiring all relevant ministries, agents and contractors to refrain from engaging in any such activities; (iii) complying with the requirements of IFAD's Policy on Preventing Fraud and Corruption in its Activities and Operations; and (iv) ensuring that the Good Governance Framework is implemented in a timely manner.

201. Government shall also ensure that: (i) it is engaged actively to allow potential Programme beneficiaries and other stakeholders to channel and address any complaints they may have on the implementation of the Programme; and (ii) after conducting necessary investigations, the Government shall report immediately to IFAD any malfeasance or maladministration that has occurred under the Programme.

ANNEXES

ANNEX 1 - MONITORING AND EVALUATION

I. Monitoring and Reporting

202. **Role of M&E in results-based programme management.** The main objectives of M&E are: (i) to provide timely and accurate information on implementation progress and constant feedback into the Management Information System (MIS) for decision-making and addressing potential plan deviations and problem areas; (ii) to evaluate the performance of implementing agencies and service providers; and (iii) to assess achievements at the levels of outcomes and impact. Project monitoring and evaluation will be conducted in accordance with established IFAD and GEF procedures. In line with the GEF/LDCF operational principles, the LDCF M&E activities will be country driven and provide for consultation and participation in a decentralized manner, actively involving target groups and service providers, who will be duly informed about the plans, implementation and the results of evaluation activities.

203. The main objective of the proposed LDCF project will be to lessen the impact of climate change on vulnerable rural groups as well as on the natural resources critical for livestock production and for the rangeland ecosystems that sustain it, thereby increasing food security. The project will undertake a baseline assessment and participatory resource mapping exercise in each cluster of villages, including a rapid vulnerability assessment, to define the baseline status prevalent before the initiation of the project activities in the project areas. Basic data and information relevant to the project will be collected, and project indicators will be measured at this stage.

204. The M&E system will be designed to offer comprehensive and reliable information to improve planning and decision-making for results-based management. The logical framework will constitute the basis for results-based M&E. The M&E system will have a three-tier structure: (i) output monitoring with focus on physical and financial inputs, activities and outputs; (ii) outcome monitoring assessing the use of outputs and measure benefits at beneficiary and community levels; (iii) impact assessment assessing programme impact for the target group in comparison with objectives. All M&E data, analysis, and reporting will be disaggregated by gender. All M&E activities will be based on IFAD's Guide for Programme M&E.

205. The LDCF intervention will be fully blended with the IFAD baseline operations (LMRP programme) so they will share the monitoring and evaluation system. The overall responsibility for M&E activities will rest with the two Knowledge Management/M&E Officers M&E Specialists (East and West, KM/M&EO); based at the Programme Management Unit (PMU), and reporting to the Programme Director. The KM/M&EO will develop their workplan in close liaison and interaction with the NRAM and the five NRAS in the five SIU. The KM/M&EO will establish a data collection, analysis and reporting system to track physical and financial performance and emerging impact.

206. The project's logical framework will be reviewed at a Start-up Workshop. The Project team will fine-tune the progress and performance/impact indicators of the project at the Inception Workshop with support from IFAD and project partners. Specific targets for the first year of implementation, progress indicators, and their means of verification will be developed at this Workshop. These will be used to assess whether implementation is proceeding at the intended pace and in the right direction and will form part of the Annual Work Plan. Targets and indicators for subsequent years would be defined annually as part of the internal evaluation and planning processes undertaken by the project team.

207. Periodic monitoring of implementation progress will be undertaken by IFAD. This will allow parties to take stock and to troubleshoot any problems pertaining to the project in a timely fashion to ensure smooth implementation of project activities. A part of the

participatory M&E will be devoted to ascertain the extent of women's participation in programme activities, constraints faced, benefits gained, aspirations met and impact on women's status in the family, their involvement in community affairs and the climate-proofing of their agriculture. Measurement of impact indicators related to adaptation benefits will occur according to the schedules defined in the Inception Workshop. The measurement of these will be undertaken through subcontracts or retainers with relevant institutions, or through specific studies that are to form part of the projects activities, or periodic sampling.

208. **Reporting**. Harmonized programme progress reports will be produced quarterly, semi-annually, and annually. Reporting progress will be made available for each of the five target States as well as consolidated for the whole project area.

209. Two Mid-Term Reviews will be undertaken in PY3 and PY5 covering: (i) physical and financial progress in comparison with the annual work plans and budgets (AWPB); (ii) performance assessment of service providers; (iii) institutional and national policy changes arising from programme activities; (iv) opportunities for deeper integration of implementation within national systems; and (v) overall progress towards the achievement of programme objectives. At the end of the programme, a Project Completion Report will be prepared by the Government, with IFAD support, to examine the overall programme performance, taking into account a broader and longer-term perspective.

210. The project will use locally adapted RIMS (IFAD Results and Impact Management System) surveys at baseline, mid-term and completion, as the main quantitative survey tool to provide information on three levels of results: (1st) project activities and outputs; (2nd) project outcomes, reflecting changes in beneficiaries behaviour, improved performance and sustainability of groups, institutions and infrastructure; (3rd) project impact on child malnutrition and household living standards. Ad hoc surveys, qualitative case studies and thematic reviews will be outsourced to independent institutions to verify results and draw lessons on themes such as climate resilience and adaptation, market access, community empowerment, infrastructure development and food security improvement. The operation and impact of the Community Action Plans will be specifically studied.

211. **Learning and Knowledge Management.** The LDCF operations will create valuable knowledge in climate resilience and adaptation on natural resources management, rangelands and livestock management, income diversification, community empowerment, infrastructure development and food security improvement, which will be captured by the PMU and utilized to generate lessons and best practices to be shared with public institutions, the IFAD country team, partners and others. In terms of Knowledge Management, operational experiences will create valuable knowledge in the target areas, which will be captured and utilized to generate lessons and best practices to be shared with beneficiaries, public institutions, the IFAD country team, partners and others. The results of programme support for rangeland restoration and water management, as well as sustainably expanding small businesses in rural areas will be widely publicized.

212. The project will promote: (i) knowledge networking through periodic seminars/workshops; (ii) publication of 'how-to' leaflets relevant to all work undertaken on restoration of nature assets, and (iii) audio-visual material that capture lessons learnt and impact. Special emphasis will be placed on knowledge regarding climate change adaptation and disaster-risk development planning. The vulnerability assessments to be undertaken at village cluster level will be the basis for that, ensuring it guides adaptive long-term planning regarding development work in Sudan. Main anchoring points for knowledge management will be identified, including research institutions, civil society, regional KM networks and specialised service providers. The project will also promote: (i) in-country knowledge networking through periodic seminars/workshops; (ii) regional knowledge networking, such as the regional network on Knowledge Access for Rural Inter-connected Areas (KariaNet) for the management and sharing of knowledge, information and experience in agriculture and rural development in the Middle East and North Africa (MENA); and (iii) regional research networks including those supported by IFAD grants.

II. Evaluation

213. Mid-term Evaluation - An independent Mid-Term Evaluation will be undertaken at the end of project year 3 and project year 5 of implementation. The Mid-Term Evaluation will take the form of a qualitative study to determine the progress being made towards the achievement of outcomes and will identify course correction if needed. It will focus on the effectiveness, efficiency and timeliness of project implementation; will highlight issues requiring decisions and actions; and will present initial lessons learned about project design, implementation and management. Findings of this review will be incorporated as recommendations for enhanced implementation during the project's term, including the revision of indicators if needed. The organization, terms of reference and timing of the mid-term evaluation will be decided after consultation between the parties to the project document. The Terms of Reference for this Mid-term evaluation will be prepared by IFAD. The mid-term evaluation will be carried out in a synergetic and coordinated fashion with the Interim evaluation of enterprises and NRM activities that will be carried out for the baseline programme LMRP. Within six months of the completion of selected clusters of group and community interventions, a *Post-Implementation Evaluation* study would be carried out by a contracted independent body under the overall responsibility of the State cadres. Each evaluation would assess the achievement of the set objectives and draw lessons for the design and implementation of future similar small business projects and NRM initiatives. The evaluations would focus on the following key outcome/impact indicators: (i) level of satisfaction of beneficiaries with outcomes, based on a beneficiary assessment rating, such as the level of increased productivity or market access; and (ii) number of women and youth with increased access to assets, incomes or services resulting from enterprise developments. In addition, the evaluations would examine technical and management aspects of the interventions, with regard to appropriateness, sustainability and potential risks, as well as their environmental impact.

214. Final Evaluation - An independent Final Evaluation will take place three months prior to the terminal tripartite review meeting, and will focus on the same issues as the mid-term evaluation. The final evaluation will also look at impact and sustainability of results, including the contribution to capacity development and the achievement of global environmental goals. The Final Evaluation should also provide recommendations for follow-up activities. The Terms of Reference for this evaluation will be prepared by IFAD. The final evaluation will be carried out in a synergetic and coordinated fashion with Final Impact Evaluation that will be carried out for the baseline programme LMRP. The internal PCR would provide the basis for a substantial *Final Impact Evaluation* commissioned from an independent service provider at the end of implementation to assess (i) Programme effects and impact; (ii) sustainability of those effects; (iii) potential for upscaling Programme activities; (iv) lessons learned from implementation and recommendations for follow-up interventions; and (v) LMRP's outcomes and impact contributing to the achievement of national objectives in the rural sector. The research would mirror the scope and methodology of the *Baseline Study* to the extent possible, to detect any changes in precisely the same indicators selected and to attempt to attribute observed changes to Programme interventions and/or to other factors.

Monitoring and evaluation plan and budget

Type of M&E activity	Responsible Parties	Budget US$ (LDCF contribution) Excluding project team Staff time	Time frame
Inception Workshop (IW) and report	GEF Coordinator/ PMU/SIUs	USD 10,000	Within first two months of project start up
Annual Progress Report (APR) and Project Implementation	Project Team IFAD		Annually

Report (PIR)			
Tripartite Review (TPR) and TPR report	Steering Committee Project team IFAD		Every year, upon receipt of APR
Steering Committee Meetings	Project Coordinator IFAD		Following Project IW and subsequently at least once a year
Mid-term Evaluation	Project team IFAD External Consultants (i.e. evaluation team)	USD 25,000	At the mid-point of project implementation.
Final External Evaluation	Project team, IFAD External Consultants (i.e. evaluation team)	USD 25,000	At the end of project implementation
Terminal Report	Project team IFAD External Consultant		At least one month before the end of the project

ANNEX 2 – RESULTS FRAMEWORK (LOGFRAME)

Logical Framework

Narrative Summary	Key Performance Indicators	Means of Verification	Assumptions (A) / Risks (R)
Programme Goal			
Increased food security, incomes and climate resilience for poor households in pastoralist communities.	• 60,000 households (HH) sustainably moved out of poverty. • 60,000 HH have increased climate resilience. • 100,000 HH have improved asset ownership index compared to baseline (RIMS).	• RIMS baseline and impact surveys. • WFP periodic surveys. • Government statistics.	
Programme Development Objective			
Improved livelihoods and natural assets in livestock-based communities.	• Average incomes of rural poor HH engaged in livestock value chains increase by 50% at Programme completion. • 20% of HH participating actively in commercial farming by PY5. • Poor HH reporting a sustainable increase in income (#).	• RIMS, baseline survey, mid-term and completion assessments. • MoLFR surveys and reports.	• GoS retreat from its pro-poor policies focused on reducing income disparities. (R) • Significant civil unrest in the Programme area. (R)
Component 1: Enhanced capacity for community adaptive planning/ Contributes to CCA-3 Total GEF Budget: USD 753,200			
Outcome 1.1: Community adaptive plans (CAPs) incorporating needs and priorities of poor women and men.	• Baseline assessments including CC vulnerability of socio-ecosystems completed in 16 target Localities • Members of 300 Village Development Committees (VDCs) and 126 governmental technical staff at the Locality and State levels capacitated with knowledge, organizational, and management skills on CC adaptation, CRR and NRM (#). • 300 CAPS setting priorities for vulnerability reduction investments developed.	• Federal and State level statistics and inventories. • Baseline reports and rangeland productivity records. • Evaluation reports • Field questionnaires.	• Key concerned stakeholders have the capacity to plan, design and implement required adaptation measures. (A) • Poor maintenance of investments and governance conflicts result in reduced benefits to herders and farmers. (R)

Narrative Summary	Key Performance Indicators	Means of Verification	Assumptions (A) / Risks (R)
Component 2: Vulnerability reduction investments based on adaptive management of NRM / Contributes to CCA-1 Total GEF Budget: USD 6,494,800			
Outcome 2.1: Community-based natural resource management and restoration to reduce the vulnerability of settled and nomadic pastoralists.	• 100,000 households access pasture and water resources. • 25% increase in rangeland productivity in target areas. • 334,000 ha of rangelands rehabilitated in five target States. • Water harvesting equipment for storing up to 500,000 m3 established. • 12,000 ha of improved agriculture land (tree-crop-livestock system) established. • 1,100 km of stock routes demarcated and restored.	• Federal and State level statistics and inventories. • Baseline reports and rangeland productivity records. • Field questionnaires.	• Key concerned stakeholders have the capacity to plan, design and implement required adaptation measures. (A) • Poor maintenance of investments and governance conflicts result in reduced benefits to herders and farmers. (R)
Outcome 2.2: Diversification of livelihoods achieved through community level income generation activities and businesses.	• New income generation activities resulting from CAPs demonstrated and adopted by 30,000 HH. • Incremental income of HH from 5,000 microenterprises.	• HH income surveys. • Beneficiary testimony. • Programme reports.	• Lack of support from men and/or local leaders for women groups. (R) • Limited rural business opportunities because of lack of local purchasing power. (R)
Component 3: Climate change preparedness and policy facilitation / Contributes to CCA-2 Total GEF Budget: USD 846,000			
Outcome 3.1: Response systems and innovative solutions for climate risk mitigation.	• Drought Monitoring, Preparedness, and Early Response System (DMPERS) is effective and sustainable. • National Sectoral Adaptation Strategy for the Livestock Sector produced. • Disputes between nomadic and settled communities regarding access to NRs reduced by 50% in the 5 target areas.	• National and State level statistics and inventories. • Policy documents and strategies. • MoU between federal and State authorities for management of RMEWS.	• All key public and private stakeholders are willing to engage in development and implementation of measures for vulnerability reduction. (A) • DMPERS embedded and budgeted properly in Government services. (A)

ANNEX 3 – PROJECT COST TABLES

The full COSTAB is provided in a separate handout

ANNEX 4 – TERMS OF REFERENCE

1. Natural Resources & Adaptation Manager (NRAM)

LDCF will hire a full-time national professional to serve as the Natural Resources & Adaptation Manager (NRAM). Within the team in charge of the implementation of the LMRP based in Kosti, the NRAM will lead the design, development, implementation and monitoring of all the NRM and climate adaptation work embedded in the Programme, in close coordination with Components 1 and 3 of the baseline programme LMRP. The NRAM will report to the Programme Director of the LMRP and will work in close collaboration with the other members of the management team, namely: Financial Controller, Logistics/Procurement Officer, KM/M&E Officers, Senior Livestock Business Development Manager and Group & Enterprise Development Manager (GEDM). The NRAM will also interact frequently with her/his counterparts at MoLFR and State structures.

The NRAM will support the Programme Director (PD) in the following work: (i) facilitate preparation and consolidate AWPB and get approval from PMU, MoLFR, and IFAD; (ii) help run the financial management and procurement of LMRP in a smooth and effective fashion; (iv) provide timely quarterly progress reports of all Programme activities to the PSC; (v) organize the baseline and reference surveys and other studies; (vi) ensure technical quality of Programme activities, (vii) coordinate and supervise the work of the providers of international TA; (viii) ensure requirements with respect to targeting of the IFAD target group are met; (ix) ensure reporting and M&E of Programme performance and RIMS; (x) provide support to State Implementation Units (SIU); and (xi) safeguard Programme funds and assets.

The NRAM will have the following tasks:

1. Support the Programme Director in the selection and hiring process for the NR & Adaptation staff, all the national and international TA required for the implementation of the NR/climate adaptation related work, drawing specific terms of reference, preparing detailed work plans, and agreeing on the exact nature and timing of the deliverables with each provider of TA. The NRAM will act as the focal point for all the TA and will closely monitor their work, making sure it is fully embedded in the overall work plans of LMRP.

<u>Under the Subcomponent of Community-led Natural Resource Management:</u>

2. Coordinate the work of the NRASs, and ensure that the State and locality level teams have all the logistic, technical, and capacity building support required for the successful development, design, and subsequent implementation of the CAPs;
3. Support the NRASs in engaging in a close dialogue with the State and Locality authorities involved in LMRP and help them in the process of selection of the members of SDATs, ensuring that each team includes the skills and capacity needed for successful CAP design and implementation.
4. In collaboration with colleagues from PMU and SIUs, identify and hire the service providers contracted for the Technical Assistance (TA) in each target State to: (i) lead the production of the baseline, including vulnerability assessment at the cluster level; (ii) undertake participatory mapping of the natural resource base of rural communities, identify risk, hot spots and investment gaps to inform the preparation of each CAP; (iii) support the SDATs in the delivery of technical training; (iii) provide backstopping and technical support for the assessment and implementation of the CAPs; and (iv) ensure that climate change adaptation and vulnerability reduction are solidly embedded in the plans and priority investments.
5. Lead the process of harmonisation of the CAPs and support the NRASs in the selection of the priority investments for each CAP, liaising closely with colleagues in charge of Components 1 and 3 of LMRP;
6. Develop partnerships and establish links with organisations, institutions, and research centres in Sudan to gather information and data on achievements, best practices, lessons learned, and develop synergies with other projects/actions in the field of NRM/climate adaptation. Make sure that these data and information flow through the

LMRP governance structure and inform the CAP development and implementation process;

7. Supervise the work of the national/international TA and make sure that it delivers effective, relevant, and timely training and capacity building;
8. Pay visits to the fields, visiting a reasonable number of village clusters and target stock routes, and actively participate in at least one CAP development processes in each of the five target states;
9. As part as the personal capacity building process, during the first 2 years of LMRP visit at least one successful experience of NRM/climate adaptation project within Sudan or the wider region, (especially Sahel and Horn of Africa). Seek the support of IFAD's NEN and ECD to identify suitable best practices for the visit.
10. Monitor the results of the IFAD/FNC/GEF Integrated Carbon Sequestration Project in Sudan, which is being implemented in the Butana, to extract lessons learned and consider possible future extension of carbon finance initiative to the LMRP area.
11. In collaboration with the NRASs and the rest of the team, lead the development of the Knowledge Management component of the work, choosing the most appropriate tools for knowledge sharing and supervising their production and dissemination.

Under the Subcomponent of Climate Change Preparedness and Policy Facilitation:

- Support the MoLFR in drafting the final TOR, and organise the advertising and hiring process to identify the most suitable international TA for the implementation of the Drought Monitoring, Preparedness & Early Response System (DMPERS). Take active part in the initial stages of DMPERS design and development, ensuring that all the proper partnerships and collaboration with Sudanese institutions are in place, and that a clear and feasible work plan is agreed for the delivery of the DMPERS, among all concerned parties. Support the TA in the mapping of relevant/similar efforts happening in Sudan in the field of Early Warning Systems (EWS), engage with the implementation agencies to explore opportunities for synergies and collaboration. Monitor closely the implementation process and support the providers of TA during their visits to Sudan. Liaise with the other components of the Programme, so as to make sure that all stakeholders, beneficiaries and Programme partners get the maximum benefit from the outcomes and deliverables linked to this activity.
- Work in close liaison with the MoLFR, and support the design and development of the National Adaptation Strategy for the Livestock Sector (NSAS/LS). Support the MoLFR in the hiring of the international and national TA to facilitate a consultation process and organise a series of national workshops that will eventually lead to the formulation of the Strategy. Help in the organisation of, and attend the workshops that will lead to the formulation of the NSAS/LS and help with the preparation of the drafts and final version, as well as with aspect related to translation, publication, and dissemination. Ensure coordination with the relevant government agencies and partners, both at central and state levels.
- Regarding the support to conflict resolution on land disputes at the State level – the NRAM will provide assistance and support to the NRASs in the organisation the State-level workshops aimed at discussing and settling land disputes, and identifying new arrangements that can lead to satisfactory agreements among for all the concerned parties. At Programme start-up, the NRAM together with the NRAS in each State will meet the State authorities and will jointly identify: (i) a number of priority, land dispute-related issues that LMRP will help solve through the workshops; (ii) the key stakeholders that need be involved in effort to settle the disputes. The NRAM will oversee the work of the NRASs and will seek and identify synergies with Component 1 of the Programme, that can help support land-related conflict resolution. If required, the NRAM will help the NRASs in hiring TA to compile information and produce independent reports that will be used as baseline documents for discussion during the workshops, and in the appointment of professional, neutral facilitators to run the workshops.

Qualification Requirements for the NRAM Position

The specialist required for the position of Natural Resources & Adaptation Manager will have following skills and profile:

- Academic background on natural resource management, rural development, agriculture, or biology.
- At least five years of experience in the field of Environment and Natural Resource Management, possibly in the field of rangeland and pasture ecosystem management.
- At least five years of experience in the implementation of rural development and/or climate adaptation and vulnerability reduction projects in Sudan or other countries of the wider region (Sahel/Horn of Africa).
- Good knowledge of the national policy and institutional framework related to rural development, natural resource management, poverty alleviation, and climate change adaptation in Sudan, possibly in relation with the livestock/pastures sector.
- Familiarity with all the governmental and non-governmental actors and stakeholders involved in rural development, livestock and pasture management, natural resource management, and climate change adaptation work in Sudan.
- Proven experience in the leadership and coordination of multidisciplinary teams, and in the planning, implementation and monitoring of complex projects.
- Good knowledge of the past and ongoing projects and initiatives on rural development, NRM, or in Sudan and more widely in the Sahel/Horn of Africa region.
- Excellent and proven presentation, facilitation and negotiation skills.
- Good knowledge of communication tools and technologies (internet, web sites).
- Fluency in oral and written English is a must. Ability to think broadly and intersect orally.

1. State-level Natural Resources & Adaptation Specialist (NRAS)

LDCF will hire five full-time national professionals to serve as the Natural Resources & Adaptation Specialists (NRAS) in the five target states of the Programme: White Nile, Blue Nile, Sennar, North Kordofan and West Kordofan. The NRAS will be based at the State Implementation Unit (SIU) established within SMAARI (Sennar, Blue Nile, North Kordofan) or SMLFR (White Nile, West Kordofan). Within the SIU team, the NRAS will lead the design, development, implementation and monitoring of all the NRM and climate adaptation work at the State level, in close coordination with Components 1 and 3 of the baseline programme LMRP. The NRAS will report to the NRAM for all technical issues related to the implementation of Component 2, while she/he will report to the State Coordinator (SC) for administrative and other day-to-day matters. Within the SIU, the NRAS will also liaise closely with the State-level accountant.

As a member of the SIU, the NRAS will support the State Coordinator in the following work: (i) facilitate preparation and consolidate AWPB, and get approval from PMU, PSU, MoLFR, and IFAD; (ii) help run the financial management and procurement of LMRP in a smooth and effective fashion; (iv) provide timely quarterly progress reports of all Programme activities; (v) organize the baseline and reference surveys and other studies; (vi) ensure technical quality of Programme activities, (vii) coordinate and supervise the work of the providers of international TA; (viii) ensure requirements with respect to targeting of the IFAD target group are met; (ix) ensure reporting and Monitoring and Evaluation of Programme performance and RIMS, (x) safeguard Programme funds and assets.

The NRAS will act as the focal point for all the work and TA at the State level, monitoring the work of all contractors, consultants and partners, and making sure that it is fully embedded in the overall work plans of LMRP. More specifically, the NRAS will have the following tasks.

<u>Under the Subcomponent of Community-led Natural Resource Management:</u>

- With the support of the NRAM, liaise with all the concerned counterparts of the State and Locality-level administration for the set up of the SDATs, to make sure that the teams are operational by the agreed deadline and that they have all the logistic, technical, and capacity building support required for the successful development, design, and subsequent implementation of the CAPs;
- Lead and facilitate the process of design and development of the CAPs in her/his State of competence, and lead the selection of the priority investments for each CAP, liaising closely with colleagues in charge of Components 1 and 3 of LMRP and identify all possible synergies with these other components;
- Make sure that the NRAM provides the required links with organisations, institutions, and research centres in Sudan to gather information and data on achievements, best practices, lessons learned, and develop synergies with other projects/actions in the field of NRM/climate adaptation. Make sure that these data and information flow through the LDCF governance structure and inform the CAP development and implementation process;
- Supervise and support the work of the service providers contracted for the TA in her/his State of competence to: (i) lead the production of the baseline, including vulnerability assessment at the cluster level; (ii) undertake participatory mapping of the natural resource base of rural communities, identify risk, hot spots and investment gaps to inform the preparation of each CAP; (iii) support the SDATs in the delivery of technical training; (iv) provide backstopping and technical support for the assessment and implementation of the CAPs; and (v) ensure that climate change adaptation and vulnerability reduction are solidly embedded in the plans and priority investments.
- Assist and supervise, with the help of the NRAM, the work of the national and international TA and make sure that it delivers effective, relevant, and timely training and capacity building;
- Pay frequent visits to the field, visiting all sixty village clusters and target stock routes found within her/his State of competence, and participate actively in at least six CAP development processes;

- As part as the personal capacity building process, during the first two years of LMRP visit at least one successful experience of NRM/climate adaptation project within Sudan or the wider region, (especially Sahel and Horn of Africa), together with the other NRASs and with the NRAM. The NRAM will be in charge of identifying suitable best practices for the visit and organising it.
- Support the NRAM in the development of the Knowledge Management component of the work, and ensure timely and appropriate dissemination in her/his State of competence.

Under the Subcomponent of Climate Change Preparedness and Policy Facilitation:

- Provide the required support to NRAM and the contracted TA or the implementation of the Drought Monitoring, Preparedness & Early Response System (DMPERS). Facilitate contact with State-level institutions and actors for the research and obtaining of the data and information needed for the DMPERS in her/his State of competence, and help the DMPERS team identify issues and opportunities related to DMPERS development and implementation. Keep abreast of the DMPERS process and feed the federal level work with information on how the system can be best applied/implemented in the State of competence.
- Provide support to the NRAM, as required, to establish contacts with State-level actors during the process of development of the National Adaptation Strategy for the Livestock Sector (NSAS/LS), and help with the review of drafts, as appropriate, to ensure that State-level issues and priorities are adequately reflected in the document.
- Regarding the support to conflict resolution on land disputes at the State level – the NRAS, with the assistance of the NRAM, will lead the organisation of State-level workshops aimed at discussing and settling land disputes, and identifying new arrangements that can lead to satisfactory agreements among for all the concerned parties. At Programme start-up, the NRAS will meet the State authorities and will identify jointly: (i) a number of priority, land dispute-related issues that LMRP will help solve through the workshops; and (ii) the key stakeholders that need be involved in effort to settle the disputes. The NRAS will seek and identify synergies with Component 1 of the Programme at the State level, that can help support land-related conflict resolution. If needed, the NRAS will lead the hiring of TA to compile information and produce independent reports that will be used as baseline documents for discussion during the workshops, and in the appointment of professional, neutral facilitators to run the workshops.

Qualification Requirements for the NRAS Position

The specialists required for the position of Natural Resources & Adaptation Specialist will have following skills and profile:

- Academic background on Natural Resource management, rural development, agriculture or biology.
- At least three years of experience in the field of Environment & Natural Resource Management, possibly in the field of rangeland and pasture ecosystem management, possibly in her/his State of assignment.
- At least three years of experience in the implementation of rural development and/or climate adaptation and vulnerability reduction projects in Sudan, possibly in her/his State of assignment.
- Good knowledge of the national policy and institutional framework related to rural development, NRM, poverty alleviation and climate change adaptation in Sudan, possibly in her/his State of assignment.
- Familiarity with all the governmental and non-governmental actors and stakeholders involved in rural development, livestock and pasture management, natural resource management, and climate change adaptation work at the State and Federal levels.
- Proven experience in the leadership and coordination of multidisciplinary teams, and in the planning, implementation and monitoring of complex projects.

- Excellent and proven presentation, facilitation and negotiation skills.
- Good knowledge of communication tools and technologies, (internet, web sites).
- Fluency in oral and written English is an advantage. Ability to think broadly and intersect orally.

3. International Technical Assistance for the set up of a Drought Monitoring, Preparedness & Early Response System (DMPERS)

LDCF will recruit International Technical Assistance for the set up of a system for weather and hazard prediction, specifically geared to the livestock and pasture sector in Sudan. The DMPERS will provide policymakers, technicians, village development committees, pastoralists and other rural stakeholders with the most up-to-date and accurate information available on meteorological-related risks, so that disasters can be minimized or avoided.

The proposed DMPERS will comprise three components: (i) an Automated Weather Forecasting System (AWFS); (ii) integrated models of derived variables (DVM); and (iii) a GIS (Geographical Information System) platform to adapt the information to the user's needs and to facilitate its management. This will be coupled with a capacity building programme to prepare institutions and beneficiaries in the implementation and use of the DMPERS.

The TA will perform the following tasks:

Development of an Automated Weather Forecasting System (AWFS)

- The AWFS should consist of a software package installed on a personal computer, with Internet access, to be hosted initially within the Ministry of Livestock, Fisheries and Rangelands (MoLFR). The forecasting approach should be based on a two-step analogous/regression statistical downscaling methodology.
- The system should produce daily categorical and probabilistic forecasts, for at least the following ten days, for rainfall and temperature for each point with at least 4,000 daily historical observations of the corresponding variable. As an additional development for those stations that are characterised by short observation series, techniques for the temporal extension of those series could be introduced, so that the AWFS would also produce forecasts for these stations, with a better spatial coverage of the territory.
- The input data should be global Numerical Prediction Models: American - Global Forecast System (GFS) and/or European - European Centre for Medium-Range Weather Forecasts (ECMWF).
- The system should be fully automated through all the stages (receiving input information, generating forecasts, elaborating and distributing products) without requiring any human intervention, except for certain routine maintenance and eventual incidents resolution.
- The system should integrate automatically the produced forecasts into the GIS platform, so that these forecasts can be managed and used as input of the derived variables models in the platform.
- As a previous step to this technical development, a feasibility analysis should be carried out, whose result would reveal the predictability for each station, each variable and each forecasting horizon (D+1, D+2 ... D+10)

Production of Derived Variables Models and Specific Indexes for Livestock and Pastures

- This output should consist of a computer programme package that calculates some derived variables and specific indexes for pasture and livestock, showing the effects of weather, and more specifically, drought, on them.
- It should produce daily predictions at a number of derived variables and indicators, including changes in water points' water levels, availability of pasture, pasture fire risk and behaviour variables, and indexes regarding animal conditions (such as influence of heat stress). The variables and indexes should be selected in collaboration with the MoLFR federal, state and locality staff, village development committees, pastoralists and other local experts. This activity should include the collaboration with other institutions and organizations of Sudan involved in the development of early warning systems (Sudan Meteorological Authority (SMA), HCNER, UNDP, WFP, UNEP, University of Reading and others).
- The forecasts produced by the AWFS, as well as other forecasts obtained from other available sources (10-day SMA forecasts) should be used as inputs for the derived variable models. Meteorological observations from different sources should also be used as input, to calculate "observations" of derived variables and indexes. In addition to the

meteorological input data, the models should use other specific input information such as pasture type, soil/topography and hydrological information.

- It should be fully automated through all its phases, and it should automatically provide all the produced information to the GIS platform for its management.

GIS Platform

- This output should consist of a complete open source (no license cost) GIS, specially developed for use as DMPERS for meteorological hazards. It should be housed in a relatively powerful Internet server, with enough bandwidth Internet connection.
- The Platform should be fully automated through all its stages, without requiring human intervention, except for certain routine maintenance, and eventual incidents resolution.
- It should manage and provide access to all the weather (observations and forecasts from all available sources) and derived variables information, as well as to other information (geographical information, land use). Additional developments should include other layers such as satellite information regarding cloudiness, precipitation, vegetation conditions, photosynthesis activity, and so on.
- The platform should include the following utilities and tools: spatial (zoom, pan) and temporal navigation (access to different prediction horizons and to historical information); exporting/importing (to/from other GIS, Google Earth) and printing tools; local reports (with the temporal evolution of selected variables at a point); animations of maps (to show the temporal evolution of selected variables); access to favourite multi-map views (maps of several variables for various forecasting horizons for certain territory, for example, for every State/Locality, all selected by the user). Additional developments should include automated production and delivery of reports and bulletins (for example, to send PDF bulletin to each State/Locality every morning with selected variables and horizons).
- It should incorporate a comprehensive warning module in which the user can define the area, the variables and thresholds to trigger different levels of alert (yellow, orange, red). The user should also be able to customize the warning communication mode (SMS, THABIT, e-mail).
- Additional developments could include simulation tools, which will be nested with the forecasts available, so the simulations should be driven by foreseen weather conditions. If other simulation tools are available, (for example, flash floods with hydrological models, animal diseases propagation), they should also be nested into the forecasts and implemented in the GIS platform.

Required Qualifications:

- At least five years of experience in the design, development and set up of Early Warning Systems for weather and hazard prediction.
- Proven track record in the development and operational implementation of each of the three components of the proposed DMPERS, for its use by public administrations.
- Availability of qualified technical staff, possibly with a working experience the in Sudan, the Horn of Africa, or the Sahel region.
- Proven experience and track record in the design, planning and delivery of training and capacity building schemes for the operationalization of DMPERS in a national context.
- Good knowledge of the institutional and policy context related to livestock and pasture management, disaster risk reduction, weather forecasting and climate change adaptation in Sudan is a strong asset.
- Knowledge of the Sudan institutions that will be involved in the development of the DMPERS is a strong asset.
- Fluency in written and spoken English is a must.

ANNEX 5 - ECCA

Summary of the Environment and Climate Change Assessment (ECCA), prepared for informing IFAD's Sudan RB-COSOP Design

This report is prepared for informing IFAD's Country Strategic Opportunities Program (RB-COSOP) 2013 – 2017 for Sudan. In preparation of this report a consultation brainstorming workshop was held on 16-17 June 2013 in Khartoum, Sudan bringing together key national research institutes, stakeholders from different government sectors and organizations, NGO's, famers and pastoralists union leader and development partners working on climate change (CC) and environment related issues. This workshop provided insight into the current status of CC research and interventions related to the agriculture and rural development (ARD) sector and also, highlighted gaps in understanding specific CC issues. The outcomes of the climate change impact and vulnerability assessment study using 2 extreme emission scenarios to project the future vulnerable areas till 2050 were used to highlight the extent of climate change impacts in different regions/states in Sudan.

Sudan socio-economic indicators (2012) indicate that about 70% of the population live on around US$1.25/day, adult illiteracy levels (people older than 15 years who cannot read or write) about 30%, about 80% of the population work in agriculture and pastorals. The economic activities in Sudan are based on: 32% of economic activities rely of agriculture, 39% on services, 29% on industry. Population is expected to increase from 32 to 45 million by 2030 and 67 million by 2050 with and increasing rate of 2% according to WB 2012 medium projection. Urban population expected to be 45% of the total population, 52% of the rural population has access to improved drinking water, 18% have access to improved sanitation, 85% of the whole population have access to improved drinking water, and 63% have access to improved sanitation. About 46.5% of the population is part of the poverty headcount ratio at national poverty line (WB 2009).

GDP of the Sudan in 2013 was US$64.05 billion (WB 2011), and Gross National Income per capita was US$1310 per annum and annual growth rate of 4.7% and inflation rate of 12.9% (WB 2010, 2011). 70% of economically active people are engaged in agricultural or pastoral activities, although only 7% of the country's land is cultivated. Irrigation is a mainstay of agricultural production, and the Gezira irrigation scheme using water diverted from the Blue Nile has provided a great boost to national agricultural development for many decades since the initial construction of Sennar Dam in 1925. The scheme has progressively been extended, and subsequent construction of Roseires Dam in 1966 provided greater regulation and diversion capacity for expansion of irrigation enterprise. Sudan produces about 80% of the global supply of gum Arabic.

Sudan's farming systems are composed of three major categories, namely irrigated, mechanized and traditional rainfed systems. Livestock as a system is actually intermingled within the three categories, but is predominantly spread within the traditional rainfed agriculture in the form of pastoral grazing with an overriding transhumance mode of livestock keeping.

Livestock production contributes about 20% to the total GDP. It prevails all over the country under three main agriculture sub-systems. The most prevalent is transhumant animal keeping within an agro-pastoral system characterized by presence of arable farming and livestock migration in part of the season in search for food and water.

Deforestation has been significant. The FAO data shows that total forests have been reduced to 11.6%, between 1990 and 2005. (UNEP, 2007) estimated the increase in deforestation at an annual rate of over 0.84% at the national level, while at the regional level, two-thirds of the forests in north, central, and eastern Sudan disappeared during 1972–2001. In Darfur, one-third of the forest cover was lost during 1973–2006. UNEP indicates that forest cover could decline by > 10% per decade, with total loss expected within the next 10 years in high-pressure areas.

Impacts of climate variability and change in ARD sector

A comprehensive impact assessment study has been conducted. A detailed climate impact assessment is shown in annex (2). The outputs and impacts of climate variability and change in ARD sector are:

Temperature Changes

It was found that the overall trend is an increase in temperature and there is a noticeable increase in the temperature up to 1.6 in Atbara, 2.1 in Khartoum, 0.6 in Obied, 1.5 in El Fasher and El Gadaref, 2 in Kassala, 0.8 in Damazene, 1.3 in Malakal.

For future projections till 2050, it was found that, the minimum change will be during February by an increase of 1^{o}C, while the maximum change will occur in November by an increase in of 3^{o}C. The mean annual change in temperature will increase by 2.7^{o}C.

Rainfall Changes

The monthly historical variation for the rainfall showed that the changes in rainfall are in the North (-5%) and South West (-7%) and South East (+10%). The overall rainfall decline between 1970 till now ranged between 10 to 20% across the western and the south western states.

For future projections till 2050, it was found that the future range of precipitation changes will vary from reduction by 9% to an increase by 9%. Annually Kassala and Gadaref states will have the highest annual reductions that will be around 3%. While other states will receive annual increase that ranges between 3% and 15%. The Red Sea, Nahr El Nile, Northern, North Darfur will be the highest seasonally vulnerable states, where the precipitation decrease will be around 9%.

Witnessing extreme events will increase, either droughts where loss of crops and livestock (food shortage), displacement, and wildfire, or floods where loss of life, crops, livestock; insects & plant diseases, epidemic/vector diseases, decline in hydro power; damage to infrastructure & settlement areas.

Runoff Changes

The assessment of the impact of climate change on the Nile flows showed that the optimistic scenario gave positive change on the precipitation with 11% over the Blue Nile and 8.0% over the White Nile. The pessimistic scenario gave negative precipitation change of –2.5% over the Blue Nile and –1% over the White Nile. The long term effect of the simulated flow showed that the optimistic scenario will have increase in Nile River average flows by 32% while the pessimistic scenario showed that there will be decrease in the Nile River average flows by 14%.

Groundwater Resources

The Nubian aquifer forms the most extensive groundwater system in The Sudan. The alluvial basins are located next to the river Nile, and along most seasonal streams. Recharge from rainfall is limited, but some 1 billion cubic meters is received annually from the Nile river system – mainly from annual overbank flood flow – and from seasonal storm runoff. The quality is good to excellent, with salinity values rarely exceeding 600 mg per liter. Many residents in the arid and semi-arid zones rely heavily on groundwater for domestic water supplies. It is expected that flow regulation upstream on the Nile, due to planned large dams and hydropower development, will negatively affect these alluvial aquifers, since the size and frequency of floods will eventually be reduced to a large degree.

There is lack of information about groundwater potential in Sudan, though it might be one of the main adaptation measures during drought time to reduce vulnerability of rural populations that live in these areas. So, it is recommended to conduct a comprehensive assessment of groundwater availability in Sudan as a coping mechanism for climate Change impacts.

Agriculture Sector (including forecasts on yield changes of primary crops)

The expected temperature increase and decrease of precipitation will result in decreasing productivity of the land specially smallholder rainfed subsistence farming that dominates in the upper states, and is characterized by low yields.

The (semi) arid parts of Sudan in the North rely almost exclusively on irrigated agriculture, but it is characterized by low productivity on the large smallholder schemes in Sudan. The expected

increase in temperature by 2.5^{o}C in most of the Northern states will put extra load on available Nile water consumption.

Water demand for agriculture may increase two or three-fold compared with that of 2000. Sub-tropical plants will tend to shift further south. Shifts in eco-agricultural zones could cause loss of varieties of indigenous breeds or species, although this may also extend the ranges of some crops. Moisture stress in crops will be exacerbated and areas of crops requiring wet or moist conditions will decrease. Evapotranspiration rates will increase, increasing crop water usage and the damaging effects of drought. Yield changes will vary widely across crops and agro ecological zones. Agricultural yields, especially in rain-fed areas, are expected to fluctuate more widely over time and to converge to a significantly lower longer-term average.

Economic Costs

Reduced agricultural productivity, rising sea levels, more frequent natural disasters, and accelerated desertification might have the net effect of constraining economic growth and increasing poverty across the region.

A WB study (WB, 2007) estimates that for each one degree in temperature increase, the agriculture production will decrease by 10%. So, this study showed that the average temperature increase in Sudan by 2050 will be around 1.5^{o}C to 2.5^{o}C which means that the country as a whole, the average agricultural output will decrease around 15-25% in value terms by 2050. The potential crop yield losses across climatic zones, utilizing alternative scenarios for rainfall, could decline in a range from 5% and 50% by 2050.

Priority Regions for IFAD Intervention

As part of this study, vulnerability assessment is carried out. A detailed vulnerability assessment is shown in annex (3). The future range of average temperature changes till 2050 will vary from 1.5^{o}C to 2.5^{o}C and precipitation change will be within a range of -9% to +9%.

Vulnerability maps for vulnerable states were produced. Overlaying the generated vulnerable areas to climate change with population distribution, soil productivity map, food insecure areas together with areas which have potentialities for increasing agricultural productivity and areas with high vulnerability to natural disasters like sand encroachment, Hadam; generated interesting priority areas in different states for IFAD intervention. These priority intervention areas are: Kassala, Gadaref, Red Sea, North and West Kordofan, and North, West and South Darfur, and Blue Nile states respectively.

Country Response To Climate Change Scenarios

National Climate Change Policies, Action Plans, Programmes and Projects

Sudan has started mainstreaming climate change in its policies, strategies and action plans related to environment and climate change since 1992 where the National Comprehensive Strategy (NCS) (1992-year 2002) is adopted followed by signing the UNFCCC in Rio in the same year. The Higher Council for Environment and Natural Resources (HCNER) represents the focal point. In 2000, Poverty Reduction Strategy and National Biodiversity Strategy and Action Plan (NBSAP) were prepared. In 2001, the environment protection act was released and in 2002 the National Action Plan (NAP) to Combat Desertification was issued. In 2003, a first document of an IWRM & WE plan strategy and natural resources strategy were formulated. The communication report under the UNFCCC was submitted in 2003, and then followed by preparation and submission, to UNFCCC, of the National adaptation program of action (NAPA) in 2004. In 2007, the draft water policy developed, complemented by National Agriculture Strategy (Campaign), National Strategy for Environment protection, Water and Sanitation Policy for North Sudan, Land use strategy and national Plan for Environmental management in 2008.

During the past several years, Sudan undertook and completed several major climate change assessments to better understand the range of adaptation opportunities (first National Communication Report to the UNFCCC). This was assured by inclusion of climate change and vulnerability in sectoral and development policies that are complementary to environmental policies embodied in the 10-year Comprehensive National Strategy (1992-2002) and the 25-year comprehensive National Strategy Outlines. There are many on-going national policy processes that have parallel aims to climate change adaptation such as: poverty reduction strategy, roll back malaria programme, water harvesting, and establishment of environment

councils at state levels. A detailed Policy, Legal and Administrative Framework in SUDAN is shown in annex (4).

ARD Sector Responses

Sudan addressed the ARD sector through different tracks that included agriculture and water planning, environmental protection, and implementing Climate Change adaptation strategy. To develop the agricultural sector, Sudan has taken a recent new and strategic direction to support agriculture. The Agricultural Revival Program (ARP) of 2008 was designed to address past weaknesses. This effort is complemented by the development of National Water Policy in 2003 which brings together aspects of water resources management, utilization, and protection in the context of a single policy and covers sectors including agriculture, industry, health, energy and transportation.

Development Cooperation Partner Responses

A number of partners responded to the climate change phenomenon in Sudan. These include: UNDP, UNEP, GEF, WB, FAO, and WHO and other development partners have been involved in implementing various projects in Sudan that are explicitly related to climate change and environmental management. Some of these projects were listed in annex 4.

Farmer Responses and Adaptation Coping Strategies in the ARD Sector

Diverse activities as had been stated in the Sudan Second National Communication Report (2013) to the UNFCCC were implemented in the climate affected states that included: micro-fencing using dead stems to build fences that reduce the sand encroachment, rangelands reseeding, village nurseries for rehabilitation of rangelands were the most important practices for increasing the resilience of the community, use of solar PV cells for underground water pumping and for lighting, with high involvement of community members (particularly Women. Also, shifting from total dependence on biomass energy to Butane gas units for domestic energy was a good practice reducing tree cutting for cooking, provision of water from ground water in different vulnerable areas to drought, promotion of water harvesting in (Butana area in Gedarif State and Nyala surroundings in South Darfur States, introducing drought resistant and early maturing vanities of crops and vegetables seeds, and livestock activities through vaccination against epidemic, strategic supplementary feeding and improved species.

Analysis of Core Policy Issues Relevant to the ARD Sector

The land tenure system has been a major underlying factor behind use of natural resources. Under the Land Resettlement and Registration Ordinance of 1925, which is still largely in force (De Wit, 2001), all unregistered land belongs to the government while community rights are recognized over its use under customary rules. Individual land registration is limited, while long land lease applies in public irrigation schemes and in large semi-mechanized rainfed private holdings. Communal land use provides incentives to irrationally increase livestock herds and encourages crop expansion with almost no soil conservation measures, leading to soil mining under continual relaxation of the shifting cultivation system that was previously followed.

In conclusion, it was found that:

The assessment for the Policy, Legal and Administrative Framework in SUDAN had clearly indicated that the necessary guidelines for better climate change adaptation and local coping mechanisms were already piloted by the local communities, government institutions, and development partners.

The experiences that were acquired by the affected communities is worthwhile for the efforts that were exerted over the years, but the problem that remained unsolved is that these success pilot stories were implemented at a very limited scale (in Gedarif State for example some of these best practices were implement is an area that covers about 700 families, while the state population is nearly 200,000 families). Thus up scaling is the key to the future success in coping with climate change adversaries.

Recommendations and Operational Considerations

Adaptation to climate change takes time to adopt. The adaptation time could reach up to 50 years or more. This necessitates preparation of a country wide long term climate change

adaptation plan till 2050 that would consider all sectors with special emphasis on ARD sector and poverty reduction as well as diversification of the national economy in order to increase livelihood resilience that will be reflected on the overall country economy resilience.

The current Government strategies and planned responses to climate risk and climate change threats in the agricultural and rural development sector are, for the period 2012-2016, predominantly focused on: (i) for investments – hard, infrastructure investments to protect against flooding; and (ii) for policy and planning – further assessment of climate change impacts on ARD subsectors; integration into sector/subsector/local action plans, policies and planning of climate change concerns; and development of programs and projects for mitigation and adaptation and sector development. The 2012-2016 policy focus is on investments interventions on vulnerable populations, on facilitation of autonomous adaptation by farmers and households and communities, on the hard adaptation measures by individuals to protect their assets or on soft interventions to support the building of local capacity for adaptation and to enhance the resilience of vulnerable communities to climate risk. IFAD has a major role in complementing this strategy with through focusing its strategy on climate smart development and promotion of pro-poor climate risk response. It would pursue this role by, among others, supporting (i) holistic approaches that include a balanced concern for poverty reduction, rural development, "soft" capacity building, and facilitation of local, autonomous adaptation responses and; (ii) better coordination and cooperation between sectors and integrated planning for public investments at the local levels; and (iii) better informed decision-making processes within the policy and planning spheres through a systematic knowledge management approach that provides policy relevant information and "learning from the field".

These could be translated into a set of proposed interventions by IFAD as part of 2013-2016 COSOP strategy. These interventions include set of adaptation measures that will help in increasing resilience and reduce the effect of the impact.

Adaptation Measures the following paragraphs identify set of proposed projects for direct intervention to increase communities and vulnerable areas resilience. These measures could be applied collectively or partially that is subject to discussion between government of Sudan and IFAD, based on available resources within each vulnerable state. The adaptation measures should cover different tracks, these include:

Financial Measures

To target increasing the resilience of the rural poor communities through introducing a number of activities that help in:

- Income generating activities
- Income levels and stability
- Revolving funds /amount of credit granted to individuals Savings
- Accessibility of vulnerable groups to credit (women, and IDPs)
- Introduction of revolving credit
- Drought contingency planning (e.g. C. Risk Insurance)

Capacity Building and Institutional Measures

Training: in community planning, drought and flood risk management, community preparedness to disasters, modern irrigation system, drought tolerant seed production and application, water users association, water reuse, rainwater harvesting, water management, disaster risk management, preparing guidelines for developing community self-reliance training, improving terrace construction and sandbag pre-positioning during floods. These activities could be categorized as following:

- Rangeland Rehabilitation
- Replanting
- Stabilization of sand dunes and creation of windbreaks
- Livestock restocking and management
- Community Development
- Water harvesting and management
- Water conservation for use in household water supply
- Rural energy management

- Creation of ponds capable of use for aquaculture, whilst managing mosquito breeding by biological control
- Setting early warning system for drought and floods with ease access of vulnerable communities, at village level and establishing flood emergency planning. Early warning systems may be more effectively relayed through telephones and the electronic media. The rapidly expanding land and mobile telephone networks in Sudan can be harnessed to facilitate information flows in early flood warning by keeping the information circuit fairly local. Simple warning tools could be used like gauging posts, flood markers.
- Post-disaster recovery-setting a mechanism, budget, plans and tools for:
    - Access to public relief and rehabilitation assistance;
    - Rehabilitation of residential buildings;
    - Rehabilitation of public facilities and services;
    - Rehabilitation of crops and lands;
    - Recovery of local businesses;
    - Management of water-borne diseases and other disease vectors; and
    - Monitoring land use/cover changes on regular basis, setting mechanism for village land use plans.

Human (household) Capital Measures

Ownership of assets
Skilled labors, and Housing type
Education and training facilities
Health services and Access to and secure water supply points for human and livestock
Household water purification systems
Access of marginal groups to education, training and extension services

Physical Measures

Wells and water pumps
Construction of flood stream bank protection using low technology
Elevated earth platforms for storage of grain and livestock and placement of homes
Provision of corrugated iron and collection drains to promote water harvesting
Secure refuges for people affected by disasters
Grain stores (capacity and accessibility)
Voluntary resettlement of homes affected by disasters and stream bank erosion
Grain mills (capacity and accessibility)
Development of emergency relief services and facilities remote rural areas
Energy conservation techniques (improved stoves)
Effectiveness of management systems availability to pasture, water, livestock, ..etc.
Local communications systems – mobile/satellite phones and radios
Purchase of mechanical equipment;
Local headquarters for groups, cooperatives or executing organizations
Local or secondary roads;

It is also highly recommended to have a continuous update of climate impact assessment study on regular basis that should not exceed 4 years to monitor changes in climate, land use/cover, communities and government response to climate change, to what extent climate change mainstreamed into national planning. Also considering ENRM/CC innovations and lessons learned based on completed and on-going IFAD interventions is crucial specially lessons learnt and cost-effective ENRM technologies in Sudan that have potential for scaling up. Also, IFAD's increased focus on the private sector has to be mainstreamed with opportunities for potential partnership to provide options for collaboration at the project level is seen as critical.

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