



Investing in rural people

## **Republic of the Sudan**

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### **Butana Integrated Rural Development Project (BIRDP) Loan 717-SD**

Proposal for Additional Financing

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### Currency equivalents

Currency Unit	=	Sudanese Geneih (SDG)
US\$1.0	=	SDG 5.7

### Weights and measures

1 kilogram	=	1000 g
1 000 kg	=	2.204 lb.
1 kilometre (km)	=	0.62 mile
1 metre	=	1.09 yards
1 square metre	=	10.76 square feet
1 acre	=	0.405 hectare
1 hectare	=	2.47 acres
1 <i>feddan</i>	=	0.42 hectares

### Abbreviations and Acronyms

ABS	Agricultural Bank of Sudan
ABSUMI	Bank led rural microfinance model
AF	Additional Financing (proposal)
APO	Associate Programme Officer
ASAP	Adaptation for Smallholder Agriculture Programme (IFAD)
AWPB	Annual Work-Plan and Budget
BDA	Butana Development Authority
BIRDP	Butana Integrated Rural Development Project
BLMIE	Business and Livestock Market Information Entity
BoD	Board of Directors
CBE(N)	Community Based Extension (Network)
CAHWs	Community Animal Health Workers
CBOs	Community Based Organisations
CBS	Central Bank of Sudan / Central Bureau of Statistics
CCI	Community Capability Index
CCU	Central Coordination Unit
CD	Community Development
CDC	Community Development Centre/Committee
CEA(s)	Community Extension Agent(s)
CEAP	Community Environmental Action Plan
CIF	Community Initiative Fund
COSOP	Country Strategic Opportunities Programme
CPM	Country Programme Manager
CPO	Country Programme Officer
DG	Director General
DTs	Development Teams
EM	Extension Materials / Means
ENRM	Environmental Natural Resource Management
EUR	Euro
F	Female
FA	Female Adult
FC	Financial Controller
Fe/Male	Female, Male
Fed	Feddan
FNC	Forest National Corporation
FS	Financial Statements
FY	Female Youth
G	Growth
GALS	Gender Action Learning System
GEF	Global Environmental Facility
GHG	Green House Gasses
GoS	Government of Sudan
H/Q	Head Quarter
ha	hectare
HH(s)	Household(s)

IA	Institutional Advisor
ICARDA	International Center for Agricultural Research in the Dry Areas
ICO	IFAD Country Office
ICSP	Integrated Carbon Sequestration Project
IFAD	International Fund for Agricultural Development
IMP	Integrated Pest Management
INGO	International Non-Governmental Organisation
KM	Knowledge Management
km/KM/Km	Kilometer
KPs	Knowledge Products
LMIS	Livestock Marketing Information System
LMRP	Livestock Marketing and Resilience Programme
LUM	Land Use Map
M	Male
M&E	Monitoring and Evaluation
MA	Male Adult
MENA	Middle East and North Africa
MFIs	Micro Finance Institutions
MFEP	Ministry of Finance and Economic Planning
MIS	Management Information System
MoU	Memorandum of Understanding
MTR	Mid-term Review
MVs	Mother Villages
MY	Male Youth
n.a.	Not applicable
NGOs	None Governmental Organizations
No	Number
NR(s)	Natural Resource(s)
NRM	Natural Resource Management
O&M	Operation and Maintenance
PA	Policy Advisor
PCU	Project Coordination Unit
PIM	Project Implementation Manual
RAP	Rural Access Project
REDD	Reducing Emissions from Deforestation and Forest Degradation
Reg.	Regulations
RF	Revolving Fund
RFA	Rural Finance Agent
RFO	Rural Finance Officer
RIMS	Results and Impact Management System
S&C	Saving & Credit
SAS	Sayed Abdella Al Sayed Engineering Co
SCGs	Saving and Credit Groups
SCU	State Coordination Unit
SDG	Sudanese Pound
SM	Supervision Mission
SMDC	Sudanese Microfinance Development Company
SMFU	State Microfinance Units
SROI	Social Return On Investment
SVs	Satellite Villages
SWA	State Water Authority
TA	Technical Assistance
ToRs	Terms of References
ToT/TOT	Trainers of Trainers
UNFCCC	United Nation Framework Convention on Climate change
USD / US\$	US Dollar
WSRMP	Western Sudan Resources Management Programme
WUC	Water User Committee
Y	Year
YP(s)	Young Professional(s)
YPP	Young Professional Programme
ZOA	Name of Dutch based Relief Organisation

## Map of the Programme area

### Sudan

#### Butana Integrated Rural Development Project - BIRDP

##### *Additional financing*



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 | 25-05-2016

## Revised Logical Framework – BIRDP

Results Hierarchy	Indicators						Means of Verification			Assumptions							
	Indicators	Units of Measurement <sup>1</sup>	Comments on Baseline	Baseline MTR	2015	End	Information Sources	Frequency	Resp.								
<b>Goal:</b> Improve in a sustainable manner the livelihoods and resilience to drought of the poor rural households.  <b>Butana:</b> - 5 States - 9 Localities - Target villages: 140 - Add. Fin.: 400 <sup>2</sup> villages (64,000 Households)	1. HH with improved assets ownership (RIMS 3 <sup>rd</sup> level)	number	- Baseline data gathered at the onset; - Baseline data gathering for newly targeted communities (1 <sup>st</sup> Q, 2017) - Indicator 2; BL data to be set	25,761	34,000	90,000	- RIMS baseline and impact surveys - ASAP surveys (including benchmark setting) - UNICEF MICS survey - Wealth surveys - Score Card - CCI	- At least, one time per year - In addition, as per need and demand	PCU	- Continued political and macro-economic stability - Government continues its commitment to poverty reduction and development of Butana							
	2. Child malnutrition among boys and girls below 5 years of age (RIMS 3 <sup>rd</sup> level).			22.3(b) 26.1 (g) <sup>3</sup>		14.5 (b) 16.9 (g)											
	3. Persons -incl. pastoralists – receiving project services by gender	number		40,000	69,000	200,000					- Progress Reports - Surveys - Approved CR CVPs	- Half yearly	PCU/DTs				
		MA		20,000	41,000	50,000											
		FA		20,000	27,000	50,000											
MY			n.a.	40,000													
FY		n.a.	60,000														
<b>Development Objective:</b> The capacity of CBOs to engage in climate resilient, environmentally sound, socially and gender equitable development initiatives and management of NRs developed.																	
<b>Component 1: Policy and Institutional Building</b>																	
<b>OUTCOME 1:</b> Effective governance framework that ensures regulated access to land and water resources of the Butana.	4. People reporting secure access and user rights to land	number	- Some communities have common rights over NRs incl. water	22,400		86,400 <sup>4</sup>	- Impact Assessment Surveys - Minutes CDCs - Progress Reports	-End current phase (2016), mid-term AF (2018) and end	PCU/DTs	- Favourable government policies; - Clarity on user rights; - Ability to capture pastoralist movements							
		MA		600		35,000											
		FA		4,480		17,000											
		MY		6,720		26,000											
		FY		2,240		8,000											
	5. People (pastoralists) reporting secure access and user rights to water	Number		n.a.	n.a.	10,000											
		MA		n.a.	n.a.	5,000											
		FA		n.a.	n.a.	5,000											
		<b>OUTPUT 1:</b>															
		1.1 Policy and Strategy (incl. NRM legislation); Framework (FW) for Governance of NRs established;		6. Studies (3), Workshops (10) and People Conferences	Study	As per advice of first outcome of					No NR legislatio n Butana	Reports of Policy Advisor	3	- Reports of Policy Advisor - Content	- Half-yearly	PCU / BDA	- Framework approved by all actors
Workshop	10																
People	20																

<sup>1</sup> MA = Male Adult; FA = Female Adult; FY = Female Youth; MY = Male Youth.

<sup>2</sup> On average there are 160 households per village and each HH consisting on average of 6 persons.

<sup>3</sup> Composed of: chronic malnourished children (% boys: - height for age, 28.8 benchmark, 22.3 MTR; % girls: 29.3 and 26.1 respectively); acute malnourished children (– weight for height: % boys: 13.6 benchmark, 11.2 MTR; % girls: 11.6 and 9.2 respectively).

<sup>4</sup> At least 1 person per household: in total 540 villages; average 160 HHs per village; 6 persons per HH.

Results Hierarchy	Indicators						Means of Verification			Assumptions
	Indicators	Units of Measurement <sub>1</sub>	Comments on Baseline	Baseline MTR	2015	End	Information Sources	Frequency	Resp.	
	Relevant studies conducted ('Land tenure, ownership and access rights'; 'Mapping Study on NRs incl. WATER and Land Use Mapping', 'on impact of gold mining')	(20) conducted	Conference	policy process		presenting outcome policy process	1	Framework - Minutes CDCs - ToRs studies - Agenda & Reports of W/shops, PCs		
	7. FW NRs operational	Framework NRs								
1.2 Institutional Development building occurred										
1.2.1 Butana Dev. Agency (BDA) established	8. BDA strategy and five-year business plan implemented	Number	No BDA	0	Roadmap	Self-financing BDA	- Minutes BoD - Annual turn over - Progress reports BDA - Outcome pilots (business)	- Half yearly	PCU / BDA	- Presidential decree on BDA respected by all parties
1.2.2 Govt. partners supported	9. No of locality units (LUs) that are capacitated and reporting performance improvement	Number		1	9	9	- progress reports Locality Units - Surveys	- Half yearly	PCU/ DTs	- Sufficient staff allocated to Locality Units - low turn over of LU - and SCU teams
1.3 Capacity building at various levels conducted (incl. TA, studies, Young Professionals, Knowledge Products, etc.)	10. No. people trained including private actors, etc. in various topics	Number Fe/male		40,549 (M) 21,599 (F)	50,420 (M) 29,367 (F)	72,000 (M) 48,000 (F)	- M&E reports, - attendance lists, - KM products - Studies - Performance reports YPs - Website (visitors, downloads)	- Quarterly	PCU; DTs; Loc. Units (LUs); BDA	- PCU in a position to focus on higher level issues incl. KM - ICO guidance on KM - ToRs of staff cover KM task
		No. studies			10	15				
		No. YPs: Fe/male			107 (F) 32 (M)	300 (F) 100 (M)				
		No. KM products			≥350	≥750 <sup>5</sup>				
	11. No. of people reached with KPs	Number			100,000					
Component 2: Climate Resilient Natural Resources Management (range, forest, vegetables, crops, water)										
OUTCOME 2: Improved climate resilient natural resources management (range, forest, vegetables, crops)	12. No. of approved and implemented Climate Resilient Community Village Plans (CVPs)	Number		140	140 <sup>6</sup>	280	- Content approved CVPs, - Surveys / GPS maps	- Quarterly	DTs/ LUs/ PCU	- Sufficient Technical Support received on planning and monitoring CVPs
OUTPUT 2:										
2.1 Functional water infrastructures	13. Time spent	Minutes / HH	1-3 hrs	60	45	30	- CDCs minutes	- Half-yearly	DTs/	- Cooperation with

<sup>5</sup> Among others, 50,000 visitors to BIRDP website annually; 40 knowledge products (KPs) on Climate Smart Small Agriculture, Livestock, Range and Pastoralism; 40 people-initiated KPs; 40 Whats-App groups; 150 items posted on websites (BIRDP, MENA knowledge base, CCU – and IFAD website / rural portal).

<sup>6</sup> Communities planned CEAP, Grazing Plans, Development Plans, etc. but Climate Resilient Community Village Planning is new.

Results Hierarchy	Indicators						Means of Verification			Assumptions
	Indicators	Units of Measurement <sup>1</sup>	Comments on Baseline	Baseline MTR	2015	End	Information Sources	Frequency	Resp.	
	collecting water	/ day					- Surveys - Data WUCs		LUs/ PCU	other actors active in water supply facilities
2.2 Improved Water harvesting per agro-ecological zone and enhanced agro-forestry systems	14. Land area under climate resilient practices	HA		4,871	149,449	360,000	- Progress reports - CDCs minutes - Surveys / GPS maps	- Half-yearly	DTs/ LUs/ PCU	- Acquainted with Climate Risk Assessment
	15. Land under rainfed agro-forestry practices	HA			n.a.	50,000	- do -	- do -	DTs/ LUs/ PCU	- Constructive partnership with FNC
2.4 Rural roads used and maintained	16. Roads and road boundary water harvesting and plantation maintained	KM	Ref. RIMS RAP data	0	74 (80%)	74 (100%)	- Surveys - Minutes CDCs - Progress reports	- Quarterly	DTs/ LUs/ PCU	- Road and wadi crossing constructions in place
<b>Component 3: Livestock and marketing Development</b>										
OUTCOME 3: Access to advisory services and bargaining position of men and women in marketing improved	17. No. of people (by gender including pastoralists) with access to secondary and primary markets	Number		Ma: 5,600 FA: 700		MA: 26000 FA: 20000	- Data markets - Score card exercise	- do -	DTs/ LUs/ PCU	- Market data reliable - 20% pastoralists access markets
<b>OUTPUT 3:</b>										
3.1 Livestock Markets operational and maintained	18. % of fully functioning primary (P) and secondary (S) markets.	%			55 (80%)	55 (100%) 25P (100%)	- Data markets, - Minutes CDCs - Progress reports		PCU/ DTs/ LUs/ PCU	- Localities / States maintain S. - and People P. Markets
3.2 Better Animal husbandry and - management (large and small animals incl. traditional poultry)	19. Mortality rate (random sample of 150 head)	%	NA	10	7	5	- Annual Livestock Surveys; up-dated GPS maps on incidence diseases	- Half-yearly	DTs/ LUs/ PCU	- GPS skills used for mapping incidence of diseases
<b>Component 4: Community Development, Business Options and Rural Micro Finance</b>										
OUTCOME 4: Community-based groups are empowered and business-oriented	20. Implemented Community Devt Plans, CVPs, and others implemented	%		75	54	85	- Records CEAs / networks / groups - Progress reports - Score card exercises	- Half-yearly	DTs/ LUs/ PCU	- Rural finance taking off as planned
<b>OUTPUT 4:</b>										
4.1 Organisation, Management and Social Skills of CDCs, groups, networks enhanced	21. Community Capability Index (CCI) value	%	62	78	85	85	- CCI surveys - Progress reports - Studies	- Half-yearly	DTs/ LUs/ PCU	- CEAs/networks active in service provision



Results Hierarchy	Indicators						Means of Verification			Assumptions
	Indicators	Units of Measurement <sub>1</sub>	Comments on Baseline	Baseline MTR	2015	End	Information Sources	Frequency	Resp.	
4.2 Business promoted through access to Rural Finance	22. No. of people with access to rural financial services	Number		0	4,387 (CIF)	10,000	- M&E Rural Finance Data - Progress reports	- Half-yearly	DTs/ LUs/ PCU	- Relevant credit products developed
4.3 Community Extension Agents / Networks enhanced	23. No. of community extension agents trained	Number		1,120	1,063	2,500 (200 pastoralist)	- Records of CEAs - M&E / progress reports - Training curriculum	- Half-yearly	DTs/ LUs/ PCU	- Payment for services happens
	24. Percentage of CEA being effective	%		75	50	75				

## EXECUTIVE SUMMARY

1. The goal of BIRDP is to improve in a sustainable manner the livelihoods and resilience to drought of the poor rural households. The project aims at achieving sustainable improvement in the livelihoods and drought-resilience of rural poor households and pastoralists (540 communities) in the project target area ("Butana") through establishing an effective natural resources governance framework; improving the access and bargaining position of women and men in the marketing; and developing the capacity of communities to engage in development initiatives and management of natural resources.
2. The project has four components, namely: (i) policy and institutional support; (ii) natural resources management; (iii) livestock development and marketing services; and (iv) community development and business options.
3. BIRDP was designed in partnership with the Government of the Sudan (GoS), planned for an initial 8 years duration (2008-2016) with a budget of US\$ 29.85 million; including US\$24.8 million from IFAD loan; US\$1.1 million from State Government; US\$3.2 million by Federal Government; and US\$0.8 million by the participating communities. The project was approved in December 2006 with entered into force in July 2008.

### Justification

4. The GoS request for additional financing is derived from the project pipeline for the current Sudan RB-COSOP that covers the period 2013-2018. The provision of additional financing for BIRDP is among the agreed upon pipeline projects, which was discussed and approved in an OSC that took place in September 2013 and included in the RB-COSOP 2013-2018. The GoS' request for additional financing is based on the need to consolidate some key project interventions and to scale-up the most successful interventions to other parts of the Butana to reach the desired impact and to fully achieve the development objective (DO).
5. The original project aims at addressing the huge challenges that are facing the Butana region, which is under enormous pressure. The lack of sound NRM policies has led to large scale pastoral land use conversion due to: the expansion of semi mechanized farming sector, agricultural expansion at the village level, unregulated artisanal gold mining, influx of private agribusinesses from both Sudan and outside Sudan, and more recently the loss of access to pastoral lands in Southern Sudan.
6. The above situation is compounded by enormous pressure, exerted by global climate change and the increasing tendency towards drier climatic conditions. Recent studies have shown large negative impacts to pastoralists by 2030 (e.g. reduction in rangeland productivity and livestock products; higher operating costs of animal grazing and water provision; high annual losses in net income). Changes in climate together with land clearance for agriculture, overgrazing, mechanized agriculture and herbicide application, are seen by herders as the main causes adversely affecting the Butana's pastoral systems, resulting in the steady deterioration of both the extent, productivity and biological diversity of rangelands.
7. BIRDP has so far made tangible achievements in terms of food security, resilience and poverty reduction, due to successful interventions in areas like water infrastructure, range and forest rehabilitation and community development. However, the magnitude of the challenge facing the area requires intensifying the response that is currently provided by the BIRDP.
8. So far, the project approach has focused its interventions on larger (mother) communities that are spread throughout the Butana with good results (see below for further details). Since 2009, BIRDP has reached directly more than 87,000 people (about 217% of target) in 140 mother communities (100% of the target). In particular the project has been successful in strengthening Community Development Committees and through them active community participation in project interventions, especially by women. In many instances, mother communities have now started supporting smaller, neighbouring "satellite" communities in adopting sustainable NRM practices, new technologies and income generating activities. The project unit reports about 66 'mother'

communities reached out to 119 'satellite' ones resulting in replicating the above good practices (201 incidents). The scaling-up / replication happened through actions by the CDCs and community extension agents with support by the development teams. Building on this success and based on the findings of the 2012 mid-term review (MTR) and subsequent supervision missions, the AF would be used to further intensify and consolidate achievements through a more focused outreach to the smaller communities and scale up in the same geographical area the most successful activities implemented by BIRDP and other programs in Sudan. Not only would this lead to improving the living conditions of more people in the targeted communities but it would also enhance the overall NRM in Butana through improving management of more lands in the sphere of the targeted villages. Reaching as many communities as possible would also increase the prospects for creating bodies that can influence public policies and law enforcement to enable sound natural resources management through the area.

9. The AF will further promote the natural resources governance framework for the Butana by continuing to strengthen the role of local communities and localities in state-level natural resource management and beyond this, the role and functioning of the Butana Development Agency (BDA) in strengthening natural resource management across the five states. In particular the project will support communities, localities and states to better regulate sustainable access and use of land and natural resources. Current consultancy on "Institutional support to BDA" will give attention to critical enforcement issues and competencies.
10. The project will develop the modalities and enforcement mechanisms to apply the governance framework of NRM in Butana, which have resulted from the policy analysis undertaken by BIRDP in order to ensure a sustained dialogue around natural resources governance at all levels. Following the recommendation to develop a Roadmap for completion and operationalization of the NRM Governance Framework, given its centrality for long-term sustainability and the limited time remaining, the project will develop a coherent plan with the line ministries.
11. Another important area of intervention for the project will be enhancing the resilience of the communities of the Butana to the climate change impacts (ASAP funding) through development of water infrastructure, and associated management systems for infrastructure and enhanced natural resources management in general. Finally the project will also support completing the rural roads network and crossings that started under BIRDP and other IFAD initiatives in the central Butana, and provide support for sustainable management of forestry in the region.
12. **Compliance with the eligibility and criteria for additional financing.** The proposal is in line with the IFAD's guidelines for additional financing, as follows:
  - (a) BIRDP has always had its "overall implementation progress" and "likelihood of achieving the development objective" rated moderately satisfactory.
  - (b) Disbursement rate is rated moderately unsatisfactory. Expenditures is picking up with start of implementation of civil works.
  - (c) Disbursement of the original IFAD loan has exceeded the 50% threshold.
  - (d) The latest supervision mission (October 2015) has determined that the quality of Financial Management and that compliance with procurement are moderately satisfactory.
  - (e) Most of BIRDP original loan covenants are complied with. Exceptions are procurement, which is rated moderately satisfactory (procurement capacity has been enhanced recently), delay in submitting progress reports and AWPB (information transfer arrangements from states to the PCU have been enhanced to speed up preparation of plans and reports). There is also delay in flow of counterpart funding, which is a problem for all IFAD projects in Sudan due to the financial crisis and IFAD loan source are used to pre-finance activities/item budgeted under Government counterpart funding. A draft PIM is submitted to IFAD and is under review.

- (f) In June 2015, the portfolio review rated the audit quality and timeliness of the financial year ended 31 December 2014 as satisfactory.
13. Finally, the requested additional financing of US\$13.3 million falls within the ratio 1:1 with the original amount of IFAD financing (US\$24.8 million). BIRDP has the absorptive and implementation capacity for this additional amount which will be spent by the modified programme completion.

#### **Summary of Implementation Performance, Outreach and Results**

14. The project has made tangible achievements in terms of food security, resilience and poverty reduction which have a good potential for being scaled up throughout the Butana. For example; the project reports that targets with regard to reduction of malnutrition among children is achieved; there has been marked decrease in cases of dispute over natural resources (50% of target at MTR), there has been increased in percentage of men and women who have access to the markets (77% of target at MTR); Community Capability Index has reached 78% compared to 62% at appraisal (70% of target at MTR), the number of beneficiaries accessing technologies adopted by the project is 20,375 (131% of target at MTR), etc. The above is due to the following well proven project interventions:
- **Environmental management plans and groups.** 140 environmental plans are formulated.
  - **Development of water infrastructure.** Development of 107 hafirs and water yards as well as development of sound system for management of the infrastructure.
  - **Soil and water conservation.** More than 20,000 HHs have adopted natural resources related technologies and about 150,000 hectare of land is under ENRM practices.
  - **Social protection of range and forestland.** 87 communities have established their protected range / forest / pasture with demarcation and /or registration.
  - **Home vegetable gardens;** 291 irrigation systems have been established including such gardens.
  - **Community development has led to significant social change.** 115 women have held leadership positions in 140 CDCs and related groups and networks.
  - The innovative **Community Extension Agents Networks** (CEANs) are active and consist of more than 994 operational agents.
  - **Preventive and curative animal health services** are disseminated to the community and have led to 30% decrease in mortality for poultry and 17% for cattle and goat.
  - **Supplementary and concentrate feeding based on local available products** is widely used. This practice has resulted in better health and productivity, e.g. 13.5% increase in the rate of calving / lambing / kidding.
  - **Strengthening indigenous village poultry systems** has generated positive results and women have started adopting them using small microfinance loans. A total of 878 persons have been trained in livestock production technologies including poultry.
  - **The rural micro finance pilots** have demonstrated that the microfinance models are acceptable at the community level in Butana and can deliver sustainable results.
15. In 2015, work has picked up with regard to developing **the natural resources governance framework** to address the whole of Butana. A vision and strategy that focuses on organizing the communities at the grass-root level has been developed and is currently under implementation with “mother” communities now supporting “satellite” communities. Community and locality forums are held and being scaled up to locality and state levels.
16. **Institutional development of the BDA** has been lagging behind. In 2015, an agreement was reached that a specialized firm / team of consultants would be recruited to lead the institutional development of the BDA. The work of the institutional consultant has commenced recently and would build on the work of the committee and earlier decrees and work by the project.

### Description of the activities to be supported and expected benefits

17. Building on lessons learnt, positive achievements and evidence of impact on the livelihood of targeted population, the project, during the AF will consolidate and replicate achievements in 400 smaller communities and scale-up good practices (such as microfinance), fill identified gaps, and firm-up an exit strategy. Moreover, ASAP financing will support further adoption of BIRDP good practices with regard to assisting smallholders to improve productivity/build resilience to climate change. The project will not provide a full menu for each newly targeted community.
18. **Component 1 - Policy and Institution Building.** The component will continue to support creating an enabling governance framework for NR management in Butana, including a governance framework and enforcement mechanism for the region. This will include work on the legislative and policy sides and support the BDA institutional building so that it becomes an effective body. The component will support as well establishment and strengthening of CBOs and strengthening of the locality technical teams as a second tier exit strategy.
19. **Component 2 - Natural Resources Management.** The objective of this component is to contribute to improved natural resources management for the natural forests and rangelands and the farmland areas, in light of the expected negative impact of climate change on the already fragile livestock and rain fed agriculture sector in Butana. The project will include support to the following climate-resilient interventions:
  - Participatory village resource mapping exercise and climate change vulnerability assessment to incorporate climate-resilience into the Village Development Plans.
  - Rehabilitation and restoration of rangelands and woodlands, as well as the plantation of trees in farmland areas supporting agro-forestry management systems, 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 protection systems (e.g. the traditional “hemas<sup>7</sup>”) to conserve and manage sustainably rehabilitated rangelands through demarcation, registration and community agreements of social fencing and temporary enclosures.
  - Promotion of measures to decrease the dependency on biomass energy and deforestation problems, by introducing efficient energy saving stoves.
  - Measures to prevent soil erosion, 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 to overcome water scarcity exacerbated by climate change: water conservation and storage and improvement of pasture, agriculture and drinking water supply through traditional methods and innovative low cost technology including hafirs, water yards, and other water harvesting systems, including micro-structures to collect runoff from infrastructures such as roofs, road surfaces, etc.
  - Promotion of adaptive farm management systems: (i) introducing efficient irrigation technologies in home vegetation gardens; (ii) introducing permanent soil cover, direct seeding (no tillage/reduced till), crop rotation crop sequence that conserve/restore fertility,

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<sup>7</sup> 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.

and integrated pest management, (iii) promoting tree-crop-livestock integrated management systems with multiple environmental and CC adaptation benefits (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 benefits (e.g. improvement of crop yields and provision of complementary source of revenues, including gums and resins, honey, dairy and milk by-products). Pioneer farmer's systems to managed natural resources (e.g. the farmer's managed natural regeneration in the Sahel countries) as a way to increase their resilience to climate change – longer and more frequent droughts – through soil and water conservation land management systems, including the plantation of trees (management practices supporting the natural regeneration of trees) in farmland have already led to improve crop yields as well as new alternative livelihoods from forest goods, such as fuel wood, fodder, and edible seeds and leaves.

20. **Component 3 - Livestock and Marketing Development.** The component will continue to contribute to the objective of improving the access and bargaining position for women and men in the marketing of livestock products through support to the consolidation of the market information systems created under the original project, creation of PPPs for operation of livestock infrastructure, training of pastoralists and agro-pastoralists on livestock and poultry production and management technologies, mapping of feed resources in the region, creating a harmonized veterinary services for the Butana, training of community animal health workers and inclusion of pastoralists.
21. **Component 4 - Community Development and Business Options.** This component will continue to support the empowerment and business development of community based organisations through formation, organisation and training of CBOs. The component will continue to support as well skills development for the communities, development of more community extension agents, and scaling-up the community extension agents networks. Microfinance models which were piloted successfully during the original project will be scaled up to other parts in the Butana region.

### **Project Costs and Financing Plan**

22. IFAD financing will be provided through US\$10.3 million (DSF grant) and US\$3.0 million (ASAP). The GoS will provide additional counterpart funding in the amount of US\$2.2 million. The beneficiaries are expected to provide US\$0.98 million using the same practices that was established under the current project. This contribution is mix of in-kind and cash.

### **Proposed modifications to the Financing Agreement**

23. There is no new component and no existing components have been excluded. Moreover, BIRDP completion will be extended till 30 September 2019. IFAD financing will be provided through US\$10.3 million (DSF grant) and US\$3.0 million (ASAP). The GoS will provide additional counterpart funding in the amount of US\$2.2 million. The beneficiaries/communities are expected to provide US\$0.98 million using the same practices that was established under the current project. The financial management arrangements will be amended to include authorised allocation of IFAD and ASAP grants.

## I. INTRODUCTION AND BACKGROUND

1. BIRDP was designed in partnership with the Government of the Sudan (GoS), planned for an initial 8-year duration (2008-2016) with a budget of US\$29.85 million. The programme was approved in December 2006 with entry into force in July 2008.

2. The GoS request for additional financing is derived from the project pipeline for the current Sudan RB-COSOP that covers the period 2013-2018. The provision of additional financing for BIRDP is among the agreed upon pipeline projects and it was discussed and approved in an OSC that took place in September 2013. Since the development of the RB-COSOP and presentation to the EB along with the pipeline in December 2013, supervision missions have continuously attempted to develop the right approach for the AF. The inclusion in the RB-COSOP and the GoS' request for additional financing is based on the need to consolidate and intensify the project interventions in the Butana to reach the desired impact and fully achieve the development objectives.

3. BIRDP covers the Butana grazing area which hosts approximately 8 million heads of livestock. The area is inhabited by 800,000 persons spread over about 700 villages. Butana occupies an estimated area of 81,497km<sup>2</sup> between latitude 14°33' and 16°22' North and longitude 33°33' and 35°33' East. This location positions the area at the centre of the North-Eastern part of Sudan, in a rectangular shape surrounded by River Atbara from the Northeast, River Nile from the Northwest, Blue Nile from the Southwest and Kassala-Gedarif-Wadi Medani Road from East and South<sup>8</sup>. The Butana grazing area was for centuries one socio-economic and political unit, but today the area is fragmented between five States, namely Khartoum, Gedarif, River Nile, Gezira and Kassala States. The greatest part of the area (62%) falls within the administrative boundaries of the Gedarif State (34%) and River Nile (28%), while 15% in Kassala, 14% in Khartoum and 9% in Gezira State. The Butana area exhibits typical Sahelian zone with its key characteristic of low amount of rainfall that varies enormously over space and time and where drought is a normal feature of the climate.

4. The Butana is currently under enormous pressure. Following the abolition of the native administration system and subsequently the traditional land use rights (1970s), the entire of the Butana area was converted to an "open grazing area" to people from within and outside the Butana. Since then, large scale land conversion to crop production started; e.g. the development of Rahad irrigated agricultural scheme, leading to conversion of large areas of grazing land to crop production and the subsequent expansion of semi mechanized farming sector inside the Butana region; particularly in Gedarif and Eastern Gezira<sup>9</sup>. With the transition to market economy and better availability of agricultural technology (mainly tractors), the Butana became subject to rapid agricultural expansion at the village level on the expense of pastoral lands.

5. Pressure on Butana has risen to unprecedented levels in the third millennium as a result of largely unregulated artisanal gold mining, influx of more private agribusinesses from both Sudan and outside Sudan, and the loss of access to pastoral lands in South Sudan<sup>10</sup>. The above situation is compounded by the increasing pressure from existing communities and activities indigenous to the area. Sedentary population in Butana villages are engaged in natural resources extractive livelihoods activities that depend on a combination of animal herding and crop cultivation. Most economic activities in the area; e.g. energy and building materials are destructive to the natural resources base (wood, charcoal, sand and gravel). Thus; the increasing population size and creeping desertification is contributing to the increased pressure. In addition to this, the increase in livestock population over the years, coupled with decreasing rainfall and removal of the regulated access to the rangelands, have

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<sup>8</sup> Source: BIRDP ecological zonation study, 2012.

<sup>9</sup> This was encouraged by the national slogan "We eat what we produce". This has happened particularly in the areas with more agricultural potential towards the south of Butana.

<sup>10</sup> The independence of the Republic of South Sudan denied many seasonal pastoralists access to dry season grazing in the South; thus forcing them to stay for longer periods in the Butana.

led to severe deterioration of the Butana grazing areas. This has intensified pressure on its fragile and deteriorating resource base and further exacerbated the vulnerability of Butana's pastoralists<sup>11</sup>.

6. Enormous pressure is also exerted by global climate change and the increasing tendency towards drier climatic conditions<sup>12</sup>. A consensus has clearly emerged among pastoralists in the region that climate has been changing over the past few decades (rainfall decline, changes in rainfall pattern with rains falling late and a shorter rainy season, delay in the flooding period of water courses, hotter dry summer season, stronger dust storms prior to the rainy season). During the period 1961-2013, Gezira state was subjected to significant reduction in monthly and annual rainfall, while the other states in Butana region were subjected to non-significant increases (Gadarif) or decreases (rest of the states). With respect to temperature, the five states in Butana region were subjected to a high significant increase in winter (November to February) minimum temperatures, with variable changes in summer and autumn temperatures. Highly significant increases in the maximum temperatures were registered in Gezira, Gedarif and the River Nile states during summer, winter and autumn, and in Kassala and Khartoum during winter. Changes in climate together with land clearance for agriculture, overgrazing, mechanized agriculture and herbicide application, are seen by herders as the main causes that have adversely affected the Butana's pastoral systems, resulting in the steady deterioration of both the extent, productivity and biological diversity of rangelands.

7. Based on the novel simulation approach to climate change impact assessment, implemented with the Trade-off Analysis for Multi-Dimensional Impact Assessment model (TOA-MD), researchers predicted minimum temperature increases by 5%, 4% and 3% by 2030 in Gedarif, Gezira and Khartoum states, respectively. Annual rainfall is predicted to increase by 17% in Gedarif, while it would decrease to 60.8% (-139.9 mm) and 52.4% (- 89.12 mm) in Gezira and Khartoum states, respectively. The simulation model showed large negative impacts to pastoralists by 2030 (e.g. reduction in rangeland productivity and livestock products; higher operating costs of animal grazing and water provision; high annual losses in net income).

## **II. DESCRIPTION AND ACHIEVEMENTS OF THE CURRENT PROJECT**

8. The Butana Integrated Rural Development Project (BIRDP) was approved in December 2006 and became effective in July 2008. The overall goal of the BIRDP is *'to improve in a sustainable manner the livelihoods and resilience to drought of the poor rural households'*.

9. The project has four main components: (i) Policy and Institution Building; (ii) Natural Resources Management; (iii) Livestock and Marketing Development; and (iv) Community Development, Business Options. The Butana Development Agency (BDA)/PCU<sup>13</sup> carries out coordination and backstopping functions for the five State Coordination Units (SCUs) and their development teams (DTs). The project appraisal stipulates the direct beneficiaries from the project at 40,000 households. The project completion date is 30 September 2016 and the closing is 31 March 2017. The total project costs are US\$29.85 million.

10. The project has made tangible achievements in terms of food security, resilience and poverty reduction. For example; the project reports that targets with regard to reduction of malnutrition among children is achieved; 87 communities have registered community pasture / forest (87% of target), 78 communities have registered water committees (71% of target at MTR); there has been marked decrease in cases of dispute over natural resources (50% of target at MTR), increase in percentage of men and women who have access to the markets (77% of target at MTR); Community Capability Index has reached 78% compared to 62% at appraisal (70% of target at MTR), the number of

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<sup>11</sup> In case of Butana, most pastoralists are actually agro-pastoralists who are settled and only on a seasonal basis, part of the family tracks with their animals. Groups coming from outside Butana are normally pastoralists and track with the entire family, and it is understandably that it complex to reach out to these outside groups.

<sup>12</sup> For additional information consult Appendix 1: Annotated SECAP Review Note – Sudan-, page 20,

<sup>13</sup> So far BDA has focused on Project Coordination Unit (PCU) tasks and responsibilities. BDA was included in the design as a PCU. The MTR discussed the opportunities of having a strong functional BDA in place for developing the long term governance of natural resources and ensuring basic services for the Butana Communities. However, this vision was challenged during the latest supervision mission by the view of the Ministry of Finance that BDA may not be in position to fulfil the vision because of the country's legal framework. Currently, an 'Institutional Support to BDA' consultancy assignment is starting to look into all the modalities and opportunities in the set-up of BDA.



beneficiaries accessing technologies adopted by the project is 20,375 (131% of target at MTR), etc. The above is due to the following well proven project interventions<sup>14</sup>:

- **Environmental management plans and groups.** 140 plans are formulated and 140 groups are formed at the community level.
- **Development of water infrastructure.** The project has developed or rehabilitated about 107 hafirs and water yards for provision of drinking water for humans and animals. The project has developed a sound system for management of the improved infrastructure with 78 communities having registered water user committees (the rest are in the pipeline)<sup>15</sup>.
- **Soil and water conservation.** Significant project interventions have focused on improving communities' access to water<sup>16</sup>. More than 20,000 HHs have adopted natural resources related technologies (in particular water harvesting measures, wadi depression cultivation, hand hay making, etc.) and about 150,000 hectare of land (range, forest; individual, communal, open area) is under ENRM practices.
- **Social protection of range and forest land.** A total of 87 communities have established their protected range / forest / pasture with demarcation and /or registration. This includes as well increased interest in establishing home nurseries.
- **Home vegetable gardens.** Since project inception 291 irrigation systems have been established (including women household gardens).
- **Community development has led to significant social change.** 115 women have held leadership positions in 140 CDCs (formed by the project) and related groups and networks. The data and studies, conducted by the project indicate that women leaders are effective.
- The innovative **Community Extension Agents Networks** (CEANs) are active and consist of more than 994 operational agents;
- **Preventive and curative animal health services** are disseminated to the community and have led to 17% decrease in cattle and goats mortality (131% of target at MTR), and 30% for poultry (75% of MTR target).
- **Supplementary and concentrate feeding based on local available products** is now wide spread among animals at home (e.g. desert goats<sup>17</sup>). About 880 people have been trained on this practice (88% of MTR target). It has resulted in better health and productivity; e.g. 13.5 % increase in the rate of calving / lambing / kidding.
- **Strengthening indigenous village poultry systems** has generated positive results, and women have started using small microfinance loans to construct a practical poultry shed/night shelters; A total of 878 persons have been trained in livestock production technologies including poultry.
- **The rural micro finance pilots** have demonstrated that the ABSUMI model as well as SCGs are acceptable at the community level in Butana and can deliver sustainable results. One ABSUMI unit was established, disbursing 1,600 loans to women members in 17 villages (more than SDG 1.5 million in loans).

11. Prior to 2015, the project faced difficulty in advancing the work on development of **the natural resources governance framework**, to address the whole of Butana and cross-cutting through the five states. Inability to recruit or keep good quality policy experts have resulted in uneven progress and lack of full-fledged plan. Intensive support by IFAD during supervisions and including dedicated

<sup>14</sup> These items below could be referred to as Good Practices developed and form the central focus of scaling-up during the AF period.

<sup>15</sup> Registration can be cumbersome. In some cases, it can take 1-4 yrs. before a community succeeds in registering its organizations.

<sup>16</sup> While some interventions can be costly and demanding in terms of mobilising of the different actors, co-financing by community, physical obstacles, procurement, etc., it has however been realised that studying and mapping water resources is needed in order to make thoughtful decisions on water infrastructure, and arrive at appropriate investments as BIRDP is not the only actor investing in water supply facilities. In many aspects, 'water' is actually a mean to govern the natural resources.

<sup>17</sup> Off springs of the costly Goat cross breeding (pre-MTR) produced less and gradually the interest in crossing diminished.

implementation support missions for land and policy aspects with participation by PTA resulted in marked improvements. In 2015, work has picked up. A vision that centres around organizing the communities at the grass root level has emerged and is currently under implementation. Community and locality level forums held to create representative bodies at these levels. The forums and being scaled up to take place at the state level and later to the whole Butana.

12. **Institutional development of the BDA** has also faced challenges, which are now being addressed. In 2015, an agreement was reached that a specialized firm / team of consultants would be recruited to lead the institutional development of the BDA. Shortly after the agreement was reached, the ministry of finance formed a committee to review the legal basis of the BDA, while declaring its commitment to the presence of the BDA. This has delayed the start-up of the assignment of the advisors. The committee has concluded its work. It appears that none of the recommendations would require significant changes to the underlying legal documents establishing the BDA. The work of the institutional consultant has commenced recently and would build on the work of the committee and earlier decrees and work by the project.

13. In terms of **Livestock and Marketing Development**, the results have been mixed. The construction/rehabilitation of secondary markets has not led to improved bargaining position for small fe/male producers, but to increased fee collection by the concerned locality authorities. The conclusions from successive supervision missions is that under prevailing conditions village/primary markets benefit women while secondary markets<sup>18</sup> benefit in particular locality authorities. Management of these markets by localities is also not going well.

14. In terms of **Business Options and Business Approaches**<sup>19</sup>, the Community Investment Fund (CIFs) has supported a diverse range of interventions; e.g. small ruminants restocking (38%), cooking gas units (22%), irrigation units (31%), poultry (4%), donkey driven carts (2%), grain storage (2%), and fodder storage (1%). Initial ABSUMI loans have mainly supported livestock related activities (87%), gas stove units (12%), small agricultural inputs and some village level microenterprises. It is worth mentioning that since the MTR, BIRDP provides services on cost recovery basis with no subsidies. Due to concerns regarding sustainability and following successes of the microfinance model in other IFAD projects, the project has shifted its mindset to be gradually business oriented and to develop partnerships with microfinance institutions. In general, the project has become more acquainted with conducting simple cost – benefit analysis.

15. Through **the Young Professional Program** (YPP) post MTR, BIRDP has contracted 75 young graduates (called Young Professionals).The YPs have been instrumental in advancing project implementation, especially in mobilising communities, raising awareness on gender inclusion and increasing women participation, supporting formation of SCGs, and contributing to monitoring by undertaking simple cost benefit analysis of communal farms. The fact that some of them lived among the targeted communities helped them to serve as agents of change. The experience they gained has been beneficial for the YPs to find employment opportunities and gain work experience after graduation<sup>20</sup>.

16. **Knowledge Management** has received due attention post MTR and details on a basic KM Strategy, the range of KM-products produced and KM activities conducted for the period 2013 – 2016. BIRDP is in collaboration with other IFAD funded projects in Sudan in developing a joint KM-strategy and intensifying efforts to share lessons learned with relevant stakeholders.

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<sup>18</sup> On the subject of providing market and veterinary services around the market, the results have not been encouraging as it proved difficult and even impossible to obtain reliable market data, while in well-established market places veterinary services in terms of accessing pharmacies are already in place.

<sup>19</sup> At the community level potential business activities can be classified into three broad categories according to ownership (i) Individual/household businesses such as small handicrafts, food products and petty trading; (ii) collective/group businesses such as grain storage, farming, transportation and trading; and (iii) community level commercial and social enterprises such as water yards, health clinics and electricity supply. Over the years the project interventions have also developed business opportunities in relatively new areas such as guar fodder, guar seed, Community Animal Health Workers (CAHWs), terracing and cooking gas supply.

<sup>20</sup> In this perspective, the YPP has proved to be successful by allowing 19 participants to find employment after the completion of the structured traineeship.

### **III. RATIONALE FOR ADDITIONAL FINANCING**

17. As described above, the GoS request for additional financing is derived from the project pipeline for the current Sudan RB-COSOP that covers the period 2013-2018. The provision of additional financing for BIRDP is among the agreed upon pipeline projects and it was discussed and approved in an OSC that took place in September 2013. Since the development of the RB-COSOP and presentation to the EB in December 2013, supervision missions have continuously developed the right approach for the AF. The inclusion in the RB-COSOP and the GoS' request for additional financing is based on the need to consolidate and scale-up the project interventions in the Butana.

18. BIRDP has so far made tangible achievements in terms of food security, resilience and poverty reduction, due to successful interventions in areas like water infrastructure, range and forest rehabilitation and community development. This is manifested in the following: (i) significant reduction in cases of dispute over natural resources (50% of target at MTR); (ii) considerable increase in percentage of men and women who have access to the markets (77% of target at MTR); (iii), high empowerment as reflected in Community Capability Index (CCI) which reached 78% compared to 62% at appraisal (70% of target at MTR); (iv) high increase in the number of beneficiaries accessing technologies adopted by the project is 20,375 (131% of target at MTR). At individual level, households have increased their resilience to drought and developed innovative coping mechanisms. The project's intervention around home, Jubraka's, goat feeding and communal gardens are diversifying diets: in some communities, consumption of vegetable has been multiplied by five. The expansion of rehabilitated terraces, sustainable intensification of sorghum supported by the project with improved seeds and leguminous fodder varieties are all contributing to improving food and nutritional security. The number of households that have improved food security is now 25,572.

19. BIRDP documented in a systematic manner all communal customary practices, values and indigenous knowledge and regulations governing natural resource utilization and management; reviewing all states' regulations, and laws at different levels (locality, state, federal levels)proposing new regulations to fill any existing gaps identified in consultations with all stakeholders and finally synthesizing all these set of customary and civil regulations and laws that govern the utilization and management of natural resources by different stakeholders at different levels, with focus on the poor households. The project plans to hold a series of inter-Locality workshops and inter-State meeting for the five states of the Butana this year. The process will provide the basis for identifying common challenges, existing policies, legislative/regulatory and institutional frameworks at each level and proposed joint actions. The process will be complemented with work to strengthen existing laws and regulations and enact new ones as necessary; synthesize customary practices and regulations with civil laws and regulations to form a coherent governance framework. The process will further be backed up by studies ('Land tenure, ownership and access rights'; 'Mapping Study on NRs including Water and Land Use Mapping', 'on impact of gold mining').

20. So far, the project has focused its interventions on larger "mother" communities that are spread throughout the Butana with excellent results. Since 2009, BIRDP has reached directly more than 87,000 people (about 217% of target) in 140 mother communities (100% of the target). In particular the project has been successful in strengthening Community Development Committees and through them active community participation in project interventions, especially by women. In many instances, mother communities have now started supporting smaller, neighbouring "satellite" communities in adopting sustainable NRM practices, new technologies and income generating activities. Building on this success and based on the findings of the 2012 mid-term review (MTR) and subsequent supervision missions, the AF would be used to further intensify and consolidate achievements through a more focused outreach to the smaller communities and scale up in the same geographical area the most successful activities implemented by BIRDP and other programs in Sudan e.g. the highly successful microfinance initiatives that was piloted recently in the Butana. Not only would this lead to improving the living conditions of more people in the targeted communities but it would also enhance the overall NRM in Butana. Reaching as many communities as possible would also increase the prospects for creating bodies that can influence public policies and law enforcement to enable sound natural resources management in the area.

21. The AF will further strengthen the natural resources governance framework for the Butana by continuing to strengthen the role of local communities and Localities in State-level natural resource management and beyond this. The current process where forums are held at the community and locality levels with bodies formed will be continued and aggregated at the states' level and beyond. The project will also continue to enhance the role and functioning of the Butana Development Agency (BDA) in strengthening natural resource management across the five states. This will include clarifying and confirming its role in relation to the five states. While the BDA will continue to have an important coordination role across the five states, the emphasis will be on empowering community bodies to more effectively link to state and federal ministries. In particular the project will support communities, Localities and States to better regulate sustainable access and use of land and natural resources.

22. An important area of intervention for the project will be enhancing the resilience of the communities of the Butana to the climate change impacts (ASAP funding) through development of water infrastructure, and associated management system. The project will also support completing the rural roads network and crossings that started under BIRDP and other IFAD initiatives in the central Butana, create a framework for operation and maintenance of these roads, and provide support for sustainable management of forestry in the region.

23. **Compliance with criteria for eligibility for additional financing.** The proposal in line with the proposal for eligibility for additional financing:

- (a) The activities that the additional financing intends to support are consistent with the on-going programme's objectives. The interventions that will be implemented during the consolidation / intensification / scaling up phase will be less costly.
- (b) The AF will be used to finance economically viable activities (Good Practices) where incremental benefits are evident as per project design.
- (c) BIRDP is consistent with the climate change adaptation priorities and technologies<sup>21</sup> for Butana region, included in the National Adaptation Programme of Action (NAPA), the SNC, and the TNA.
- (d) The AF will be used within the framework of relevant IFAD policies<sup>22</sup>, while component two 'Natural Resource Management' can substantially contribute to achieving the outcomes of ASAP such as - improved land management and gender-sensitive climate-resilient agricultural practices and technologies, - drop of water per crop, - resilient building (climate risks, losses due to weather), - climate smart infrastructure, etc.; vice versa ASAP and ICSP to achieving the BIRDP objectives.
- (e) The incremental results expected from the AF will in principle be integrated with the results expected from the on-going project so as to monitor results for a longer period of time.

24. **Compliance with the criteria for submission for additional financing.** The proposal is in line with the IFAD's guidelines for submission of proposals for additional financing, as follows:

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<sup>21</sup> BIRDP will build on the NAPA proposed best practices and lessons learned on adaptation interventions in the areas of water harvesting and soil water conservation techniques (e.g. terrace "turus" cultivation, earth-bund construction, V-shaped water harvesting, hafirs and dam construction) and rangeland and forest rehabilitation, applied in Butana region by IFAD and other partners. The small but on-going cooperation with ICARDA keep working on efficient use of available supplementary irrigation water (more crops per drop).

<sup>22</sup> To mention are: targeting including youth, food security, smallholders, pastoralism, gender, rural finance, environment and natural resource management, scaling-up, knowledge management.

Criteria (Paragraph 8. of PB/2014/Rev.1)	Meets requirement	Details
a) The ongoing project was not an actual problem project in the latest portfolio review and the status remains unchanged at the point of recommendation for additional financing;	Yes	BIRDP has always had its "overall implementation progress" and "likelihood of achieving the development objective" rated moderately satisfactory.
b) Loan disbursement of the original financing is generally in line with projected disbursements as measured by the disbursement profile	Yes	Disbursement rate is rated moderately unsatisfactory. Expenditures is also picking up with intensifying implementation of civil works.
c) At least 50% of the original IFAD financing has been disbursed, unless a project was specifically approved with a funding gap that was expected to be financed in a subsequent PBAS cycle.	Yes	Disbursement of the original IFAD loan has exceeded the threshold.
d) The latest portfolio review has determined that the ongoing project fiduciary management is rated moderately satisfactory or better in the project status report.	Yes	The latest supervision mission (October 2015) has determined that the quality of Financial Management and that compliance with procurement are moderately satisfactory.
e) The latest portfolio review has determined that the ongoing project is compliant with all loan covenants.	Yes (partially)	Most of BIRDP original loan covenants are being complied with. Exceptions are: <ul style="list-style-type: none"> <li>- Procurement is rated moderately satisfactory. The team was strengthened with staff dedicated to procurement</li> <li>- Delay in submitting progress reports and submitting the AWPB. There has been re-arrangements to smoothen transfer of information from the state teams to the central unit to speed up preparation of reports and plans</li> <li>- delay in flow of counterpart funding, which is a problem for all IFAD projects in Sudan due to the financial crisis. The project uses the Loan proceeds to pre-finance activities and items budgeted under Government counterpart funding.</li> <li>- Draft PIM is submitted to IFAD and under review.</li> </ul>
f) The latest portfolio review has determined that the submission of audit reports is satisfactory to IFAD, and that the Audit Report for the preceding year has been submitted on time and without qualification.	Yes	There has been marked improvement in the quality and timeliness of audits over the whole IFAD portfolio in Sudan. In June 2015, the portfolio review determined the quality of audit to be satisfactory (based on the submission of the audit report in June 2014).

25. Finally, the requested additional financing of US\$13.3 million falls within the ratio 1:1 with the original amount of IFAD financing (US\$24.8 million). BIRDP has the absorptive and implementation capacity for this additional amount which will be spent by the modified programme completion. This is based on the fact that large part of the proposed financing will be directed to civil works, which the project has all the tools in place. Significant part will also be directed for scaling-up the ABSUMI initiative, which is well established activity across IFAD portfolio in Sudan.

#### **IV. DESCRIPTION OF ACTIVITIES TO BE SUPPORTED BY ADDITIONAL FINANCING**

26. Building on lessons learnt, positive achievements and evidence of impact on the livelihood of targeted population, the project, during the additional financing phase will consolidate and replicate good practices, fill identified gaps, strengthen project management and develop an exit strategy. Moreover, ASAP financing will be targeted at facilitating the further adoption of BIRDP good practices with regards to assisting smallholders to improve productivity/build resilience to climate related challenges.

27. In the context of replication and intensification, the AF will be focused on the subcomponents that have shown the greatest benefits and which have proven to be contributing to maximizing results. In addition to gap filling, limited focus will also be provided for consolidating the results from some of the activities that still need some support; such as secondary markets information system.

28. The revised Logical Framework, including the assumptions and means of verifications as per design document, have been checked and where relevant up-dated as per changes since the original design took place. The updated log frame takes into consideration the revised guidelines for Log frames<sup>23</sup>.

##### **A. Component 1 – Policy and Institution Building**

29. The objective of the component is to support creating an enabling governance framework for NRs management in Butana. The CBOs and community extension workers and their networks in the mother villages (targeted before), will play an instrumental role in forming the CDCs and the mobilization of new (smaller) communities that will be targeted during the AF phase.

30. Sub-component 1-1. Development of NR governance framework. The project will continue to support the ongoing process of developing a natural resources governance framework and enforcement mechanism for the whole Butana across the five states. This will include as well work on the legislative and policy sides and will build on the forums that have been established at community and locality levels with the intention to create stakeholders representative bodies at the different levels and to scale them up to state level and beyond. These bodies will also be linked to the state and federal Ministries of Agriculture as well as localities. They will lobby for creating workable governance framework, harmonise existing laws and regulations across the different administrative units, with the aim to reach at a harmonious enforceable governance framework for the whole region. Knowledge generated by the BIRDP; e.g. the ecological zonation study, and other projects; e.g. the semi-mechanised sector study, will be used as an important input into the process as well. They will guide discussions in the forums and the governance framework development processes.

31. In February 2015, a presidential decree with the title: 'Range Organisation and Development of Fodder Resources Law', was issued. The decree has established access rights and land tenure related to range and common land. Assessment of the decree by different missions that are addressing policy work in different IFAD supported projects have found the decree to be an important step forward. This is expected to simplify the entire process, once each State has activated this decree. The project will work with the different states with regard to enforcing the decree as part of the work on establishing the governance framework.

32. The project will continue to keep the policy advisor who has been leading the process since early 2015 with excellent results.

33. Sub-component 1-2. Institutional capacity building. The sub-component will continue to support the BDA institution building so that it becomes an effective body with buy in from beneficiaries and government at different levels. This will include clarifying and confirming its role in relation to the five states. While the BDA will continue to have an important coordination role across the five states, the emphasis will be on empowering community bodies to more effectively link to state and federal

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<sup>23</sup> Revised Guidance on Log Frames (July 2015), indicates that there should be a maximum 15 indicators. At the time of preparation of this log frame, the new instructions for RIMS have not come into force yet.

ministries. The presence of a strong BDA is important for the development and rolling out the governance framework. The project will continue to retain the consultancy team that was recruited in 2016. Consultations and meetings will be carried out to ensure buy-in by the stakeholders to the role of the BDA. Work will also be carried out to develop models on how BDA could provide services to the communities on cost recovery basis. A business development advisor will be recruited by the project to support this activity. Both business development and provision of services along with the work on microfinance (sub-component 4-2) would form the foundation for the financial sustainability of the BDA.

34. The AF will support the strengthening of CBOs (formed under sub-component 4-1) and localities to carry out their role in creating the governance framework. In doing so, the sub-component will support the development of pastoral and community / village land use maps (200), community / village environmental plans (CVPs) (280), and locality level grazing plans (9). All of the above will be done taking into consideration building resilience and adaptation to climate change. The existing plans in the 140 villages will be synthesized to take into consideration the climate change adaptation and be in harmony with the other CVPs. The above plans will feed into building the governance framework under sub-component 1-1. International and national technical assistance will be recruited to support implementation of this sub-component.

35. Earlier experience shows that training of development teams composed of state and locality staff is important in improving implementation quality and pace. In that regard, the AF will support staff trainings that would serve resilience building; e.g. climate-risk reduction in land-use planning, ecosystem-based adaptation, extension for pastoralist communities, business based approaches in extension, etc. Similarly tailor made programs will be directed to locality staff and private sector actors with the aim to support the exit strategy. Capacity building efforts will target 500 staff from the development teams and localities and 150 private actors.

36. The sub-component will support building the capacity of locality technical team. Building the capacity of CBOs, the localities and presence of the community extension agents and their networks is considered a second tier exit strategy.

37. Sub-component 1.3 Knowledge Management. Under this sub-component, BIRDP would produce range of knowledge products to document its experiences at large. This would result in range of products; such as updated BIRDP website; knowledge products on climate smart small agriculture, livestock; people-initiated KPs; What's-App groups; etc. In addition, the project will support natural resources related studies (and others) to address climate change adaptation knowledge gaps as well as other work that will feed in the NR governance framework.

38. The Young Professional Program has been effective during the original program in boosting implementation of certain activities that required close interaction with the project. During the AF phase, this subcomponent will be scaled-up take on board 200 new YPs, to help boost implementation. The project will promote a policy and strategy among the State governments to promote the YP scheme beyond the project.

## **B. Component 2 – Natural Resources Management**

39. Under the AF, the project will continue to contribute to Improved Natural Resources Management in the areas of range, forest, vegetables, crops, and water. Based on earlier experience, new communities can have high expectations and may try to obtain the same level of project's support that was provided during the initial phase. As the AF is about scaling-up, the project approach will be based on allocating a lump-sum amount per community, which will be less than what was provided during the original phase. This is based on the fact that communities targeted by the AF phase are smaller, the spill over from mother communities would reduce the need for project support, the presence of community extension agents from the previous phase will also reduce the need for support, etc. In general, this component is about intensification and scaling-up. As discussed above, the existing CDC's and CEAs will play key role in the intensification / scaling-up / implementation under this component.

40. Sub-component 2-1. Development of water infrastructure. Water is identified as the most important need for the people in the Butana. As discussed in the project progress section, BIRDP has developed extensive experience in this area. For development of water infrastructure, the component will support development of 75 new infrastructures of different sizes and types; e.g. cisterns, water yards, hafirs and dams. These water infrastructures will be financed on cost sharing arrangements with the communities, using the same modality that was used during the original phase. The development of the water infrastructure will be guided by the community / village environmental plans and other products that are developed by component 1-2 at the community level.

41. Decision regarding what type of infrastructure to be built will be based on a water resources assessment, carried out by the project. The project will also provide engineering services for design, preparation of tender documents, and construction supervision. The procurement process will be done using procurement with community participation, which has been used during the latter stages of the project. Lessons learnt from the original phase will be taken into consideration, e.g. enhancing procurement capacity for the communities, size of infrastructure and environmental impacts, and availability of community contribution. It will also support the training of 375 more people on water infrastructure management.

42. Sub-component 2-2. Rainwater harvesting, range and forest management. This subcomponent will provide extended support to scaling-up enhanced rainwater harvesting techniques. Outputs will include development of rainwater harvesting in public range and forest land (150,000 ha), introduction of modified traditional terrace cultivation for crop production (40,000 ha), depression cultivation expansion (1,000 ha), and introduction of irrigation systems (100 ha). It will also support improved community range and forest management over 200,000 ha, improvement and establishment of 2500 women home gardens, introduction of 6000 km of fire lines, introduction of sand dune fixation over 105 ha. Similar to the above sub-component 2-1, the community / village environmental plans and other products that are developed under component 1-2 at the community level will guide the above interventions. During the original phase, the project has strengthened the capacity of the BDA with equipment, which will be used to carry out most of these activities in partnership with the communities. Many of the activities under this sub-component will be financed on cost sharing arrangements with the communities, using the same modality that was used during the original phase. Most of the community contribution will be in-kind. The sub-component will support sustainable forestry management in Butana through strengthening synergies with the GEF financed Integrated Carbon Sequestration Project, which is co-financed by BIRDP with regard to certain aspects.

43. Subcomponent 2-3. Crossings and rural roads. The project will fill some of the existing gaps in 27 crossings and 74 km of rural roads that have been supported by the original phase of BIRDP as well as other IFAD supported projects in the central Butana, which are implemented by the BDA. Central Butana is characterized by silty clay and black cotton soils where relatively poor drainage characteristics combined with flat topography results in prolonged periods of inundation during the rainy season especially in depressions and flat plain areas. Throughout the rainy season, general access to and from the main external markets is very difficult for vehicular access, livestock and people especially across seasonal streams. BIRDP supported improving rural access in that area. Given the huge needs, a stand –alone project that complements BIRDP rural access component was approved in December 2009, became effective in April 2010, and completed by December 2015. At that point of time, IFAD did not have an additional financing instrument; thus it was prepared as a stand-alone project. Due to price escalation and actual site conditions encountered during design and construction, the costs have increased compared to available funding. Thus; the project has suffered significant financing gap. While the constructed roads are mostly passable, there are some essential road layers and protection works that have not been completed yet; and thus could jeopardise the structural integrity of the works. The additional financing would help complete some of the remaining works and continue supporting the community road fund, which is an important part of the arrangements for operation and maintenance.



### **C. Component 3 – Livestock and Marketing Development**

44. Under this component BIRDP will continue to contribute to the objective of improving the access and bargaining position of women and men in the marketing of the livestock products. The component will not continue to support the establishment of new secondary markets or provision of mobile clinics as it did not work well during the original phase. As discussed before, secondary markets were not effective in improving access of the poor to markets. Furthermore, markets and other infrastructure management models used by the localities are poor. As discussed above, the existing CDC's and CEAs will play key role in the intensification / scaling-up / implementation under this component.

45. Sub-component 3-1. Operation of livestock markets and other infrastructure. The subcomponent will support business and livestock markets information systems through support to basic monitoring of the secondary markets and slaughter houses and following up agreements with the localities regarding the infrastructure management. Building on earlier capacity building programs for locality staff in market management and information gathering, the AF phase will provide assistance in analysing collected market data as well as development of Public – Private - Partnerships models for management of livestock value chains infrastructure. It is expected that about 10,000 beneficiaries would benefit from the information system.

46. The project will support 25 primary village markets. This is based on requests by village's female livestock keepers, who expressed the need to have a marketing window close to their villages so that they can better sell their products. Investments in primary/village markets are relatively small (approximately 25,000 SDG/market), while the expected outcome in terms of female access to markets would be significant.

47. Sub-component 3.2. Animal husbandry and management. Support will be extended as well to animal feeding initiatives. This will include year around mapping of feed resources; including collecting information and analysis of the overall availability and quality of animal fodder, forage and grazing resources. This will support development of general policy for the access and use of the Butana for grazing, which is undertaken under component 1-1 as part of developing natural resources governance framework for the whole region. This will also involve working with the communities to develop a calendar with numbers and classes of animals, grazing, fodder and feed availability; identifying critical points during the year, and developing plans to deal with the constraints. The project will support preparation of 50 feed calendars. As mentioned above, 9 locality grazing plans will be produced under component 1-2. In complementarity with the above activity, the project will develop synergies with the "drought monitoring preparedness and response system" (DMPRS) that will be developed by the IFAD/GEF project "Livestock & rangeland Resilience Programme". DMPRS would inform the planning of investments on water and fodder enhancement, produce timely and accurate information on water and feed conditions to guide movement of transhumance pastoralists, support decision-making in the sanitary and veterinary sector; and facilitate the link between pastoralists and markets. International technical assistance support will be provided for this activity. It is expected that the information will be disseminated to beneficiaries through different channels in Butana, including 10,000 pastoralists.

48. The AF will support preventive and curative health services to achieve among other things a harmonised and cost-effective approach to veterinary services for the Butana communities; in particular regarding the annual whole-flock vaccination campaigns against Sheep Pox, PPR and Botulism. During 2015, some CDC networks managed to procure vaccines and to apply them under supervision of veterinarians. The AF phase will continue to support initiatives aiming to scale up the above innovative activity and similar innovations and to arrive at a system, in which governmental veterinary officers, community animal health workers (CAHWs) and livestock owners' interest groups would set-up their own system for vaccination. Integration of the pastoralists in this activity is crucial for both nomadic and the sedentary livestock's health and survival. The sub-component will support as well vaccination of poultry against new-castle disease. In general, this activity will aim to reach 10,000 households (10% of which are pastoralists).

49. The sub-component will continue to focus on the animal husbandry and management for sheep/lamb fattening. It will also continue to support maximising the full use of local breeds genetic potential through better management, strategic feeding and husbandry at strategic periods of time, and where possible controlled breeding with selected bucks. The good practices developed during the original project with regard to promoting cooperation with private actors and groups/networks in stocking ingredients such as molasses, salt, oil seed cakes, vaccines, etc. will be scaled-up through linking with micro finance activities. The same applies to conservation and storage of hay and agricultural by-products at household and village levels. The sub-component will aim to reach 5,000 households (10% are pastoralists). The AF will continue as well to scale-up the positive outcomes of the original project with improving the scavenging poultry production model, based on local available resources and materials and vaccination. This low-cost pro-poor income generating activity is popular and important for women. The first SCG loans are already being used for poultry enterprise development.

#### **D. Component 4 – Community Development and Business Options**

50. Through this component, BIRDP will continue to support the empowerment and business development of community based organisations. In doing so, the component will intensify formation, organisation and training of CBOs. Similar to other components, the existing CDC's and CEA will play key roles in the intensification / scaling-up / implementation under this sub-component.

51. Sub-component 4-1. Community Development Committees, Interest Groups and Networks. The AF phase will continue to support organisation, management and development of social skills of CDCs, interest groups, and different networks. During that phase 128,000 new persons will be subject to organisation and management training. Those who received the same training during the previous phase (70,000) will be playing a key role in organisation and scaling-up. The communities' extension agents will be leading the process. The outputs of this activity will include formation of 400 new CDCs and associated networks (at least 150 will be registered) and interest groups and associated networks as well as 20 new youth groups. Out of the above CDCs, associated groups and networks, 300 will have women in leadership position.

52. The project will train 14,000 persons on social skills trainings. It will also help formulate 280 community plans, which will be done in conjunction with the community village environmental plans (sub-component 1-2). The project will also provide some limited support for implementation of the community plans. Based on earlier experience, new communities can have high expectations and may try to obtain the same level of project's support that was provided during the initial phase. As the AF is about scaling-up, the project approach will be based on allocating a lump-sum amount per community, which will be less than what was provided during the original phase. This is based on the fact that communities targeted by the AF phase are smaller, the spill over from mother communities would reduce the need for project support, the presence of community extension agents from the previous phase will also reduce the need for support, etc. In doing so, communities are expected to contribute more. This is in line with the findings of the first phase when the communities have shown that they can take responsibility for procurement, and communities would pay community extension agents networks for services.

53. Sub-component 4.2. Business Options through Microfinance. This sub-component was introduced post MTR to pilot microfinance initiatives in the Butana. These models have started under other IFAD funded projects in Kordofan region and are being scaled-up to other parts of Sudan. The success of these pilots in Butana have prompted the scaling-up of the microfinance initiatives to replace the existing community investment fund (CIF) model that was developed under the original project on the basis of project grants to the communities. The main challenge with that model is the limited potential for robust scaling-up after the project phasing-out and devaluation of the fund and thus lack of sustainability.

54. Two Agricultural Bank of Sudan Microfinance Initiative (ABSUMI) units that are linked to the Agricultural Bank of Sudan (ABS) have been established by the original project in Khartoum and Kassala states in 2014 and 2016 respectively. Data available from the Khartoum microfinance unit indicate that activities have reached 1,500 households (until October 2015) with portfolio of

SDG 1.5 million and 100% repayment rate. All participating households are represented by women only. The ABSUMI loans support livestock related activities, small agricultural inputs and a range of village level microenterprises. This experience has demonstrated that the ABSUMI model is acceptable at the community level and can deliver sustainable results. In 2015 (until October), the project has piloted successfully as well establishment of 30 savings and credit groups (SCGs) in 10 communities (518 members). All of the above groups are women groups except for one men group. The model has received strong acceptability and increasing demand in the pilot communities. The members save SDG 20 per month per member. Some of the groups have started to issue loans to its members. These figures indicate the high acceptability of both ABSUMI and SCGs models and the potential for its replication across the BIRDP area.

55. The AF phase will continue supporting the two existing ABSUMI units, establish one new unit; thus bringing the total number of microfinance units in Butana to three. Support will include capacity building for staff of microfinance units (both existing and new, provision of cars and furniture, establishment of MIS system, development of manuals, and documentation of lessons learnt. The AF will replicate the SCGs in the communities where they are already present and also scale them up to all other project villages, including the mother villages where no SCGs were formed before. This will involve the formation of 470 SCGs, each comprising around 20 women. The SCGs capital will be deployed either as loans to individual members or as collective investment in group enterprises using Islamic banking modalities. The profit margins earned from these investments will be added to its internal capital.

56. Community Investment Funds (CIFs) will be formed for each group of SCGs preferably at community level. These village level CIFs will be federated into a central community owned Apex microfinance institution offering a range of financial services across all the project villages and beyond. The apex will serve as the exit strategy for the CIFs which otherwise face an uncertain future after the project closure. The AF will enable the mobilization of the Apex, its capitalization, operations support to facilitate services to reach the member villages and create linkages to the central bank for licensing and regulatory control and to banks and MFIs for portfolio financing support. The credit services of the apex will support the adoption of project interventions amongst a wider proportion of the target group households contributing towards overall project sustainability and impact. In the long-term the presence of the apex will encourage the implementation of new economic development projects through the Butana Development Agency (BDA) which will further increase impact.

57. During the AF period, it is expected that 9,500 households will be reached through the SCGs interventions, 10,000 through ABSUMI model, while 3,000 households will benefit through the Apex (federation of CIFs) interventions. This will include both new villages as well the “mother” villages that was targeted during the original project.

58. The microfinance activities will support as well developing business skills at community level. This will be done through designing specialized credit products, and financing value chain activities based on simple feasibility studies. Trainings to the communities will be provided through sub-components 4.1, 4.3, and 1-2 along with support by the microfinance credit officers. It is expected that 5,000 households will be involved in profitable business.

59. Sub-component 4.3 Community Extension Agents and Networks. This sub-component will continue to focus on expanding and strengthen the Community Extension Agents (CEAs) and would support the development of the innovative Community Extension Agents Networks (CEANs). So far, the original project has supported training and mobilization of 940 agents in the targeted villages. The AF will support training and mobilization of 1,200 new CEAs to come on board. The CEAs will be offered basic and advanced training in gender mainstreaming, animal health, integrated Pest Management, soil and water conservation, management of water facilities, extension , communication and reporting skills, forestry, natural resources, rural finance and business development, and monitoring and reporting.

## **V. PROJECT AREA AND TARGET GROUP**

60. In terms of project areas, the current five States and nine localities remain the same. In addition to some consolidation in these previously targeted communities, the AF phase will target 400 additional smaller communities in the vicinity of the previously targeted ones. Each of these new communities has approximately 160 households (HHs) per village with average 6 persons per HH (960 persons per community). Each of the previously targeted communities (140 mother villages) will participate in consolidation / scaling-up / implementation in 2-3 new communities (smaller villages). This will be done through the existing CDC's and CEAs and their networks under close supervision by the development teams. The total number of beneficiaries that will be receiving project support will be 128,000. Out of this number, there will be 48,000 adult males, 41,000 adult females, 16,600 youth male, 22,400 youth female. The above number will include both agro-pastoralists and pastoralists.

## **VI. IMPLEMENTATION, COORDINATION, SUSTAINABILITY CONSIDERATIONS, MONITORING AND EVALUATION AND KNOWLEDGE MANAGEMENT**

61. **Implementation and Coordination.** The implementation arrangements will remain the same with minor changes to the composition of the BDA to allow more effective coordination and back-stopping to the state units and development teams. This will include bringing in an institutional officer along with institutional consultancy team, an assistant community development officer and rural finance officer. The current admin / procurement officer should continue in carrying out the procurement functions. Each of the state coordination units will need to be strengthened by a rural finance development agent. It is also recommended that the tasks of project coordinator be separated from those of the BDA director so that the director would have more time for the institutional building of the BDA.

62. **Sustainability.** In line with the Government structure, the technical teams at locality levels would ideally assume more role as means for ensuring sustainability. The typical implementation work currently conducted by the State Coordination Units will be ideally taken over gradually by the locality technical units and CEANs, while the SCUs is to focus more on their advisory role as per government structure<sup>24</sup>.

63. The idea of communities paying for the services of the community extension agents can be worked out for all other community extension agents. Some modalities are already in place such as payment for services of CAHWs and IPM agents. These arrangements could be developed further so that a universal system is developed. CEAN could be an important tool for ensuring sustainability.

64. **Horizontal and vertical scaling-up.** At the DTs level, more horizontal experience sharing (among the different teams and among the same discipline) is envisaged. In addition, vertical scaling-up (within and among the line departments of the relevant state ministries, NGOs, private actors, CBOs, etc.) is foreseen, while horizontal scaling-up is planned at large namely reaching out to an additional 400 communities.

65. **Monitoring and Evaluation.** Of the 400 new communities, baseline surveys will be conducted in line with the earlier baseline study conducted at the start-up of BIRDP.

66. In order to arrive at a manageable monitoring and evaluation system, some unrealistic indicators (e.g. carrying capacity, market prices, etc.) have not been included in the AF log frame. These changes were done based on earlier experience that no reliable data could be collected for these indicators. Other indicators have been added to cover rural finance and ASAP. RIMS higher level indicators are kept intact. The LF has been changed further to allow for adoption of the new IFAD log frame guidelines.

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<sup>24</sup> The risks are: localities have limited resources and are not always able to have technical cadres, states are not always focusing on their advisory role. In other words, states may be implementing, which is not in line with government policy. Even if, SCUs and Locality Technical Units would not be able to provide timely services post-BIRDP, it is expected that the Community Extension Agents Networks will further develop especially after linking them to microfinance services.

67. The Butana Development Agency (BDA), whose staff includes an M&E Officer, will play a crucial role in monitoring and evaluation of project performance and impact. As per design, the State Coordination Units (SCUs) play a major role in monitoring and evaluation. The project will continue to make efforts to involve technical staff at locality level, namely young graduates attached to the SCUs, as well as Community Extension Agents Networks, with concrete assignments including the collection of data for monitoring and evaluation of project interventions. The PCU together with the SCUs will develop a harmonized M&E plan to avoid overlapping and duplication among monitoring activities. Gradually, the typical implementation and monitoring work currently conducted by SCUs shall be taken over by Locality Technical Units and Community Extension Agents Networks, while SCUs shall focus on their advisory role as per government structure. IFAD ECD team will assist BIRDP in ensuring understanding of and capacity to measure the adaptation-related indicators. IFAD will help BIRDP in acquiring expertise for the use of remote sensing as an important monitoring instrument for monitoring Butana grazing areas.

68. **Knowledge Management.** A project KM Strategy is in place and most staff have received training in that field. Upgrading staff ToRs to include M&E and KM might be relevant. It is also possible to use an incentive system to encourage staff to be more active in the production of KPs, looking – among other things – at how to promote effective testing of climate-resilient new development approaches in order to generate quality-assured evidence, and how to engage to partners so that they actively participate in the KM process. The best incentive to create a project staff culture that embraces knowledge work - making knowledge identification, generation, sharing, and use a natural feature of daily work - would be the endorsement of knowledge agenda and priorities at the highest level in BIRDP through a strategy with adequate resources, conveying to staff that knowledge activities embedded in BIRDP are important to improve development effectiveness. This can be supplemented in various other ways, such as: (i) building in dedicated time for knowledge work in all project activities; (ii) recognize knowledge use achievements; and (iii) recognize staff contributions to KM and learning according to a performance-based scheme. As field experiences showed, communities are able to provide inputs for specific KPs. About 40 people-initiated KPs are planned under the AF. Furthermore; the AF phase will support formation and management of WhatsApp groups (40) and KPs on ENRM.

69. **Exit strategy.** The elements for the exit strategy are in place and are being addressed: (i) strengthening formation of CBOs, networks, community extension agents, etc.; (ii) providing tailor made support to weaker communities is under way, using findings of an assessment of CBOs capacities; (iii) linking CEAs and networks to locality technical staff / Unit; (iv) linking CEAN and communities to microfinance; (v) encouraging more role for the localities; (vi) encouraging networking amongst nearby villages; and (vii) developing the BDA. Refining of the exit strategy will be completed by the end of this phase to ensure that achievements are sustained, improved and scaled-up.

## **VII. ADJUSTMENTS IN RESULTS MATRIX**

70. As mentioned above, new (outcome) indicators for ASAP, and RF have been introduced. The log frame was updated in line with the new IFAD guidelines on log frames. The number of indicators was reduced to 20, and subcomponents are merged to allow the limited number of indicators. RIMS indicators are used. Level-2 indicators are also used for output level as much as possible.

## **VIII. PROGRAMME COSTS AND FINANCING**

71. Building on lessons learnt, positive achievements and evidence of impact on the livelihood of targeted population, the project, during the AF will consolidate and replicate achievements in 400 smaller communities and sometimes scale-up good practices (such as microfinance), fill identified gaps, and firm-up an exit strategy. Moreover, ASAP financing will support further adoption of BIRDP good practices with regard to assisting smallholders to improve productivity/build resilience to climate. The project will not provide a full menu for each newly targeted community.

72. The total Additional Financing costs including contingencies are estimated at US\$16.47 million over a three year period. The foreign exchange component totalling US\$3.12 million represents 19% of the total base costs. Project costs by components are summarized in Table 1. Summary and detailed cost tables are given in Appendix 4.

73. The project would be financed by IFAD's Debt Sustainability Fund (DSF), the Adaptation for Smallholder Agriculture Program (ASAP) Trust Fund, the Government of Sudan (GOS) and the beneficiaries. IFAD/DSF grant of about US\$10.3 million and IFAD/ASAP trust fund of US\$3.0 million together would finance 80.9% of the total project costs. The Government financing of about US\$2.17 million (13.2%) would cover part of the costs of salaries, operations and maintenance, and identifiable taxes. Finally, the beneficiary/communities' contribution US\$0.98 million (5.9%) would be mainly through cost sharing of 25% of the value of supported community investments in form of in-kind contribution and cash. The following Table 1 presents the project's financing plan by component.

**Table 1: Financing plan by component (US\$ million)**

	IFAD		ASAP		Communities		The Government		Total		Local (Excl. Duties & Taxes)	
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	For. Exch.	Taxes
<b>A. Policy and Institution Building</b>												
Development of NR Governance Framework	68	25.8	170	64.2	-	-	26	10.0	264	1.6	20	218
Institutional Capacity Building	378	52.8	270	37.6	-	-	68	9.5	716	4.3	142	506
Knowledge Management	293	63.4	141	30.4	-	-	29	6.2	463	2.8	36	398
<b>Subtotal Policy and Institution Building</b>	<b>740</b>	<b>51.3</b>	<b>580</b>	<b>40.2</b>	<b>-</b>	<b>-</b>	<b>123</b>	<b>8.6</b>	<b>1 443</b>	<b>8.8</b>	<b>198</b>	<b>1 122</b>
<b>B. Natural Resources Management</b>												
Development of Water Infrastructure	-	-	2 275	65.8	695	20.1	488	14.1	3 457	21.0	972	1 997
Rainwater Harvesting, Range and Forest Management	1 957	74.3	154	5.9	251	9.5	270	10.3	2 632	16.0	530	1 850
Crossings and Rural Roads	2 852	88.2	-	-	-	-	457	13.8	3 309	20.1	852	1 999
<b>Subtotal Natural Resources Management</b>	<b>4 808</b>	<b>51.2</b>	<b>2 429</b>	<b>25.8</b>	<b>945</b>	<b>10.1</b>	<b>1 215</b>	<b>12.9</b>	<b>9 398</b>	<b>57.1</b>	<b>2 355</b>	<b>5 846</b>
<b>C. Livestock &amp; Marketing Development</b>												
Operation of Livestock Markets and Other Infrastructure	117	68.5	-	-	32	18.8	22	12.8	171	1.0	47	102
Animal Husbandry and Management	98	96.9	-	-	-	-	3	3.1	101	0.6	-	98
<b>Subtotal Livestock &amp; Marketing Development</b>	<b>215</b>	<b>79.0</b>	<b>-</b>	<b>-</b>	<b>32</b>	<b>11.8</b>	<b>25</b>	<b>9.2</b>	<b>272</b>	<b>1.7</b>	<b>47</b>	<b>200</b>
<b>D. Community development &amp; Business Options</b>												
Community Development Committees, Interest Groups and Networks	558	89.3	-	-	-	-	67	10.7	625	3.8	90	468
Business Options through Microfinance	951	80.4	-	-	-	-	232	19.6	1 183	7.2	248	703
Community Extension Agents and Networks	326	96.7	-	-	-	-	11	3.3	338	2.0	8	318
<b>Subtotal Community development &amp; Business Options</b>	<b>1 836</b>	<b>85.6</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>310</b>	<b>14.4</b>	<b>2 145</b>	<b>13.0</b>	<b>346</b>	<b>1 490</b>
<b>E. Project Management</b>												
Butana Development Agency	1 609	78.1	-	-	-	-	452	21.9	2 061	12.5	90	1 931
State Coordination Units	1 105	96.0	-	-	-	-	46	4.0	1 151	7.0	87	1 044
<b>Subtotal Project Management</b>	<b>2 714</b>	<b>84.5</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>499</b>	<b>15.5</b>	<b>3 212</b>	<b>19.5</b>	<b>176</b>	<b>2 975</b>
<b>Total PROJECT COSTS</b>	<b>10 313</b>	<b>62.6</b>	<b>3 009</b>	<b>18.3</b>	<b>978</b>	<b>5.9</b>	<b>2 172</b>	<b>13.2</b>	<b>16 471</b>	<b>100.0</b>	<b>3 122</b>	<b>11 633</b>

**Table 2: Expenditure Accounts Project Cost Summary**

	(SDG '000)			(US\$ '000)			Foreign Exchange	Base Costs
	Local	Foreign	Total	Local	Foreign	Total		
<b>I. Investment Costs</b>								
<b>A. Civil works</b>	25 575	10 953	36 529	4 487	1 922	6 409	30	40
<b>B. Equipment</b>								
Vehicles	3 063	1 094	4 157	537	192	729	26	4
Machinery	307	1 489	1 796	54	261	315	83	2
Computers	43	76	119	7	13	21	64	-
Other equipment	636	271	907	112	48	159	30	1
<b>Subtotal Equipment</b>	<b>4 048</b>	<b>2 931</b>	<b>6 979</b>	<b>710</b>	<b>514</b>	<b>1 224</b>	<b>42</b>	<b>8</b>
<b>C. Furniture</b>	377	-	377	66	-	66	-	-
<b>D. Technical assistance</b>								
<b>1. Specialist services</b>								
Local technical assistance	17 554	-	17 554	3 080	-	3 080	-	19
International technical assistance	269	628	898	47	110	158	70	1
<b>Subtotal Specialist services</b>	<b>17 824</b>	<b>628</b>	<b>18 452</b>	<b>3 127</b>	<b>110</b>	<b>3 237</b>	<b>3</b>	<b>20</b>
<b>2. Salaries</b>	530	-	530	93	-	93	-	1
<b>3. Field Allowances</b>	1 662	-	1 662	292	-	292	-	2
<b>4. Inputs or materials</b>	9 346	2 025	11 371	1 640	355	1 995	18	12
<b>Subtotal Technical assistance</b>	<b>29 362</b>	<b>2 654</b>	<b>32 016</b>	<b>5 151</b>	<b>466</b>	<b>5 617</b>	<b>8</b>	<b>35</b>
<b>E. Grant</b>	1 150	286	1 436	202	50	252	20	2
<b>Total Investment Costs</b>	<b>60 513</b>	<b>16 823</b>	<b>77 336</b>	<b>10 616</b>	<b>2 951</b>	<b>13 568</b>	<b>22</b>	<b>84</b>
<b>II. Recurrent Costs</b>								
<b>A. Operations and maintenance</b>	2 225	556	2 782	390	98	488	20	3
<b>B. Salaries</b>	10 948	-	10 948	1 921	-	1 921	-	12
<b>C. Allowances</b>	1 367	-	1 367	240	-	240	-	1
<b>Total Recurrent Costs</b>	<b>14 541</b>	<b>556</b>	<b>15 098</b>	<b>2 551</b>	<b>98</b>	<b>2 649</b>	<b>4</b>	<b>16</b>
<b>Total BASELINE COSTS</b>	<b>75 054</b>	<b>17 380</b>	<b>92 434</b>	<b>13 167</b>	<b>3 049</b>	<b>16 216</b>	<b>19</b>	<b>100</b>
Physical Contingencies	755	356	1 111	132	63	195	32	1
Price Contingencies	278	60	337	49	10	59	18	-
<b>Total PROJECT COSTS</b>	<b>76 087</b>	<b>17 795</b>	<b>93 882</b>	<b>13 349</b>	<b>3 122</b>	<b>16 471</b>	<b>19</b>	<b>102</b>

## IX. DESCRIPTION AND QUANTIFICATION OF THE EXPECTED BENEFITS

74. As discussed before the project would reach out around 64,000 new HHs during the AF phase in addition to the ones during the original phase. It is expected that 100% of the new HHs would achieve food security, while 50% of the above target (32,000 HHs) would improve their resilience to climate change shocks<sup>25</sup>. The overall decrease in child malnutrition, among boys and girls will be at least 35%, while the number of very poor HHs will decrease by 30%. Adding the AF targets to the current achievements, the total number of HHs with improved food security would be about 90,000 by the end of AF phase, and the number of beneficiaries receiving the project services would be around 200,000.

### Update of project financial and economic analysis

75. The economic and financial analysis is updated using the information that has become available during the original project.

76. The main sources of quantified Project benefits come from: (i) increased livestock production on the rangeland; (ii) incremental crop production; and (iii) increased income from off-farm micro-enterprises. The drop of net benefit each three years reflects the production failure due to drought. The total number of households that will gain both direct and indirect benefits during the AF phase from the Project is estimated at 64,000 households, with an average of 160 households/community, with 33% that will receive project services and 50% will be targeted for climate resilience. About 128,000 persons - including pastoralists- will receive project services of which 37.5% are male adults, 32% are female adults, 13% male youth and 17.5% female youth.

77. The Economic Internal Rate of Return (EIRR) on the investments in the Project area over 20 years is estimated at 16.70% and the Net present value (NPV) of the project is positive (US\$ 16,26 Million ). The economic analysis suggests that the BIRDP Project is feasible. An estimate made over 25 years economic life time of the project would generate an EIRR greater than that the 20 years period and a higher NPV. With an OCC of 11%, the NPV is still positive and the EIRR is higher than the OCC. All these worthiness indicators establish the economic feasibility of the project. The Benefit cost ratio estimated is 1.65:1 showing that for each 1 SDG spent in the programme will generate a 1.65 SDG of benefits, which is in favor of the programme.

78. **Sensitivity Analysis.** In order to include risk factors, a sensitivity analysis in terms of “variable by variable” and “scenario” analysis was done to test changes in economic indicators in conjunction with aggregate costs, benefits, and delays in the realization of project costs and benefits. The EIRR drops to 15.4% with an increase in costs of 10%. With an increase of costs by 20%, the project is still worthy (ERR of 14.2%). However, with an increase of the aggregate costs by 80%, the EIRR with 8.9% is less than the OCC and the project is not feasible. A decrease of benefits by 10% to 40% still yields an EIRR greater than the 10% OCC. However, a decrease of benefits by more than 40% with constant costs shows an EIRR smaller than the OCC, and therefore a non-viable project.

79. A change of the recurrent costs fixed at 20%<sup>26</sup> of recurrent cost starting year 12 (and plus) to 100% still yield a profitable project; the EIRR will be 15.37%, that is a diminution of 1.33 points.

80. In terms of scenario analysis, the project remains feasible with an increase in project costs by 10% to 20% and a simultaneous decrease in benefits by 10%. But an increase of costs by 30% with a simultaneous decrease in benefits by 20% and more will generate an EIRR less than the OCC. The decrease of benefits by 30% with increases of costs by 10% and more produce an EIRR smaller than the OCC, and a non-feasible project as it is for the case for a delay of benefits by one year.

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<sup>25</sup> Climate Resilience is a new indicator and thus no previous targets were set.

<sup>26</sup> Recurrent costs are considered as 20% of recurrent cost starting year 12 to the last year for the economic lifespan of the project. This means that localities and local communities will take care of the recurrent costs of the project implementation period. This amount is quite reasonable if we take into consideration the poor endowment of beneficiaries and local states of the great Butana.

81. The sensitivity tests of the project suggest that the project is robust and worthwhile, especially if we consider the conservative assumptions made in the computation of the benefits. The project therefore has a positive impact on household welfare and allows farmers a higher propensity to participate to its activities. Moreover, the project will have a multiplier effect and higher marketing value added such as sacking, processing, new services, marketed incremental production to other States, and abroad Sudan.

## **X. FINANCIAL MANAGEMENT AND PROCUREMENT**

82. A Financial Management Assessment (FMA) has been undertaken for BIRDP in October 2015 and control risk was rated as Medium. Inherent risk of Sudan is High as measured by Transparency International's Corruption Perceptions Index (CPI). The annual CPI in 2015 puts the country at the bottom of the list at 165th out of 167, scoring 12. No FM assessment has been carried out for the ICSP. Taking into account other control areas, the overall fiduciary risk assessment at design is assessed as High (See Appendix 3.2) and after implementation of the mitigation the residual financial management risk is rated Medium.

### **Financial staffing**

83. **BIRDP.** The Butana Development Agency (BDA) acts as the central PMU of BIRDP, and is an independent agency that was formed by a presidential decree. The BIRDP covers five states of the River Nile, Khartoum, Jazeera, Gedaref and Kassala and each has a state coordination unit (SCU). The staff of the financial management unit of the BDA and SCUs consists of Financial Controller (FC) assisted by an accountant at the BDA, and an accountant seconded from government for each of the five SCU. The procurement and different technical units are separated from the financial management unit with exception of procurement at SCUs which is carried out by the SCUs Accountants. The FC has recently resigned and his replacement is not yet in place. To mitigate against the risk of the turnover in this key position, BDA will recruit competitively from the open market a qualified and experienced FC not later than the end of the 2<sup>nd</sup> quarter of 2016.

84. **ICSP.** The Finance Manager of ICSP is responsible for the overall financial management of the project. The Implementation Support Mission fielded in Feb 2016 by IFAD highlighted fundamental weakness in the financial management which requires an immediate action. To mitigate against this risk of low capacity FM staff, ICSP will recruit a qualified accountant to be responsible for the ICSP funded by GEF and the additional financing.

85. **Budgeting.** BIRDP will follow bottom up approach budgeting. Each of the five SCUs prepares its own AWPB in alignment with the state budget and in accordance with beneficiaries needs - based on theoretically best estimates. AWPBs are then consolidated by Monitoring and Evaluation Specialist along with the BDA and in line with IFAD financing agreements and requirements. The consolidated AWPB is discussed between BDA and SCUs and final version is presented to the BDA Board of Directors (BOD) for approval. Subsequently, the approved AWPB by BDA BOD is discussed with MOFNEP. ICSP will send its approved AWPB by the Steering Committee and MOFNEP to BDA for consolidation and submission to IFAD for review and concurrence. The final AWPB should be submitted to IFAD two months before the start of each project year.

86. **Flow of funds/disbursements.** The Project will use available disbursement methods of replenishment, reimbursement and direct payments. It is expected that most expenditures will be paid through the Designated/Operating Account/s using the imprest mechanism. The ceiling authorized allocations will be based on budgets for six months for the two implementing agencies. BDA will use the existing BIRDP EUR Designated Account opened at Omdurman National Bank (ONB) in Khartoum for IFAD Loan to receive funds from IFAD Grant and SDG Operating Accounts at BDA and the five State Coordination Units levels. The funds will flow from IFAD Loan/ IFAD ASAP and Grant pool Designated Account to the BDA pooled Operating Account opened and maintained in the Sudanese French Bank in local currency of SDG. The funds then flow from the BDA pooled Operating Account to each of the SCUs pooled sub-operating bank accounts opened and maintained in different commercial banks at each of the five states. The operating and sub-operating accounts are/will be



used to pay for the eligible expenditures incurred at BDA and SCUs levels. The pool Designated Account is/will be used mainly to transfer funds to the BDA Pooled Operating Account and rarely for payments such as project staff travel allowances on aboard trainings. The fund flows from the BDA pooled Operating Account to each of the five SCUs will be made on quarterly basis against proposed activities submitted from SCUs, and subsequently reviewed by the technical and FM units and approved by the BDA Director. The ICSP, will also open an Operating Account in a bank acceptable to IFAD in SDG. This Operating Account will receive the fund from the Operating Account of BIRDP to pay for eligible expenditures mainly salaries and allowance and administrative costs. Flow of funds is included in Appendix 3. Transfers from BIRDP Operating Account to ICSP Operating Account will also be made on quarterly payments made on the basis of foreseen activities and cost estimates. Relevant expenditures incurred by ICSP will be reported on monthly basis to BIRDP in order to be incorporated in the in the BIRDP WA and financial reports.

87. **Internal Controls.** Segregation of duties exists with regard to preparing, reviewing and authoring transactions at BDA and SCUs levels although this is weakened with this turn over in the FC position. In addition, the internal controls currently in place are informal in the absence of an operational approved PIM, which is at draft stage and has not been finalised since the inception phase of the original Project. All internal control mechanisms will be detailed within the financial management manual which to be finalised before the disbursement of the additional financing can began. Similarly for ICSP whereby current PIM will need to be updated to include the additional financing.

88. **Accounting systems, policies and procedures.** The existing Access based accounting system that is capable to generate various reports will be configured to include the additional financing before the disbursement of the additional financing can begin. Equally ICSP will procure an accounting software system. Beneficiaries' contributions in-kind or cash measurement and accounting and disclosures in the financial statement will be detailed in the PIM.

89. **Financial Reporting and Monitoring.** Financial Statements are prepared on the cash basis. The financial reports can be generated from accounting system and ICSP will submit monthly reports to BDA to facilitate timely consolidation. BDA will be responsible for consolidation and submission of accurate financial reports to IFAD as per General Condition and for preparing the consolidated financial statement for audit purposes.

90. **Counterpart funding.** The counterpart funding to the existing BIRDP is neither timely nor sufficient. IFAD Loan proceeds have been used to pre-finance GoS-funded activities. GoS should pay with no further delays to pre-financed from the Loan proceeds and to timely transfer its contribution to the existing and additional financing as per AWPB and financial agreement.

91. **Audits.** The National Audit Court of Sudan (NAC) will undertake the external audit of the Project funds (both BDA and ICSP) and the related counterpart funding in accordance with IFAD audit guidelines. A reputable internal audit firm will be engaged to perform the internal audit once 50% of additional financing is expended.

92. **Procurement.** In recent years, considerable investments (training, guidelines, templates) have been made to improve the procurement performance. When respecting the revised procurement system put in place, BIRDP's procurements are up-to the mark. Procurement with community participation which took off slowly (2 years ago) has turned into a catalysing factor, and will be applied across all communities. It is proposed that the procurement methods and prior review thresholds are revised when developing the Letter to the Recipient.

## **XI. OUTLINE of CHANGES REQUIRED in the LEGAL AGREEMENT of the PROJECTS**

93. There is no new component and no existing components have been excluded. Moreover, BIRDP completion will be extended till 30 September 2019. IFAD financing will be through a DSF grant (US\$10.3 million) and an ASAP grant (US\$3.0 million). The GoS will provide additional counterpart funding in the amount of US\$2.2 million, mostly as contribution to salaries, operating cost,

VAT and customs. The beneficiaries/communities are expected to provide contribution in the amount of US\$0.98 million using the same arrangements established under the current project. This contribution is mix of in-kind and cash. The financial management arrangements will be amended to include authorised allocations for IFAD and ASAP grants and additional general conditions precedent to withdrawal. Procurement section in the financing agreement needs to be changed to indicate that IFAD General Conditions, Procurement Guidelines and Procurement Handbook will be in force. Other procurement arrangements; such as procurement methods, thresholds, guidelines for prior review, etc., will be included in the Letter to the Recipient.

94. Upon approval of the proposal by the IFAD Executive Board, the existing Financing Agreement will be amended to include the additional financing and above modifications.

## Appendix 1. Annotated SECAP Review Note - Sudan

### 1. Major landscape characteristics and Issues (Social, natural resources, and climate)

#### 1.1. Socio-cultural context

1. Butana occupies an estimated area of 81,497km<sup>2</sup> between latitude 14° 33' and 16°22' north and longitude 33°33' and 35°33' east, in a rectangular shape surrounded by the river Atbara in the north-eastern part, the river Nile in the north-western part, the Blue Nile in the southwest, and the Kassala- Gedarif-Wadi Medani Road in the East and South<sup>27</sup>. The Butana area is fragmented between five States, namely Gedarif (34% of the area), River Nile (28%), Kassala (15%), Khartoum (14%), and Gezira (9%). The project covers the Butana grazing area that hosts approximately 8 million heads of livestock, and is inhabited by 800,000 person, mostly camel-owning tribes with agro-pastoralists practicing rainfed agriculture, spread over about 700 villages that provide first and second order services. In the Butana area on average 50% of the herders are classified as poor pastoralists and agro-pastoralists (having less than 100 heads of livestock)<sup>28</sup>. Illiteracy among camel herders is 32.3 % for herders aged 15–29 years, and 67.7% for 30–49 years and > 50 years old, indicating high illiteracy rate among middle and old herders<sup>29</sup>.

2. Butana is home to many tribal groups, namely the Shukriyya, Bataheen, Kawahla and Jaalein, and many other groups of pastoral and non-pastoral nature, which utilize the area on seasonal and year-round basis. Currently, three production systems exist in Butana: the nomadic migratory (22 %), semi-nomadic (36 %) and the sedentary production system (42 %). Animal herding (goats, sheep, cattle and camels) is the dominant livelihood system, supported by small-scale rainfed agriculture (Sorghum, Millet).

3. Rangeland that consists of trees, shrubs and herbs is the most preferred by pastoralists in Butana, since trees and shrubs are mainly used as a browsing resource for livestock, especially for camels and goats that are highly dependent on them. An open-grazing system is practiced in the Butana area, which entails communal use of the natural grassland by any number of the tribes. The number of the animals that normally graze on the rangeland is not controlled by anybody. The nomads compete for good grass in the limited area that belongs to all of them. As per history, Butana has always been an area used by outside pastoralists communities, but in recent years the influx has tremendously increased due to the separation of South Sudan as well as unrest in other States. A very high influx is expected currently due to bad rainfall in 2015 in Eastern Sudan.

4. Water, is by definition the scarcer and most limiting factor in Butana. All people and their livestock depend on the amount and distribution of rainfall to satisfy human needs, livestock and plant growth. According to researchers (Elhaj, 2008) the amount of rainfall recorded by many weather stations around Butana showed a declining trend during the period 1968-1987<sup>30</sup>. In fact, the Butana region has experienced severe droughts in the late 1960s, 1984, 1990 and 2000, that have been – together with land tenure right problems and Federal policies days that aimed at being self-sufficient in food leading to the encroachment of mechanized rainfed and irrigated agriculture on pastures - a landmark in the transformation of the population landscape in Butana: a transition from a mobile life style of animal husbandry to a sedentary one based on agriculture and other forms of income, although animals remain the most important aspect of household economy.

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<sup>27</sup> Source: BIRDP ecological zonation study, 2012.

<sup>28</sup> Pastoral Strategic Action Plan for Semi Desert and Low Rainfall Savanna Sudan (2014-2024).

<sup>29</sup> Drosa, A. et al (2011) Some aspects of camel raising in the Butana Area of Sudan. Conference on Int. Research on Food Security, NRM and Rural Development. Univ. of Bonn.

<sup>30</sup> Elhaj, M. A. 2008. Causes and impact of desertification in the Butana area of Sudan. Ph. D Thesis, University of Free State, South Africa.

5. The practice of the Nomadism by the herders has shown a decrease along years 1984, 1994 and 2003 with percentage of 73.3%, 33% and 22%, respectively<sup>31</sup>. It also reflected a negative decrease in camel herd population under migratory system (-10.97%), and a positive increase of in camel herd population in sedentary system (+5.2 %). In fact, there is a growing tendency towards combining the four major types of animals in the region (camels, cattle, goats and sheep), and substituting the migratory system of camel husbandry with agro-pastoralism in order to utilize the crop by-products of sorghum cultivation for animal feeding.

6. According to the 2013 situation analysis of the “Pastoral Strategic Action Plan for Semi-desert and Low rain fall Savanna in Sudan (2014-2024) PR-325-Sudan”, prepared by the Range and Pasture General Directorate<sup>32</sup>, the national institutional and policy framework has provided little attention and support to sustainable management of this renewable resource. The abolishment of the Native Administration (NA), the traditional leadership and effective governing body of natural resources utilization and protection, by the government deprived communities of their local authority to control their lands and resources without providing an effective alternative. Although the government has later made some shy attempts to re-institute the NA yet it did not regain its former authority and respect. The Five Year National Strategy and the Agricultural Revival did not consider the economic and social importance of pastoralists and Pastoralism. The former did not give any consideration to the implications of the secession of South Sudan for pastoralists while the latter reflects the historical dominance of crop production for the Sudanese economy.

7. Unfavourable government policies that favoured the expansion of semi-mechanized farming at the expense of woodlands and rangelands traditionally used as dry season or transitional grazing areas, and the establishment of irrigated agriculture schemes in areas traditionally used for grazing without integration of livestock and introduction of fodder crops in the cropping sequence, have ignored pastoralism and pastoralists in favour of agriculture. Government policy does not sufficiently recognize the role of livestock in poverty reduction. Equally national policy does not facilitate the secure access of pastoralists to basic resources (land, grazing, and water) upon which their production systems depend, as well as risk coping mechanisms against natural disasters and neither ensures access to basic services (health, schooling, domestic water supply, etc.)<sup>33</sup>.

## **1.2. Natural resources and NRM**

8. Butana is a large flat plain area where the cracking clays are the dominant soil type intercepted by silt depressions deposited by seasonal wadis that constitute an important cultivable land. The clay soils are dark, cracking vertisols, and low in nitrogen and phosphorus. Other soil types within the plain are aridisols and alfisols. The central part of Butana is clay plain with numerous water resources that form their own deltas or “khors” and do not drain into nearby rivers. People normally cultivate sorghum crops in the khors.

9. Butana area is characterized by the availability of plenty of seasonal watercourses “Khors”. Most pastoralists utilize these areas as wet season grazing land and move out before the surface water in natural ponds and dugouts is exhausted. Important streams and wadies are “El Hawad” and “Abuhasheem”. Some of the famous “hafirs” are; Abugnagid, Abujarad, Abudelieg and Elhasheeb. Groundwater is fundamentally scarce and highly localized and during dry years and periods of low rainfall the area suffers from severe shortage of water. The expansion of irrigated agriculture in the Butana (New Halfa and Rahad schemes) has provided additional sources of water through the network of canals that supply croplands with irrigation water.

10. Butana region has diverse vegetation types resulting from the variability in rainfall, as well as the topography, the network of drainage systems, and soil texture. Plant diversity and density increase towards the south similar to the increase in rainfall. The predominant tree species are Acacia

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<sup>31</sup> Drosa, A. et al (2011) Some aspects of camel raising in the Butana Area of Sudan. Conference on Int. Research on Food Security, NRM and Rural Development. Univ. of Bonn.

<sup>32</sup> Pastoral Strategic Action Plan for Semi Desert and Low Rainfall Savanna Sudan (2014-2024) has been produced with the assistance of the International Treaty on PGRFA, for developing a national strategy to build resilience of pastoral communities to climate change.

<sup>33</sup> Range and Pasture General Directorate (2013) PR-325- Pastoral Strategic Action Plan for Semi- Desert and Low Rainfall Savanna Sudan (2014-2024).

mellifera (Kitir), *Acacia tortilis* subsp. *tortilis* (Samur) and subsp. *raddiana* (Sayal), *Acacia nubica* (Laout), and some pockets of *Acacia seyal* (Talih) and *Balanites aegyptiaca* (Higlig). The most common annual grasses and herbs are *Sehima ischaemoides* (Dambalab), *Schoenefeldia gracilis* (Gabash), *Blepharis edulis* (Siha), *Ipomoea cardiosepla* (Tabar), *Aristida* spp., and *Cymbopogon nervatus* (Nal). *Seyal* and *Kitir* are the most preferred browse trees that also contribute significantly to soil improvement in the semiarid areas, providing great quantities of highly nutritive fodder during critical periods when grasses and herbs are not available in the Butana region.

11. Based on average annual rainfall, potential evapo-transpiration and according to the ratio of humid months to arid months and length of the growing season, Butana region may be divided into five agro-ecological zones.

12. **Desert Zone:** It is located in the extreme northern part of Butana, covering about 18 % of the region area. Rainfall is less than 100 mm/year and no rain-fed cropping and livestock activities are carried over there. There is small-scale irrigation agriculture along the narrow strip of the Nile. Part of Khartoum and Nile states are located in this zone.

13. **Semi-desert Zone:** It extends from the border of the desert zone, covering about 40% and it is the largest part of the region. Rainfall ranges from 100 to 200 mm/year with duration of the growing season from 30 to less than 60 days. This short growing season and the low unreliable rainfall in this zone is a major risk to agricultural production in this zone, however, in the centre and the southern part of this zone wadis cultivation is extensively practiced. Irrigated agriculture is practiced along the Nile. The five states of Butana region have parts within this zone.

14. **Arid Zone:** It lies to the south of the semi-desert zone, and occupies about 15% of the region area. Rainfall ranges from 200 to 350 mm/year with duration of the growing season from 60 to less than 90 days. The erratic nature of the rainfall and the short duration of the season make crop production extremely risky in this zone. Climatically, the area is more suitable for production of livestock than for cultivation of crops. It can be important source for grazing and browse for nomadic herds of camels, sheep, and goats. Parts of Kassala, Gedarif and Gezira states are located in this zone.

15. **Semi-arid Zone:** This is the dry farming region of the country. It covers about 25% of the region area. It occupies the southern part of the region, extending roughly southward. Rainfall varies from 350 to 750 mm/year, with growing season duration of 90 to less than 120 days. The cultivated crops depend upon the erratic and variable rains which occur within the specified periods. Introduction of drought resistant strains of crops, efficient use of soil moisture and application of fertilizers are important to improve production. Parts of Kassala, Gedarif and Gezira states are located in this zone.

16. **Sub-humid Zone:** Due to climate change and rainfall isohyets shift, this area is not any longer within the region. The far south-west of the Butana region receives more than 600 mm/year and it is near the northern limits of the sub-humid zone.

17. Rainfall is the most important climatic factor in the Butana area. All people and their livestock depend on the amount of rainfall that falls to support the growth of the plants. They use the land as a grazing area and some of them cultivate the "wadis" or the seasonal watercourses. The rainfall is characterized by its obvious seasonal variations. The wet season extends from June to September, when all the nomads converge on the Butana from different regions to graze the available pastures. October and November are periods when the livestock start to feed on the litter of the plants that are beginning to wither and vanish. In winter, December to February, the nomads are preparing to face the dry season from March to May, when they concentrate around the permanent water points, graze the little pasture in those areas, or migrate to the irrigation schemes around the area to purchase fodder for their animals. In a few cases, water is transported in tankers to meet commercial herd requirements during the dry seasons, so that livestock will be able to utilize the large quantities of dry grass available in water deficient areas. A new phenomenon has emerged namely traders taking lorries full of sheep and trying to benefit from the lush pastures, which contributes to tensions.

18. Camels of Butana area make up to 25.7% of the total Sudan's camel population. Cattle are the "Butana" cattle breed, well known for highest milk production compared to all other indigenous cattle breeds in Sudan, may be with the exception of the "Kenana" breed. Sheep in the Butana are desert sheep locally known as "Ashgar" and "Abraq" or "Musalami". Goats are mainly of the common Nubian goat type.

### **1.3. Climate**

19. Butana area exhibits typical Sahelian climate conditions, with its characteristic low amount of rainfall that varies enormously over space and time and where drought is a normal feature of the climate. Temperature is high all year around, with the highest temperatures in April above 40°C and in October around 36°C, and the lowest in January with the maximum temperature being 17°C. Rainfall is limited to the months of July-October, which is brought by the moist south- westerly winds that follow the movement of the inter-tropical convergence zone (ITCZ) to the north, with the amount diminishing northwards. About 75% of the area belongs to the desert, semi desert and arid agro-ecological zones, receiving less than 300 mm of annual rainfall, with a growing season length between less than 1 and 3 months. Semi-arid lands with 350-750 mm of annual rainfall and 3 to 4 months of growing season occupy about 25% of the area, namely in Kassala, Gedarif and Gezira states.

### **1.4. Key Issues**

20. The interaction between anthropogenic maladaptive practices (e.g. overgrazing, irrational firewood collection, wild and intentional fires, rangeland conversion into agriculture land, artisanal and industrial mining) and climate change (namely the higher frequency and intensity of drought events) has contributed to the severe degradation and loss of the butane rangelands. Some authors report that more than 50% of remaining rangelands has lost its valuable palatable herbs, namely *Blepharis edulis*, with a negative shift in plant composition and reduction in plant species diversity. The removal of the vegetation cover has led to sand encroachment, which has accelerated the development of dunes rendering large areas unproductive. Herders perceived the changes in climate together with land clearance for agriculture, overgrazing, mechanized agriculture and herbicide application, as the main causes that have adversely affected the Butana's pastoral systems, resulting in the steady deterioration of both the extent, productivity and biological diversity of rangelands.

#### **A. Biased policies and poor enforcement mechanisms leading to land tenure problems, unsustainable pasture management and land use changes**

21. The pastoralism system in Butana area has undergone rapid changes both in the availability, species composition and quality of rangelands (e.g. rangeland cover loss; disappearance of perennial palatable species that played a very important role as dry season grazing plants in water-scarce areas; expansion of new low nutrition or unpalatable plant species), and in the livestock management strategy and pattern of mobility. Some studies indicated that the annual productivity of degraded rangelands has dropped from around 100 to 30 kg/ha. These changes are basically due to the undermining of the communal tenure rights and reallocation of significant parts of communal rangelands for rainfed and irrigated agriculture investments, weakening the role of tribal leaders and causing acute conflicts over limited resources. Lack of rangeland registration is an important shortcoming and efforts to register rangeland concerns a long process as there are many resisting forces. The expansion of rainfed and irrigated agriculture has reduced the area available for natural pasture lands and forced many nomads to settle in one place. Even though irrigation schemes have caused a reduction in the natural pastures, they have provided the nomads with the opportunity to buy supplementary fodder from crop residues following the cropping seasons.

#### **B. Water management problems**

22. Changes in the seasonal availability of fodder and water are the main physical limitation to keeping livestock in the Butana area. Herders have developed ways of reacting to these changes, also of surviving during droughts, with a principal strategy being their mobility. The elderly nomads in the Butana have explained that the pastures system has been faced by different constraints since the

late 1960s. The deterioration of the vegetation cover forces the nomads to move long distances to searched for fodder and water. Water points or hafirs were constructed in areas that contained pastures that had not been utilized before. Despite its positive effect, the construction of water points has led to major problems<sup>34</sup>.

23. The construction of hafirs or other water points often lead to the deterioration of soil, vegetation cover and the quality of pastures due to overstocking in the area surrounding the water points. The dominant palatable species (e.g. *Blepharis edulis* or Siha) in the area might complete disappeared, while the area was invaded by unpalatable or low nutritional value grass like "Nal". When any hafir is dry, most of the nomads move to a nearby one and this leads to a high concentration of animals replicating the same process of degradation.

24. Most of respondents (64%) preferred hafirs that are dug by the government rather than the surface wells which belong to local inhabitants, as the people owning the wells could easy prevent the other nomads from taking water. The other reason to prefer "Hafirs" is that the water is easily available. The water in the hafirs is at the surface compared with wells that are deeper and it takes a long time and a lot of work to fill small tank.

25. While watering rights of man-made traditional wells were tightly enforced and served as a control on over-exploitation, water sources that were publicly financed were open to all, breaking the age-old equilibrium between water and rangeland use.

26. The people usually avoid the hafirs that keep water for a longer time after the rainy season because this stagnant water causes disease that can spread easily among the animals.

27. Butana is often used to constructing very large hafirs making it complex for people to manage these and attracting influx of outsiders who tend to settle.

28. The fact that there is no water policy or water resource maps, while dealing with five States, hampers the implementation of responsible water supply interventions. Different projects and organizations address the short term needs for water, arranging for water facilities without overseeing the long term consequences.

## C. Mining

29. The area of mining encompasses thousands of square km mainly in Central Butana. There is a Federal investment law, which is used to allocate large land parts to foreign mining companies, affecting large areas where people and local government have no say about their development plans and use rights against mining. There are a number of economic, social and environmental impacts generated by artisanal small-scale mining operations illegally operating with no attention to environmental laws, that came into light in Butana in 2010: (i) abandonment of cattle-herding and agriculture due to high turnout of gold revenues; (ii) employment of children and women in mining operations; (iii) significant health problems due to mercury manipulation and dust generation by the mills affecting the lungs and nervous system of workers; (iv) air, water and soil pollution; (v) appearance of crime and drug-related social phenomena. There is no doubt that this is precious resource but it should not be extracted without sustaining the renewable natural resources and preventing degradation. This can only be achieved by immediately reclaiming the used land after the extraction processes are over with.

## D. Climate change

30. **Climate change observations:** Climate change represents a major environmental challenge in Sudan, with an on-going trend towards drier climatic conditions. Elhaj (2008) reported that the Butana region has experienced severe droughts in the years 1984, 1990 and 2000, and Elagib and Mansell (2000) reported that the mean annual temperatures in Sudan have increased significantly between 0.076 °C and 0.20 °C per decade, specifically in the central and the southern regions. During

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<sup>34</sup> Elhaj, M.M. (2006) Causes and Impact of Desertification in the Butana Area of Sudan.

the period 1961-2013, Gezira state was subjected to significant reduction in monthly and annual rainfall, while the other states in Butana region were subjected to non-significant increases (Gadarif) or decreases (rest of the states). With respect to temperature, the 5 states in Butana region were subjected to a high significant increase in winter (November to February) minimum temperatures, with variable changes in summer and autumn temperatures. Highly significant increases in the maximum temperatures were registered in Gezira, Gedarif and the River Nile states during summer, winter and autumn, and in Kassala and Khartoum during winter.

31. Most of the interviewees (94%) from a study conducted to assess local people perceptions on climate change impact on browse trees/shrubs cover in a number of villages from the central, western and southern part of Butana region<sup>35</sup>, mentioned a significant deterioration of the quantity and quality of tree/shrub cover with a current tree cover insufficient to feed their animals, mainly attributed to the combined effect of rainfall decrease, overgrazing, expansion in rainfed agriculture and irrigation schemes, tree cutting for charcoal production, and cut of water points due to land governance problems.

32. This was evidenced by the increase of bare soil and eroded land, and the disappearance of many tree species from the region, such as *Commiphora Africana* (gufal), *Terminalia brownie* (soubagh), *Combretum africana* (gufal), *Faidherbia albida* (haraz), several *Acacia* species<sup>36</sup>, *Ziziphus spina-christi* (sidir), and *Balanites aegyptiaca* (hijleeg). These findings are consistent with those of Ismail (2009)<sup>37</sup> who stated that the natural vegetation cover in the Butana decreased from 46% in 1984 to 26% in the year 2000, an issue that was attributed to multiple factors combining climate conditions deterioration, land conversion and poor management practices.

33. A consensus clearly emerged among pastoralists in the Butana region that climate has been changing over the past few decades. There is also strong consistency between pastoralists' perceptions, satellite image analyses, and scientific data about recent changes in the Butana climate conditions. Informants mentioned that the number of the rainfall events decreased considerably during the period of 1970-2005, with rains falling late and a shorter rainy season. The respondents mentioned that during the 1960s they received more than 12 rainfall events per season on average, while during recent years the number ranged between 2 to 10 rainfall events per season.

34. Most of the respondents mentioned that the rainfall amount received per season is considerably less than in the past. The decline in the number of rainfall events and amount was associated with the increased number of stronger dust storms from 1-3 to 5-7 on average prior to the rainy season. Informants mentioned delay in the flooding period of water courses, and hotter dry summer season. Informants also mentioned that before the drought years they only searched for fodder and water within a range of 10 to 50 km but in recent years the distance ranged from 100 to 150 km (Table 5.7). Elhassan (1981) reported that there were palatable plants around the villages in the central Butana area during the period between 1950 and 1970 in both wet and dry seasons. But this situation changed during the 1980s and the nomads had to travel greater distances in the rainy season.

35. The Standard Precipitation Index (SPI) and Aridity Index gave evidence that the northern part of the Butana area become drier since drought worsens during the last decades. The 100, 300, and 500 mm isohyets shifted toward the south by about 89, 46, 23 km for each isohyet respectively during the period from 1950s to 2004. This led to a shift of the vegetation cover towards the south.

36. An assessment of vegetation changes in Butana from 1984 till 2001, based on NDVI<sup>38</sup>, demonstrated that the human impact on the vegetation cover was more clear after drought years, especially during the 80s: 1984 drought severely affected the most arid areas in the northern half of

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<sup>35</sup> Abdelmalik, M et al (2015) Agro-pastoralists' perceptions on the impact of climate change on browse trees and shrubs cover in the Butana region of Sudan. Sudan Academy of Sciences Journal – Special Issue on Climate Change. Vol 11 (15-23).

<sup>36</sup> *Acacia ehrenbergiana* (salam), *A. Senegal* (hashab), *A. nilotica* (sunut), *A. seyal* (talih).

<sup>37</sup> Ismail, I, E. 2009. Adaptation mechanisms in semiarid environments and natural resources degradation in the Butana Gedarif State. PhD thesis. University of Khartoum.

<sup>38</sup> The NOAA series satellite with AVHRR sensors (high-resolution sensors) makes vegetation indices like the Normalized Difference Vegetation Index (NDVI) available, in conjunction with traditional methods, for monitoring vegetative phenological changes across time and space.



Butana, while during the following droughts (1987-1991) the effect of human activities became more severe in all Butana. The nomads suffered great losses of animals and were forced to leave the natural pastures and congregate in the areas near the irrigation schemes of Rahad and New Halfa and in the rainfed agricultural cropping area in the southern half, from where they could get supplementary fodder and water during drought with the consequent higher pressure on the vegetation. After 1991 the vegetation started to recover since the nomads reacted flexibly to drought (e.g. purchasing additional fodder, purchase and transportation of water, reduction in livestock numbers<sup>39</sup>, and moving the herds of livestock to the areas near to the irrigation schemes to eat the crop residues). During the period of 1997-2001 the area experienced drought in 2000 and the human effect again became severe but was less widespread than during the period 1982-1991.

37. **Climate change projections:** Based on the novel simulation approach to climate change impact assessment, implemented with the Trade-off Analysis for Multi-Dimensional Impact Assessment model (TOA-MD), researchers predicted minimum temperature increases by 5%, 4% and 3% by 2030 in Gedarif, Gezira and Khartoum states, respectively. Annual rainfall is predicted to increase by 17% in Gedarif, while it would decrease to 60.8% (-139.9 mm) and 52.4% (-89.12 mm) in Gezira and Khartoum states, respectively.

38. The simulation model showed large negative impacts to pastoralists by 2030: the significant increases in minimum and maximum monthly temperatures and significant decrease in annual rainfall will reduce rangeland productivity leading to highly significant reduction in animal production, higher operating costs of animal grazing and water provision, and high annual losses in net income. Urgent adaptation interventions are needed to mitigate the climate change impacts, namely rehabilitation of tree/shrub rangelands, the spreading of water harvesting and soil water conservation systems, the improvement of herd structure and management, and the diversification of livelihoods.

## **2. Potential project's social, environmental, and climate change impacts and risks**

### **2.1. Key potential impacts**

39. The project is not expected to generate social, environmental, or climate change impacts. Project design incorporates climate change adaptation measures, the restoration of ecologically-sensitive pastureland, and the special consideration of women, youth and marginalized groups in the economic diversification and income generation activities whereby linking up to rural micro financing activities

### **2.2. Climate change and adaptation**

40. According to Sudan's National Adaptation Programme of Action (NAPA), the most vulnerable groups to climate change are traditional rainfed farmers and pastoralists. As previously mentioned, there is ample evidence of past climatic shocks that, in combination with land tenure, land use changes and land management problems, have led to the degradation of rangelands and the disintegration of the traditional pastoralism system in many areas in Sudan. Despite forecasted losses in livestock and dairy productivity accompanied by high losses in people's income by 2030 due to climate change, land degradation in the Butana plains can be arrested if urgent rangelands restoration interventions, adaptive management of natural resources, herd improvement and livelihoods' diversification, coordinated pastoral-agro-forestry land use, and careful water point site designation can be implemented.

41. NAPA proposed the following major activities among the adaptation measures to face CC impacts across the five ecological zones:

- (a) Community-based forest and rangeland management and/or rehabilitation, including temporal enclosures, rotational grazing systems, afforestation of areas denuded of trees, restoration of degraded rangelands, plantation of trees to promote agro-forestry, construction of shelterbelts to reduce windstorm impacts, and bringing back marginal

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<sup>39</sup> Rahmanin (1994) mentioned that livestock in the area was reduced on average by one third after the extremely dry years of 1990-1991, primarily due to sales and not to death of the animals as is often assumed.

- agriculture land into rangeland through the cessation of farming and rehabilitation of trees and other rangeland vegetation;
- (b) Lessening of pressure on local forests through the use of alternative construction and energy sources;
- (c) Rehabilitation of available water facilities (water stations, hafirs, sudd, reservoirs) and establishment of new ones;
- (d) Establishment of drought early warning systems for disaster preparedness;
- (e) Ensure institutional development, with the effective participation of women in projects that target adaptation to climate change;
- (f) Amendment/revision and implementation of land-use, forestry and water resources laws and policies in order to be consistent with customary laws, and establishment of state councils for ENRM;
- (g) Strengthening of agricultural and veterinary extension programmes and services for small-scale farmers that target ENRM, including demonstrations.

42. The Pastoral Strategy Action Plan for Semi-desert and low rainfall Savanna (2014-2024), focusing in Butana area and North Kordofan State, proposed a number of integrated CC adaptation development measures for building resilient livelihoods. The Strategy recommends investments in a number of adaptation interventions matching the NAPA and INDC priorities, among which:

- (a) improvement of rangelands through proper management, forestation, grazing reserves, and agro-forestry with effective utilization of crop residues, crop rotation and soil conservation techniques;
- (b) improve production potential of local livestock breeds more adapted to local environmental constraints and diseases;
- (c) development of watering facilities along stock routes and roads to markets, and establishment of feeder roads from production areas to markets;
- (d) promote renewable energy technologies to reduce pressure on forest;
- (e) address existing policies and institutional constraints to ENRM and climate change at local and national level;
- (f) technology transfer through extension, research and capacity building of all concerned actors, with special focus on empowering women and other marginalized groups;
- (g) Establishment of procedures for the prediction and forecast of seasonal forage production to assist pastoralists and settle communities to take timely decisions and avoid losses associated to climate shocks.

### **3. Environmental and social category**

43. The project is considered category B.

44. The project activities will be identified in a participatory way, as part of climate-resilient Community Environmental Action Plans (CEAP) that will identify priority measures for climate adaptation in the target villages, and will determine environmental risk-mitigation interventions for the project supported investments. The location and magnitude of the impact of the activities supported by the project justify its classification as category B:

- (a) Construction or rehabilitation of climate-resilient infrastructure in “non-sensitive areas” (e.g. no protected areas are part of the target areas) that allow/facilitate the revival and effective integration of the traditional livestock management (transhumance) with the sedentary agroforestry/livestock farming system, which is critical to compensate water and fodder scarcity and prevent climate-shocks which may involve the death of livestock and production losses (e.g. rural feeder road improvement, road boundary water harvesting points, hafirs and other water points in rangeland areas with water scarcity, etc.). Infrastructures also include village markets to create a place where female livestock keepers can better sell their animals and other products, such as ghee and eggs.
- (b) Promoting diversified agroforestry farmland providing food and fodder crops and

NWFP<sup>40</sup> in “non-sensitive areas” – near the villages – making use of climate-adapted fodder/food species and varieties, SLM practices, and tree planting.

- (c) Mapping year around fodder resources to provide timely information to herders about the overall availability and quality of animal fodder. The project will build on the “drought monitoring preparedness and response system” (DMPRS) concept to be developed by the GEF component of the IFAD project “Livestock & rangeland Resilience Programme”, a tool that serves multiple purposes, including:
  - inform the planning of investments on water and fodder enhancement;
  - produce timely and accurate information on forage, water level conditions and drought forecasts to guide transhumance and spatial movement of herds;
  - support decision-making in the sanitary and veterinary sector; and
  - facilitate the link between pastoralists and markets.
- (d) Sustainable rangeland and livestock management and ecological restoration of degraded pastureland with an ecosystem-based adaptation approach (adapting sustainable management practices – transhumant livestock movements – to current land tenure conditions, establishing temporary protection zones to improve rangelands conditions, rehabilitating degraded forest and pastureland through the ecological restoration of tree/shrub/herbaceous plant communities, the fixation of sand dunes, the establishment of fire lines and road boundary plantations).
- (e) Prevention of pollution and health problems affecting people and herds through:
  - the setting up of own system for vaccination, with the inclusion of both pastoralists and sedentary livestock;
  - the introduction and dissemination of efficient clean cook stoves preventing ambient pollution;
  - bridging knowledge gaps, sustain policy dialogue around natural resources governance, and advocate for the enforcement of governmental policies to prevent mining pollution problems affecting people’s health, soil and water resources.
- (f) Empowerment of communities for taking-up self-responsibility and arrive at basic payment for services, through:
  - Community Initiative Fund (CIF), involving in-kind grants for livestock restocking, cooking gas units, fodder storage, irrigation equipment, etc.;
  - saving and credit groups (SCGs), involving the development of about 4-5 groups in a project village with up to 20 women per group, based on participatory agro-enterprise principles and the sustainable use of natural resources (e.g. natural resources-based activities, including the development of capacities and provision of the necessary equipment for production, post-harvesting, processing and marketing operations);
  - Extending the ABSUMI loans support livestock related activities, small agricultural inputs and a range of village level microenterprises, including water yard business involving BDA’s ownership of water yards/hafir and a profit sharing arrangement with the community, the implementation of terraces, and the supply of butane gas.

45. The project will build on lessons learned from previous BIRDP phase, consolidate the successful results, fill climate-risk and other important gaps, and scale-up the good practices into the new villages, in which the existing Mother villages play a leading role. The project will also undertake important policy work to make sure adequate policies (Governance Framework of NRs) are in place, and enforced, which is a necessary condition for the long-term sustainability of the NRM interventions.

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<sup>40</sup> Non-wood forest products.

46. The Project is strongly aligned with, and contributes to the priorities of the NCs to the UNFCCC, which identifies livestock and rangelands management as one of the most vulnerable areas to climate change. The Project is also in line with the CC adaptation priorities of the Sudan's National Adaptation Programme of Action (NAPA), and the CC adaptation measures for building resilient livelihoods included in The Pastoral Strategy Action Plan for Semi-desert and low rainfall Savanna (2014-2024), focusing in Butana area and North Kordofan State, and will contribute to further integrate CC adaptation considerations in policies, strategies and laws addressing agriculture, forest, livestock and rangeland, water, and other key environmental issues.

#### 4. Climate risk category

47. The project is considered of **Moderate Risk**.

48. The project has an ASAP component aiming to mainstream climate change adaptation into the whole BIRDP investment. Project design has incorporated all available information regarding climate change vulnerability, impacts and adaptation needs identified in the NCs to the UNFCCC, the Sudan's National Adaptation Programme of Action (NAPA), the Pastoral Strategic Action Plan for Semi Desert and Low Rainfall Savanna Sudan (2014-2024) aiming to build resilience of pastoral communities to climate change, as well as several current scientific papers on climate change adaptation in Sudan<sup>41</sup>.

49. Moreover, the project formulation has included expertise work to undertake desk and field assessments, and participatory consultations with key stakeholders and project beneficiaries in order to:

- (a) incorporate lessons learned on ENRM from previous BIRDP phase and other climate change adaptation projects on livestock, agro-forestry and rangeland management in Butana,
- (b) understand local perceptions about changes in climate and effective local strategies to cope with climate shocks;
- (c) identify in a participatory way priority adaptation measures, in line with the adaptation priorities identified in the NAPA and other official documents for Butana;
- (d) identify gaps and needs for adopting ENRM and climate change adaptation at the policy, institutional development, capacity building, and field implementation levels.

50. This has resulted in the identification of CC adaptation measures (policy development, capacity building, adaptive management and restoration of pastureland, the use of climate-adapted species and varieties, climate-proof infrastructures, income-generation diversification based on natural resources-based value chain development), listed in BIRDP project formulation document (Component 2 – Enhancing climate resilience in NRM (water, forest, vegetable, fodder and agriculture crops) and described in a more detail in the Working Paper: BIRDP Project - Butana Ecological Zone Study.

#### 5. Recommended features<sup>42</sup> of project design and implementation

##### 5.1. Mitigation measures

51. The project design has already mainstreamed CC adaptation into the whole BIRDP investment through an ASAP funding of US\$3.0 million that will help mainstream CC adaptation into forest, agroforestry and rangeland management, water harvesting, fodder and livestock productivity and the diversification of local livelihoods. The project has also a poverty-reduction objective, with the main target group being poor/vulnerable households involved in livestock production and agriculture, and vulnerable groups, including women. By involving these communities into sustainable NRM and livestock production, and creating complementary, sustainable means of income generation, the project will help increase local standards of living while reducing climate-related risks and decreasing pressure on critical ecosystems, endangered palatable and economic valuable plant species and

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<sup>41</sup> Several papers included in the Sudan Academy of Sciences Journal Special Issue (Climate Change), Vol. 11, 2015.

<sup>42</sup> Guidelines as to what constitutes ENRM Core Principles and Best-Practice Statement can be found in IFAD 'Environment and Natural Resource Management Policy' (2011).

natural resources in general. As a key pre-requisite, the project will support the development of a Governance Framework of NRs, which forms the backbone of long term sustainability of the NRM interventions. Without this framework and its enforcement, the mitigation measures can easily be overruled, for instance, by expanding the mechanised farming or industrial mining.

## **5.2. Multi-benefit approaches**

52. The project has a multiple-benefit approach for sustainable production, poverty reduction, environmental protection and climate-risk reduction, through the conservation and restoration of ecosystem services on which livestock and agriculture production depends, the sustainable management of natural resources, the efficient use of the scarce water resources, and integrated management of forest-rangelands-agroforestry farming systems for income diversification and integrating forage crops into farming systems to ensure livestock feeding needs.

## **5.3. Incentives for good practices**

53. The proposed investment will generate a diverse set of economic, social and environmental benefits. The project will improve about 240,000 ha of land (200,000 ha of forest and rangelands and 40,000 ha of agriculture land) through forest/rangeland restoration and NRM practices. The external benefits of integrated restoration and SLM that do not directly accrue to the farmer would be significant: for instance, according to Aymeric et al (2014)<sup>43</sup>, the present value of aquifer recharge and carbon sequestration in a single watershed in Gedarif amounts to approximately 50,000 SDG/ha of restored and sustainably managed rangeland, over 25 years using a discount rate of 5%. Degraded land reforestation and conversion of mono-cropping farmland into Acacia Senegal agroforestry will lead to Reforestation of barren approximately 37 m<sup>3</sup>/ha/yr of additional infiltrated groundwater (4.5 million cubic meters for the watershed as a whole). The same authors calculated an additional 2.4 to 3.3 tons C/ha sequestered as a result of converting pure sorghum farming into agroforestry farming with A. Senegal, and an increase of 8.1 to 11.1 tons C/ha over 25-year time horizon as a result of tree planting in degraded lands. A. Senegal agroforestry systems allows topsoil nitrogen to increase by up to 30 kg/ha, reduce soil fertility stress factor by about 5%, and 24% to 28% increase average sorghum yields after the fourth year of conversion into under agroforestry SLM, compared with mono-cropping sorghum cultivation.

54. Other direct, tangible benefits are the increase in family income and savings in the targeted project areas, based on the improvement of rangeland and agroforestry management systems, the conversion of mono-crop sorghum crops into agroforestry farmland with a diversified production (food crops, fodder crops, wood and non-wood forest products), and the reduction of pressures on forests and rangelands thanks to complementary sources of income and alternative renewable energy sources. The project will provide rural finance to 10,000 households for climate-resilient ENRM investments (e.g. agroforestry, forest and rangeland improvement, livestock improvement and produce diversification, water harvesting, soil and water conservation technologies for agriculture) for a higher and more diversified income from livestock production combined with sales of fodder and non-wood forest products, such as honey, leaf products, gums, and resin. For instance, the production of gum Arabic that may result from A. senegal tree planting in agroforestry farmland and degraded rangelands can help enhance smallholder livelihoods (present value benefit of 6,525 SDG/ha or 460 SDG/ha/yr annuity value for a discount rate of 5%) and reduce inter-year variability of their income, since gum Arabic tapping takes place outside the grain-harvesting season. Previous experiences and lessons learned from IFAD and other stakeholders in Sudan, demonstrated that the adoption of LP gas stoves and cylinders can prevent cooking pollutants by 95% and reduce by 2/3 the energy costs for the local population (e.g. US\$10 LPG refill costs compared with US\$22-30 for a 70 kg sack of charcoal) resulting in savings that can cover the initial stove costs within 8-10 months<sup>44</sup>. This results in significant savings of tons of CO<sub>2</sub> equivalent and the conservation of the already scarce wood resources.

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<sup>43</sup> Aymeric, R., Myint. M.M., & Westerberg, V. (2014). An economic valuation of sustainable land management through agroforestry in eastern Sudan. Report for the Economics of Land Degradation Initiative by the International Union for Conservation of Nature, Nairobi, Kenya. Available from: [www.eld-initiative.org](http://www.eld-initiative.org).

<sup>44</sup> Bringing Low Smoke Cook-stoves to Darfur, Sudan (2014) <http://www.who.int/mediacentre/factsheets/fs292/en/>.

55. The rehabilitation and integrated management of forest, rangeland and farmland, will result in the diversification of production and income opportunities that may buffer against income risk associated with climate variability. This will also generate new 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 feedlot fattening; workers supplying auxiliary markets such as water for livestock through the management of water points and truck transportation to grazing grounds; guar production providing excellent fodder and seed products with export potential), with special focus on women and youth (e.g. investing in the future generation, reducing huge unemployment problems, preventing joining fundamental religious movements, migration, etc.).

56. Project investments in water harvesting infrastructure and equipment will represent an increase of 20% in the availability of water, the efficiency of water use, and the reduced risk of vector-borne diseases affecting livestock and people. Such investments will have a very positive effect to the most vulnerable groups, such as women, in terms of savings of about SDG 1.5/day for potable water purchasing and of about 1 hour/day for water collection. About 2,500 women households will benefit from efficient irrigation equipment for vegetable home gardens. Increased income and reduced workload of women as a result of improved farming systems, water harvesting and improved cook stoves, will result in more freedom, time available and investments for education, health, training, and the development of small businesses.

#### **5.4. Participatory processes**

57. The Project approach is based on community-driven development to enhance adaptive capacity, reduce climate-induced risk and reduce poverty. BIRDP will lead participatory processes to assess climate risks and incorporate CC adaptation into the Community Village Plans (CVP). Approved CVP incorporating adaptation measures will be a precondition of any local investments in natural resource management. TA will be contracted to provide backstopping and technical support for the climate risk assessment and implementation of selected measures, ensuring that climate change adaptation and vulnerability reduction are solidly embedded in the plans. The process will start with a baseline assessment and participatory village resource mapping exercise, including a rapid vulnerability assessment. The process will build on the successful achievements and the pilot activities tested through previous IFAD projects, and on the best practices and lessons learned included in the NAPA and INDC about adaptation interventions applied in Butana region.

58. The project will also facilitate participatory processes through supporting/strengthening local grievance redress mechanisms to serve as complementary avenues to resolution of potential conflicts as well as consultation workshops at different levels (from the State to the Village level) aimed at discussing and settling land disputes (e.g. conflicts and disputes between Butana-based pastoralists, outside livestock keepers and sedentary population; competition for water, land degradation and human security risk problems resulting from mining activities with a negative impact on livestock and agriculture activities/users), promoting consensus on the management plans of the targeted territories, and identifying new arrangements that can lead to satisfactory agreements for all the concerned parties, including user and access rights. BIRDP and on longer term BDA should ensure that the initiated process for dialogue around natural resource governance at all levels in both the Butana and beyond can be sustained. Bridging the existing gaps in current knowledge is a prerequisite for substantive and evidence-based dialogue. In this respect the project will develop the modalities and enforcement mechanisms to apply the governance framework of NR in Butana, which have resulted from the policy analysis and workshops (e.g. BDA conferences and the Locality, State and Inter-State workshops) undertaken in the previous BIRDP project phase.

## 6. Analysis of alternatives

59. Not applicable (environmental and social objectives are already included in the project design).

## 7. Institutional analysis

### 7.1. Institutional framework

60. As per design, BIRDP Project Coordination Unit (PCU) cares for the overall coordination while Development Teams (DTs) (also called State Coordination Units-SCU) for the actual implementation. PCU staff are either BDA or project employed while DTs are on detachment to BIRDP and receive a modest top-up. As the turnover of staff at SCU level (DTs) has been high in the previous BIRDP project phase, efforts have been made to involve technical staff at locality level – yet, most localities have limited or no technical staff - Young Professionals, as well as Community Extension Agents Networks. The DTs hand-in-hand with the Young Professionals and the more advanced Community Extension Agents Networks shall take the lead in consolidating and scaling-up the activities, so that the PCU team can fully focus on the higher level activities, namely the development of the Framework for the governance of Natural Resources, the finalisation of the Rural Road activities, Knowledge Management, Climate Change Assessment & Monitoring, etc. This can however only materialise when SCUs are more empowered, and therefore, to succeed, a less centralised management arrangement has been planned.

61. The PCU will keep the coordination framework with the coordination unit of the Integrated Carbon Sequestration Project (ICSP), under the Forest National Corporation (FNC). BIRDP will benefit from the ICSP experience and interventions on increasing biomass carbon stock and reducing GHG emissions, directly related to the sustainable NRM activities of the project (e.g. restoration, protection and sustainable management of forest and rangelands; Soil and water conservation interventions in farmland, rangelands and forestland, including the promotion of agro-forestry systems (tree-livestock-farming systems). Representatives of BIRDP (members of the board of directors) and FNC will play an active role in the projects steering committees in order to facilitate smooth implementation and coordination between the two initiatives. The Project Management Units of both projects will meet on a regular basis in order to guarantee efficient field level coordination, thus facilitating team building of key staff of implementing partners, avoid overlap between the two projects and guarantee maximum synergy and optimal application of the available funds.

62. In line with the Government structure, and base on project formulation recommendations, technical teams at locality levels will be deployed. Gradually, the typical implementation work currently conducted by SCUs shall be taken over by Locality Technical Units and Community Extension Agents Networks, while SCUs shall focus on their advisory role as per government structure. Albeit the risks - Localities have limited resources and are not always motivated to employ technical cadres, while States are not keen to focus on their advisory role -, this structure is as per Government policy. Even if, SCUs and Locality Technical Units would not be able to provide timely services post-BIRDP, it is expected that the Community Extension Agents Network will further develop and ideally being linked to BDA, while BDA itself being put in a position to provide services on longer term.

63. Once BDA is fully functioning, it will play a crucial role in: (i) mobilizing funding to support sustainable rural development; (ii) facilitating the execution of the project's interventions through the provision of the necessary investments, capacity building and resource deployment, and ensuring replication/expansion of successful project interventions; (iii) strengthening stakeholder's organization for the use/access to NR and efficient livestock marketing; (iv) be a mediator in the overall economic and social development of Butana, and complement the existing local, state and federal authorities; (v) monitoring and evaluation of project performance and impact. The Board of Directors (BoD) shall oversee the development and functioning of BDA, while a newly formed small steering committee should assess the progress of BIRDP and approve related annual plans, budgets, audit reports, etc.

64. As per design, each targeted community should be mobilised and ultimately being organised as a registered Community Development Committee. Next, productive groups to be organised along

subject matters, and to be answerable to the CDCs. When in the scaling-up mode, the project will be much more demand driven and not all communities might be motivated to form a CDC; some might join another community's CDC, or would be more at ease with a lighter organisational form such as a network or might use existing community organisational structures. It is therefore planned that there shall be an additional 400 groups/networks/CDCs formed.

## **7.2. Capacity building**

65. Targeted capacity building activities will take place at the beginning of the project implementation to ensure that sustainable NRM and CC mitigation and adaptation activities are: (i) undertaken in a cost-effective way and with the full involvement of the local population; (ii) mitigation and adaptation benefits are monitored and reported correctly. These activities will create the appropriate enabling environment to implement the investment activities in the most efficient way. These will include the following tasks: - Deliver awareness raising sessions for Policy makers and technicians; - Conduct training sessions for technicians; - Organise awareness raising campaigns at local community level; - Training for development of non-wood forest products-based traditional and intermediate technology to process non-wood forest products in cottage industry or use of these products (fruits, seeds, honey) for sale, and establish pilot projects.

66. Additionally, capacity building of project staff will be an important activity to ensure effective incorporation of CC risk-reduction and adaptation into the whole BIRDP. Advanced training for experienced staff (DTs), and basic as well as on-the-job training of new staff (Locality Technical Units, YPs, Rural Finance staff, etc.) is expected to cover 500 staff members. Advanced training is much about utilising GIS images, facilitating participatory climate-risk reduction in land-use planning and resource mapping, getting acquainted to ecosystem-based adaptation approach, working with pastoralist communities, adopting business thinking, and so on. New topics for basic training are, among others, Rural Finance, Climate Resilient Value Chain - and Business Development while topics for private actors should be developed as per need assessment.

67. Relevant capacity building programmes will be developed to train about 150 private actors (value chain) on climate-resilient livestock production, product diversification and marketing. Although topics for private actors should be developed as per need assessment, it has been identified the urgent need to train them in the sustainable and environmental-friendly production of stocking ingredients (e.g. fodder, agriculture co-products as livestock feed such as molasses and oil seed cakes, salt, vaccines), as well as regarding conservation and storage of hay and agriculture products.

68. In terms of Knowledge Management, BIRDP aims at documenting its positive as well as less positive experiences at large resulting in a range of knowledge products such as up-to-date BIRDP website; 40 knowledge products (KPs) on Climate Smart Small Agriculture, Livestock, Range and Pastoralism; 40 people-initiated KPs; 40 WhatsApp groups; 150 posts on websites (BIRDP, MENA knowledge base, CCU – and IFAD website / rural portal). In addition, a range of NR related studies are planned among others to address the critical NR adaptive management related knowledge gaps.

## **7.3. Additional funding**

69. The project already includes US\$3.0 million from ASAP.

## **8. Monitoring and Evaluation**

70. Baseline surveys of the new villages will be carried out at the start of the project to take a snapshot of the situation in all project areas, and will be repeated on a yearly basis to measure progress made towards achieving project goals, objectives and outputs. A more detailed set of indicators will be included in the project work plan, such as:

- (a) No of Drinking Water Systems constructed / rehabilitated (Water yards, Hafirs, Cisterns, Dams) (75).
- (b) People trained in water infrastructures management (375).
- (c) Area under modified traditional terrace cultivated (40,000 ha).



- (d) Area under improved depression cultivation (1,000 ha).
- (e) Irrigation system installed and commanded area (incl. women gardens/farms) (100 systems).
- (f) People trained in water harvesting and related plant and land management (6,000).
- (g) Individual HH home gardens (Jubraka) (2,500).
- (h) Commercial HH tree nurseries (280).
- (i) Area under sand dune fixation (105 ha).
- (j) Area under improved range and forest management including protection (200,000 ha)
- (k) Community irrigated shelterbelts & woodlots (105 ha).
- (l) Length of fire lines (km) and area protected (6,000).
- (m) Other productive infrastructures constructed (27 Wadi Crossings) – gap filling/finishing.
- (n) Rural Feeder Road – finishing – (74 km).
- (o) Road boundary water harvesting and plantations (74 km).

71. Simple monitoring arrangements will be set up at the start of the project to measure progress towards achieving project goals, objectives and outcomes. Monitoring will focus on the progress of the Project component activities in each project village against the schedule of planned activities. Monitoring data would be gathered in simple forms presented in the PIM. The project staff will record the data required during their regular visits to the communities using simple formats that will be included in the PIM. Additionally, Mother communities will play a major role in the collection of many data, for which they will be trained and supervised accordingly.

72. Participatory monitoring to ensure transparency and effectiveness in project implementation would be beneficial. Participatory monitoring is well suited for finding out how well project communication and awareness campaigns are understood by the people they are supposed to reach. It can be used to obtain feedback from all stakeholders as well as to improve communication among these stakeholders and to strengthen their voice. When stakeholders have greater voice and can make inputs into project decision-making, they have a greater sense of ownership of the project. Project will apply the already developed mechanisms for participatory monitoring and channelling its results to all stakeholders.

73. External evaluators will assess the impact of the components and sub-components at completion of the project. The base line data for each participating community will be recorded when the community joins the programme as well as for the sample communities (a separate survey) to be evaluated at project completion.

#### **Further information required to complete screening, if any**

74. There is no need for additional information to complete screening.

#### **Budgetary resources and schedule**

75. Not applicable.

#### **11. Record of consultations with beneficiaries, civil society, general public, etc.**

76. The project formulation team has undertaken consultations with government officials from state/local administration (e.g. agriculture, forestry, irrigation, range and pasture, animal resources) in Rufa'a, Es Soubagh, New Halfa, and Ed Dammer, and with local community members in selected communities (Tukoon in Gedarig State - Es Soubagh; Um Shadida in Kassala State – New Halfa; Ed Daraweesh, in Khartoum State – Abudelig; El Abaar in River Nile State – Ed Dammer). Field assessments and discussions with administration staff and local beneficiaries have facilitated the identification of local perceptions and know-how to cope with climate shocks, land use suitability, specific interventions/remedial measures and action plans necessary for building climate resilience and boosting the sustainable use of natural resources in the most effective way in each target zone (see Working Paper: BIRDP Project - Butana Ecological Zone Study).

77. A bottom up process of consulting a range of actors on natural resources governance constraints has taken place through eighteen community conferences attended by representatives of 139 communities. The conferences represented important platforms for the discussion of the main issues related to natural resource management in the Butana. Results of the discussions reveal common important issues, such as water scarcity problems for both humans and animals, the rising pressure on natural resources from agriculture and mining, the degradation problems of forests and rangelands, the wide gap in legislations and policies together with lack of law enforcement mechanism, the absence of government institutions responsible for natural resource management, and the rising risks associated with CC impacts.

## Appendix 2. Financial Management Assessment

1. A Financial Management Assessment (FMA) has been undertaken for BIRDP in October 2015 (as part of supervision mission) and control risk was rated as Medium. Inherent risk of Sudan is High as measured by Transparency International's Corruption Perceptions Index (CPI). The annual CPI in 2015 puts the country at the bottom of the list at 165th out of 167, scoring 12. No FM assessment was carried for the ICSP. Taking into account other control areas, the overall fiduciary risk assessment at design is assessed as High (see Appendix 3.2) and after implementation of the mitigation the residual financial management risk is rated Medium.

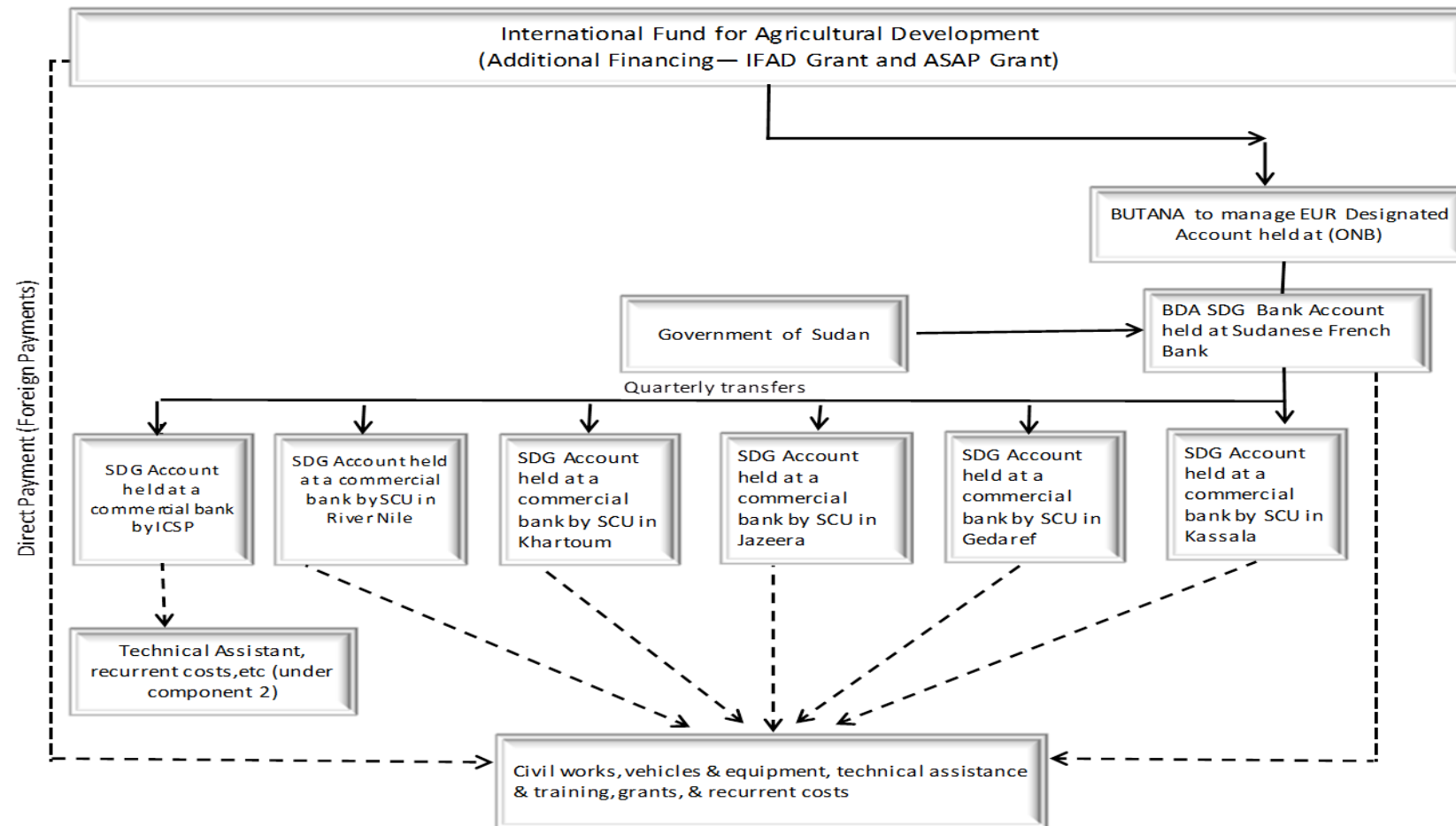
### Financial staffing

2. **BIRDP.** The Butana Development Agency (BDA) that acts as the central PMU of BIRDP, and is an independent agency that was formed by a presidential decree. The BIRDP covers five states of the River Nile, Khartoum, Jazeera, Gedaref and Kassala and each has a state coordination unit (SCU). The staff of the financial management unit of the BDA and SCUs consists of Financial Controller (FC) assisted by an accountant at the BDA, and an accountant seconded from government for each of the five SCU. The procurement and different technical units are separated from the financial management unit with exception of procurement at SCUs which is carried out by the SCUs Accountants. The FC has recently resigned and his replacement is not yet in place. To mitigate against the risk of the turnover in this key position, BDA will recruit competitively from the open market a qualified and experienced FC not later than the end of the 2<sup>nd</sup> quarter of 2016.
3. **ICSP.** The Finance Manager of ICSP is responsible for the overall financial management of the project. The Implementation Support Mission fielded in Feb 2016 by IFAD highlighted fundamental weakness in the financial management which requires an immediate action. To mitigate against this risk of low capacity FM staff, ICSP will recruit a qualified accountant competitively to be responsible for the ICSP funded by GEF and the additional financing.
4. **Budgeting.** Project will follow bottom up approach budgeting. Each of the five SCUs prepares its own AWPB in alignment with state budget and in accordance with beneficiaries needs - based on theoretically best estimates. AWPBs are then consolidated by Monitoring and Evaluation Specialist along with the BDA one in line with IFAD financing agreements and requirements. The consolidated AWPB is discussed between BDA and SCUs and final version is presented to the BDA Board of Directors (BOD) for approval. Subsequently, the approved AWPB by BDA BOD is discussed with MOFNP. ICSP will send its approved AWPB by the Steering Committee and MOFNP to BDA for consolidation and submission to IFAD for review and concurrence. The final AWPB should be submitted to IFAD two months before the start of each project year.
5. **Flow of funds/disbursements.** The Project will use available disbursement methods of replenishment, reimbursement and direct payments. It is expected that most expenditures will be paid through the Designated/Operating Account/s using the imprest mechanism. The ceiling authorized allocations will be based on budgets for six months for the two implementing agencies. BDA will use the existing BIRDP EUR Designated Account opened at Omdurman National Bank (ONB) in Khartoum for IFAD Loan to receive funds from IFAD Grant and SDG Operating Accounts at BDA and the five State Coordination Units levels. The funds will flow from IFAD Loan/ IFAD ASAP and Grant pool Designated Account to the BDA pooled Operating Account opened and maintained in the Sudanese French Bank in local currency of SDG. The funds then flow from the BDA pooled Operating Account to each of the SCUs pooled sub-operating bank accounts opened and maintained in different commercial banks at each of the five states. The operating and sub-operating accounts are/will be used to pay for the eligible expenditures incurred at BDA and SCUs levels. The pool Designated Account is/will be used mainly to transfer funds to the BDA Pooled Operating Account and rarely for payments such as project staff travel allowances on aboard trainings. The fund flows from the BDA pooled Operating Account to each of the five SCUs will be made on quarterly basis against proposed

activities submitted from SCUs, and subsequently reviewed by the technical and FM units and approved by the BDA Director. The ICSP, will also open an Operating Account in a bank acceptable to IFAD in SDG. This Operating Account will receive the fund from the Operating Account of BIRDP to pay for eligible expenditures mainly salaries and allowance and administrative costs, and activities under component 2. Flow of funds is included in Appendix 3. Transfers from BIRDP Operating Account to ICSP Operating Account will also be made on quarterly payments made on the basis of foreseen activities and cost estimates. Relevant expenditures incurred by ICSP will be reported on monthly basis to BIRDP in order to be incorporated in the in the BIRDP WA and financial reports.

6. **Internal Controls.** Segregation of duties exists with regard to preparing, reviewing and authoring transactions at BDA and SCUs levels although this is weakened with this turn over in the FC position. In addition, the internal controls currently in place are informal in the absence of an operational approved PIM, which is at draft stage and has not been finalised since the inception phase of the original Project. All internal control mechanisms will be detailed within the financial management manual which to be finalised before the disbursement of the additional financing can begin. Similarly for ICSP whereby current PIM will need to be updated to include the additional financing.
7. **Accounting systems, policies and procedures.** The existing Access based accounting system that is capable to generate various reports will be configured to include the additional financing before the disbursement of the additional financing can begin. Equally ICSP will procure an accounting software system. Beneficiaries' contributions in-kind or cash measurement and accounting and disclosures in the financial statement will be detailed in the PIM.
8. **Financial Reporting and Monitoring.** Financial Statements are prepared on the cash basis. The financial reports can be generated from accounting system and ICSP will submit monthly reports to BDA to facilitate timely consolidation. BDA will be responsible for consolidation and submission of accurate financial reports to IFAD as per General Condition and for preparing the consolidated financial statement for audit.
9. **Counterpart funding.** The counterpart funding to the existing BIRDP is neither timely nor sufficient. IFAD Loan proceeds have been used to pre-finance GoS funded activities. GoS should pay with no further delays to pre-finance from the Loan proceeds and to timely transfer its contribution to the existing and additional financing as per AWPB and financial agreement.
10. **Audits.** The National Audit Court of Sudan (NAC) will undertake the external audit of the Project funds (both BDA and ICSP) and the related counterpart funding in accordance with IFAD audit guidelines. A reputable internal audit firm will be engaged to perform the internal audit once 50% of additional financing is expended.
11. **Procurement.** In recent years, considerable investments (training, guidelines, and templates) have been made to improve the procurement performance. When respecting the revised procurement system put in place, BIRDP's procurements are up-to the mark. Procurement with community participation which took off slowly (2 years ago) has turned into a catalysing factor, and will be applied across all communities.

## Appendix 3: Flow of Funds





## Appendix 3.2: Summary of financial management risks and mitigating actions

FM risk category	Initial risk rating	Proposed FM risk mitigating measures	Residual risk rating
<b>A. Inherent Risks</b>			
Country Level. a) Transparency International rating in 2015 continued to put Sudan at 3rd from the bottom of the list, with a score of 1.2. b) Economy of Sudan is suffering from high inflation and wide currency fluctuations.	High	N/A	High
Entity and Project design. a) Project spread over five States and several Localities. b) Implementation will happen through two different management units of BDA/BIRDP and ICSP and coordination between both would be a challenge. c) Uncertainty of the outcomes of the on-going review by Government for BDA's structure and resources. .	High	a) BDA is ring-fenced and staff are/were hired from the market on a competitive basis. b) Each of the five States has a coordination unit staffed with seconded personnel from Government for the implementation of BIRDP Project. c) Steering committee will be established to ensure an effective coordination between ICSP and BIRDP management units is in place. d) Receipt from government a report of satisfactory details pertaining to strengthening BDA's staff, resources and long term sustainability is a disbursement condition from additional financing.	Medium
<b>B. Project Control Risks</b>			
1. Organization & Staffing. d) Adequate qualified staff, with prior knowledge of IFAD procedures. It is to be noted that BIRDP Financial Controller position is vacant with the recent departure of the post holder. e) Turnover in the senior financial management positions. f) Coordination between BIRDP PMU, States Coordination Units and ICSP PMU on financial matters would be a challenge.	High	a) Finance Controller of BIRDP to be recruited from the market before end of Q2 2016. Contract to be performance based. b) Qualified and experienced Finance and Administration Officer to be recruited for ICSP. Contract to be performance based. c) Existing finance staff of BIRDP at BDA and SCUs to take IFAD on-line training on Financial Management Operational Guidelines and Procedures. d) Overall coordination will remain within the ToR of the Financial Controller of BIRDP.	Medium
2. Budgeting. a) Project budget will follow a bottom up approach, however capacity at the beneficiary levels in creation of a budget is weak. b) Too many layers within the budget creation and approval process and coordination challenges. c) Overruns and unrealistic budgets.	High	a) Budget coordination will remain with the BIRDP PMU. b) State and Locality levels and ICSP PMU will receive assistance and trainings to ensure that the budgets are prepared in a realistic and appropriate manner. c) Existing staff of BIRDP PMU have an experience of preparation and consolidation of budgets as per IFAD requirement. d) BIRDP PMU will present the consolidated budget including ICSP to its Steering Committee/BoD and MoFNEP and ensure that timelines are	Medium

FM risk category	Initial risk rating	Proposed FM risk mitigating measures	Residual risk rating
		<p>maintained.</p> <p>e) BIRDP PMU will submit the consolidated budget two months before the start of the project financial years for IFAD review and concurrence.</p> <p>f) Interim financial reports, prepared by each SCU, ICSP and consolidated by BIRDP PMU, showing progress against budgets to be submitted to IFAD quarterly.</p> <p>g) IFAD office in Sudan will provide implementation support on processes and procedure.</p> <p>h) Monthly financial reports on budget versus actuals to be discussed timely by each PMU management to ensure any course of corrective action will be made for significant variances.</p>	
<p>3. Funds Flow &amp; Disbursements</p> <p>a) Limited abilities to forecast fund use leading to slow disbursement.</p> <p>b) Management of funds between the different States Coordination Units and ICSP PMU could result in liquidity issues, delayed fund flow and disbursement because of poor cash outflow forecast and bureaucratic processes at BIRDP PMU.</p> <p>c) Counterpart funds is neither sufficient nor timely and do not flow to project bank accounts, per the commitment, which will impact and increase the risk on special account funds, which could be utilized in lieu of counterpart funds.</p>	High	<p>a) Central BIRDP PMU will transfer funds to SCUs and ICSP PMU on quarterly basis, based on approved AWPB.</p> <p>b) Continuous follow-up of the Flow of Fund arrangements to ensure any course corrections will be made to mitigate risk of liquidity problems.</p> <p>c) BIRDP PMU will maintain control of funds disbursed to State Coordination Units and ICSP.</p> <p>d) Counterpart funds to be included in the budget which will be submitted to GoS/MoFNEP prior to the country annual budgeting process.</p> <p>e) GoS should repay the funds to special/operating account which was used under the original loan to pre-finance costs budgeted under counterpart contribution.</p> <p>f) GoS funds should pay in advance into the dedicated account that is designated for the project every quarter.</p>	Medium
<p>4. Internal Control.</p> <p>a) Weak control structures magnified with vast distances between PMUs and States.</p> <p>b) Remoteness of villages where expenditures are going to take place weaken the internal control systems.</p>	High	<p>a) Financial implementation manuals will be a condition for disbursement of additional financing authorised allocations and knowledge of the same will be mandatory for all staff involved in financial management.</p> <p>b) An internal auditor /firm will be hired once 50% of the additional financing is expended. ToR to be cleared by IFAD. The role will be: to ensure controls (as defined in the manuals).</p>	High
<p>5. Accounting Systems, Policies &amp; Procedures.</p> <p>a) Manual or Excel based accounting prevails for additional financing .</p> <p>b) Lack of consistency with different layers within the Project structure in application of accounting policies and procedures.</p>	High	<p>a) The existing BIRDP accounting software system will be configured to include the additional financing which is a disbursement condition on the additional financing.</p> <p>b) ICSP will procure an accounting software system as disbursement condition.</p> <p>c) Key finance staff will be required to take and pass IFAD's e-learning on financial management.</p>	Medium



<b>FM risk category</b>	<b>Initial risk rating</b>	<b>Proposed FM risk mitigating measures</b>	<b>Residual risk rating</b>
c) Beneficiaries'/Communities contributions measurement and accounting.		d) Internal control mitigation measure mentioned above will ensure that consistency is maintained for application of policies and procedures e) PIM will detail the beneficiaries' contribution measurement and accounting both in kind and in cash.	
6. Reporting & Monitoring. a) Unable to produce financial management reports. b) Linkages through all levels to ensure that funds are properly tracked, recorded and reported. c) Periodic monitoring of financial reports are not prepared.	High	a) BIRDP Accounting software to be able to produce financial reports. b) ICSP to provide financial management report regularly to BIRDP PMU for review and consolidation. c) Reporting and monitoring requirements will be detailed within PIMs. d) PMUs manage finances with IFAD procedures and all processes documented in the PIM.	Medium
7. Internal Audit. a) Internal audit function does not exist at the PMUs , states and locality levels.	High	a) Private internal auditor will be hired at the PMU level when 50% of the additional financing is expended. The internal audit to cover both PMUs and the five States coordination units.	Medium
8. Auditing a) National Audit Court(NAC) but is not in full compliance with IFAD Audit Guidelines with regard to number of audit opinions required. b) Staffing within the NAC is limited therefore delaying the delivery of final audit reports.	Medium	a) Ensure continued dialogue with NAC to ensure that IFAD requirements are fulfilled. b) BDA will ensure expedient follow up to ensure that that NAO has scheduled programme to meet audit delivery time-frame of the consolidated audit report for both BIRDP and ICSP.	Low
Programme Fiduciary Risk at design: OVERALL FM RISK	HIGH		MEDIUM



## Appendix 4. Cost Summary and Detailed cost tables

Table 1: Components Project Cost Summary

	(SDG '000)			(US\$ '000)			%	% Total
	Local	Foreign	Total	Local	Foreign	Total	Foreign Exchange	Base Costs
<b>A. Policy and Institution Building</b>								
Development of NR Governance Framework	1 387	113	1 500	243	20	263	8	2
Institutional Capacity Building	3 252	795	4 047	570	139	710	20	4
Know ledge Management	2 421	206	2 627	425	36	461	8	3
<b>Subtotal Policy and Institution Building</b>	<b>7 060</b>	<b>1 113</b>	<b>8 173</b>	<b>1 239</b>	<b>195</b>	<b>1 434</b>	<b>14</b>	<b>9</b>
<b>B. Natural Resources Management</b>								
Development of Water Infrastructure	13 790	5 387	19 177	2 419	945	3 364	28	21
Rainw ater Harvesting, Range and Forest Management	11 921	2 969	14 890	2 091	521	2 612	20	16
Crossings and Rural Roads	13 691	4 728	18 420	2 402	830	3 232	26	20
<b>Subtotal Natural Resources Management</b>	<b>39 403</b>	<b>13 084</b>	<b>52 486</b>	<b>6 913</b>	<b>2 295</b>	<b>9 208</b>	<b>25</b>	<b>57</b>
<b>C. Livestock &amp; Marketing Development</b>								
Operation of Livestock Markets and Other Infrastructure	691	261	952	121	46	167	27	1
Animal Husbandry and Management	572	-	572	100	-	100	-	1
<b>Subtotal Livestock &amp; Marketing Development</b>	<b>1 264</b>	<b>261</b>	<b>1 524</b>	<b>222</b>	<b>46</b>	<b>267</b>	<b>17</b>	<b>2</b>
<b>D. Community development &amp; Business Options</b>								
Community Development Committees, Interest Groups and Netw orks	3 006	499	3 505	527	88	615	14	4
Business Options through Microfinance	5 248	1 388	6 635	921	243	1 164	21	7
Community Extension Agents and Netw orks	1 871	46	1 917	328	8	336	2	2
<b>Subtotal Community development &amp; Business Options</b>	<b>10 125</b>	<b>1 932</b>	<b>12 057</b>	<b>1 776</b>	<b>339</b>	<b>2 115</b>	<b>16</b>	<b>13</b>
<b>E. Project Management</b>								
Butana Development Agency	11 177	504	11 680	1 961	88	2 049	4	13
State Coordination Units	6 026	486	6 512	1 057	85	1 143	7	7
<b>Subtotal Project Management</b>	<b>17 203</b>	<b>990</b>	<b>18 193</b>	<b>3 018</b>	<b>174</b>	<b>3 192</b>	<b>5</b>	<b>20</b>
<b>Total BASELINE COSTS</b>	<b>75 054</b>	<b>17 380</b>	<b>92 434</b>	<b>13 167</b>	<b>3 049</b>	<b>16 216</b>	<b>19</b>	<b>100</b>
Physical Contingencies	755	356	1 111	132	63	195	32	1
Price Contingencies	278	60	337	49	10	59	18	-
<b>Total PROJECT COSTS</b>	<b>76 087</b>	<b>17 795</b>	<b>93 882</b>	<b>13 349</b>	<b>3 122</b>	<b>16 471</b>	<b>19</b>	<b>102</b>

**Table 2: Components by Financiers**

	IFAD		ASAP		Communities		The Government		Total		Local (Excl. For. Exch. Taxes)		Duties & Taxes
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%			
<b>A. Policy and Institution Building</b>													
Development of NR Governance Framework	68	25.8	170	64.2	-	-	26	10.0	264	1.6	20	218	26
Institutional Capacity Building	378	52.8	270	37.6	-	-	68	9.5	716	4.3	142	506	68
Knowledge Management	293	63.4	141	30.4	-	-	29	6.2	463	2.8	36	398	29
<b>Subtotal Policy and Institution Building</b>	<b>740</b>	<b>51.3</b>	<b>580</b>	<b>40.2</b>	<b>-</b>	<b>-</b>	<b>123</b>	<b>8.6</b>	<b>1 443</b>	<b>8.8</b>	<b>198</b>	<b>1 122</b>	<b>123</b>
<b>B. Natural Resources Management</b>													
Development of Water Infrastructure	-	-	2 275	65.8	695	20.1	488	14.1	3 457	21.0	972	1 997	488
Rainwater Harvesting, Range and Forest Management	1 957	74.3	154	5.9	251	9.5	270	10.3	2 632	16.0	530	1 850	252
Crossings and Rural Roads	2 852	86.2	-	-	-	-	457	13.8	3 309	20.1	852	1 999	457
<b>Subtotal Natural Resources Management</b>	<b>4 808</b>	<b>51.2</b>	<b>2 429</b>	<b>25.8</b>	<b>945</b>	<b>10.1</b>	<b>1 215</b>	<b>12.9</b>	<b>9 398</b>	<b>57.1</b>	<b>2 355</b>	<b>5 846</b>	<b>1 197</b>
<b>C. Livestock &amp; Marketing Development</b>													
Operation of Livestock Markets and Other Infrastructure	117	68.5	-	-	32	18.8	22	12.8	171	1.0	47	102	22
Animal Husbandry and Management	98	96.9	-	-	-	-	3	3.1	101	0.6	-	98	3
<b>Subtotal Livestock &amp; Marketing Development</b>	<b>215</b>	<b>79.0</b>	<b>-</b>	<b>-</b>	<b>32</b>	<b>11.8</b>	<b>25</b>	<b>9.2</b>	<b>272</b>	<b>1.7</b>	<b>47</b>	<b>200</b>	<b>25</b>
<b>D. Community development &amp; Business Options</b>													
Community Development Committees, Interest Groups and Networks	558	89.3	-	-	-	-	67	10.7	625	3.8	90	468	67
Business Options through Microfinance	951	80.4	-	-	-	-	232	19.6	1 183	7.2	248	703	232
Community Extension Agents and Networks	326	96.7	-	-	-	-	11	3.3	338	2.0	8	318	11
<b>Subtotal Community development &amp; Business Options</b>	<b>1 836</b>	<b>85.6</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>310</b>	<b>14.4</b>	<b>2 145</b>	<b>13.0</b>	<b>346</b>	<b>1 490</b>	<b>310</b>
<b>E. Project Management</b>													
Butana Development Agency	1 609	78.1	-	-	-	-	452	21.9	2 061	12.5	90	1 931	41
State Coordination Units	1 105	96.0	-	-	-	-	46	4.0	1 151	7.0	87	1 044	20
<b>Subtotal Project Management</b>	<b>2 714</b>	<b>84.5</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>499</b>	<b>15.5</b>	<b>3 212</b>	<b>19.5</b>	<b>176</b>	<b>2 975</b>	<b>61</b>
<b>Total PROJECT COSTS</b>	<b>10 313</b>	<b>62.6</b>	<b>3 009</b>	<b>18.3</b>	<b>978</b>	<b>5.9</b>	<b>2 172</b>	<b>13.2</b>	<b>16 471</b>	<b>100.0</b>	<b>3 122</b>	<b>11 633</b>	<b>1 715</b>

**Table 3: Expenditure Accounts by Financiers**

	IFAD		ASAP		Communities		The Government		Total		For. Exch.	Local (Excl. Taxes)	Duties & Taxes
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%			
<b>I. Investment Costs</b>													
<b>A. Civil works</b>	2 836	43.0	2 084	31.6	727	11.0	944	14.3	6 591	40.0	1 976	3 670	944
<b>B. Equipment</b>													
Vehicles	493	65.8	-	-	-	-	256	34.2	750	4.6	197	296	256
Machinery	284	87.1	-	-	16	5.0	26	7.9	325	2.0	270	30	26
Computers	18	85.5	-	-	-	-	3	14.5	21	0.1	14	5	3
Other equipment	109	66.6	31	18.8	-	-	24	14.5	164	1.0	49	91	24
<b>Subtotal Equipment</b>	905	71.8	31	2.5	16	1.3	309	24.5	1 261	7.7	530	422	309
<b>C. Furniture</b>	58	85.5	-	-	-	-	10	14.5	68	0.4	-	58	10
<b>D. Technical assistance</b>													
<b>1. Specialist services</b>													
Local technical assistance	2 569	83.1	294	9.5	-	-	228	7.4	3 091	18.8	-	2 863	228
International technical assistance	136	85.8	23	14.2	-	-	-	-	158	1.0	111	47	-
<b>Subtotal Specialist services</b>	2 704	83.2	316	9.7	-	-	228	7.0	3 249	19.7	111	2 910	228
2. Salaries	75	79.8	-	-	-	-	19	20.2	93	0.6	-	93	-
3. Field Allow ances	56	19.1	233	79.7	-	-	3	1.2	293	1.8	-	289	3
4. Inputs or materials	1 205	60.2	344	17.2	235	11.7	219	11.0	2 003	12.2	357	1 427	219
<b>Subtotal Technical assistance</b>	4 040	71.7	894	15.9	235	4.2	470	8.3	5 638	34.2	467	4 719	451
<b>E. Grant</b>	251	99.5	-	-	-	-	1	0.5	253	1.5	50	201	1
<b>Total Investment Costs</b>	8 090	58.6	3 009	21.8	978	7.1	1 734	12.6	13 810	83.8	3 024	9 071	1 715
<b>II. Recurrent Costs</b>													
A. Operations and maintenance	393	80.2	-	-	-	-	97	19.8	490	3.0	98	392	-
B. Salaries	1 619	83.9	-	-	-	-	311	16.1	1 929	11.7	-	1 929	-
C. Allow ances	211	87.5	-	-	-	-	30	12.5	241	1.5	-	241	-
<b>Total Recurrent Costs</b>	2 223	83.5	-	-	-	-	438	16.5	2 661	16.2	98	2 563	-
<b>Total PROJECT COSTS</b>	10 313	62.6	3 009	18.3	978	5.9	2 172	13.2	16 471	100.0	3 122	11 633	1 715

**Table 4: Expenditure Accounts Project Cost Summary**

	(SDG '000)			(US\$ '000)			Foreign Exchange	Base Costs
	Local	Foreign	Total	Local	Foreign	Total		
<b>I. Investment Costs</b>								
<b>A. Civil works</b>	25 575	10 953	36 529	4 487	1 922	6 409	30	40
<b>B. Equipment</b>								
Vehicles	3 063	1 094	4 157	537	192	729	26	4
Machinery	307	1 489	1 796	54	261	315	83	2
Computers	43	76	119	7	13	21	64	-
Other equipment	636	271	907	112	48	159	30	1
<b>Subtotal Equipment</b>	4 048	2 931	6 979	710	514	1 224	42	8
<b>C. Furniture</b>	377	-	377	66	-	66	-	-
<b>D. Technical assistance</b>								
<b>1. Specialist services</b>								
Local technical assistance	17 554	-	17 554	3 080	-	3 080	-	19
International technical assistance	269	628	898	47	110	158	70	1
<b>Subtotal Specialist services</b>	17 824	628	18 452	3 127	110	3 237	3	20
2. Salaries	530	-	530	93	-	93	-	1
3. Field Allow ances	1 662	-	1 662	292	-	292	-	2
4. Inputs or materials	9 346	2 025	11 371	1 640	355	1 995	18	12
<b>Subtotal Technical assistance</b>	29 362	2 654	32 016	5 151	466	5 617	8	35
<b>E. Grant</b>	1 150	286	1 436	202	50	252	20	2
<b>Total Investment Costs</b>	60 513	16 823	77 336	10 616	2 951	13 568	22	84
<b>II. Recurrent Costs</b>								
<b>A. Operations and maintenance</b>	2 225	556	2 782	390	98	488	20	3
<b>B. Salaries</b>	10 948	-	10 948	1 921	-	1 921	-	12
<b>C. Allowances</b>	1 367	-	1 367	240	-	240	-	1
<b>Total Recurrent Costs</b>	14 541	556	15 098	2 551	98	2 649	4	16
<b>Total BASELINE COSTS</b>	75 054	17 380	92 434	13 167	3 049	16 216	19	100
Physical Contingencies	755	356	1 111	132	63	195	32	1
Price Contingencies	278	60	337	49	10	59	18	-
<b>Total PROJECT COSTS</b>	76 087	17 795	93 882	13 349	3 122	16 471	19	102

**Table 5: Project Components by Year -- Base Costs**

	2017	2018	2019	Total
<b>A. Policy and Institution Building</b>				
Development of NR Governance Framework	112	103	48	264
Institutional Capacity Building	373	237	106	716
Knowledge Management	216	142	105	463
<b>Subtotal Policy and Institution Building</b>	<b>702</b>	<b>483</b>	<b>259</b>	<b>1 443</b>
<b>B. Natural Resources Management</b>				
Development of Water Infrastructure	1 470	1 115	871	3 457
Rainwater Harvesting, Range and Forest Management	1 273	974	384	2 632
Crossings and Rural Roads	2 041	1 268	-	3 309
<b>Subtotal Natural Resources Management</b>	<b>4 785</b>	<b>3 357</b>	<b>1 256</b>	<b>9 398</b>
<b>C. Livestock &amp; Marketing Development</b>				
Operation of Livestock Markets and Other Infrastructure	68	68	36	171
Animal Husbandry and Management	52	29	20	101
<b>Subtotal Livestock &amp; Marketing Development</b>	<b>120</b>	<b>97</b>	<b>55</b>	<b>272</b>
<b>D. Community development &amp; Business Options</b>				
Community Development Committees, Interest Groups and Networks	270	233	122	625
Business Options through Microfinance	638	376	169	1 183
Community Extension Agents and Networks	134	129	75	338
<b>Subtotal Community development &amp; Business Options</b>	<b>1 042</b>	<b>737</b>	<b>366</b>	<b>2 145</b>
<b>E. Project Management</b>				
Butana Development Agency	748	618	696	2 061
State Coordination Units	473	338	339	1 151
<b>Subtotal Project Management</b>	<b>1 221</b>	<b>956</b>	<b>1 035</b>	<b>3 212</b>
<b>Total PROJECT COSTS</b>	<b>7 869</b>	<b>5 631</b>	<b>2 970</b>	<b>16 471</b>

**Table 6: Disbursements by Semesters and Government Cash Flow**

	Financing Available			Total	Costs to be Financed	The Government	Cumulative Cash Flow
	IFAD	ASAP	Communities		Project		
	Amount	Amount	Amount		Costs	Cash Flow	
1	2 534	661	207	3 403	3 935	-532	-532
2	2 534	661	207	3 403	3 935	-532	-1 064
3	1 798	499	159	2 455	2 815	-360	-1 424
4	1 798	499	159	2 455	2 815	-360	-1 784
5	824	344	123	1 291	1 485	-194	-1 978
6	824	344	123	1 291	1 485	-194	-2 172
<b>Total</b>	10 313	3 009	978	14 299	16 471	-2 172	-2 172



**Table 7: Component 1. Policy and Institutional Building**

	Unit Cost	Base Cost ('000)				Expenditures by Financiers ('000)											
		2017	2018	2019	Total	IFAD				ASAP				The Government			
						2017	2018	2019	Total	2017	2018	2019	Total	2017	2018	2019	Total
<b>I. Investment Costs</b>																	
<b>A. Sub-component 1-1. Development of NR Governance Framework</b>																	
1. National Policy Advisor	6.000	48.0	48.0	24.0	120.0	-	-	-	-	48.1	48.2	24.2	120.5	8.2	8.2	4.1	20.5
2. Admin. Assistant - Policy Team	500	6.0	6.0	6.0	18.0	6.0	6.0	6.0	18.1	-	-	-	-	-	-	-	-
<b>3. Legislation for NRM</b>																	
a. Legal Gaps Identified and Addressed	3.500	17.5	17.5	-	35.0	-	-	-	-	17.5	17.6	-	35.1	3.0	3.0	-	6.0
<b>4. Butana Conferences</b>																	
International Sub-zone Conferences	175,088	10.5	5.3	-	15.8	10.5	5.3	-	15.8	-	-	-	-	-	-	-	-
Locality Level Conferences	1.000	5.0	4.0	-	9.0	5.0	4.0	-	9.0	-	-	-	-	-	-	-	-
State Level Conferences	2.000	4.0	6.0	-	10.0	4.0	6.0	-	10.0	-	-	-	-	-	-	-	-
Butana Level Interstate Conferences	5.000	-	-	10.0	10.0	-	-	10.1	10.1	-	-	-	-	-	-	-	-
Establishing Community Level NRM Regulations & By-law s	200	5.0	5.0	4.0	14.0	-	-	-	-	5.0	5.0	4.0	14.1	-	0.0	-	0.0
Firming up 5-Year Business Plans for BDA	5.000	5.0	-	-	5.0	5.0	-	-	5.0	-	-	-	-	-	-	-	-
Subtotal Butana Conferences		29.5	20.3	14.0	63.8	24.5	15.3	10.1	49.9	5.0	5.0	4.0	14.1	-	0.0	-	0.0
Subtotal Sub-component 1-1. Development of NR Governance Framework		101.0	91.8	44.0	236.8	30.6	21.3	16.1	68.0	70.6	70.8	28.2	169.6	11.2	11.2	4.1	26.4
<b>B. Sub-component 1-2. Institutional Capacity Building</b>																	
<b>1. Policy &amp; Strategy</b>																	
<b>a. Environmental Community Village Plans Formulation</b>																	
Field Days for Formulation of Env. Plans at Community Level	33.600	11.2	11.2	11.2	33.6	-	-	-	-	11.2	11.2	11.3	33.8	-	-	-	-
Community Meetings for Formulation of Plans	100	28.0	14.0	7.0	49.0	-	-	-	-	28.0	14.1	7.1	49.2	-	-	-	-
Subtotal Environmental Community Village Plans Formulation		39.2	25.2	18.2	82.6	-	-	-	-	39.2	25.3	18.4	82.9	-	-	-	-
<b>b. Grazing Plan with Strategies in Place</b>																	
Range Expert in Formulation of 9 Grazing Action Plans	6.000	12.0	-	-	12.0	-	-	-	-	12.0	-	-	12.0	2.0	-	-	2.0
Conference for Endorsement at Sub-zone Level	1.200	10.8	-	-	10.8	-	-	-	-	10.8	-	-	10.8	1.8	-	-	1.8
Subtotal Grazing Plan with Strategies in Place		22.8	-	-	22.8	-	-	-	-	22.8	-	-	22.8	3.9	-	-	3.9
Subtotal Policy & Strategy		62.0	25.2	18.2	105.4	-	-	-	-	62.1	25.3	18.4	105.7	3.9	-	-	3.9
2. Senior Intitutional Advisor (National TA)	6.000	18.0	12.0	12.0	42.0	18.0	12.1	12.1	42.2	-	-	-	-	3.1	2.0	2.1	7.2
3. Other National TA for Institutional Development	6.000	24.0	18.0	18.0	60.0	24.0	18.1	18.1	60.3	-	-	-	-	4.1	3.1	3.1	10.2
4. Private Sector and Business Development Advisor	22.500	22.5	22.5	22.5	67.5	22.5	22.6	22.7	67.8	-	-	-	-	-	-	-	-
<b>5. BoD/Task Force/Steering Committee Members Meeting</b>																	
Board of Director Meetings	3.000	12.0	12.0	12.0	36.0	12.0	12.1	12.1	36.2	-	-	-	-	2.0	2.0	2.1	6.1
Steering Committee	2.000	8.0	8.0	8.0	24.0	8.0	8.0	8.1	24.1	-	-	-	-	1.4	1.4	1.4	4.1
Subtotal BoD/Task Force/Steering Committee Members Meeting		20.0	20.0	20.0	60.0	20.0	20.1	20.2	60.3	-	-	-	-	3.4	3.4	3.4	10.2
6. Establishing MoUs between BDA and Localities	500	9.0	-	-	9.0	9.0	-	-	9.0	-	-	-	-	1.5	-	-	1.5
<b>7. BDA Services on a Cost-recovery Basis</b>																	
Goods on Pilot Basis	37.500	25.1	12.4	-	37.5	25.9	12.8	-	38.7	-	-	-	-	4.4	2.2	-	6.6
Works on Pilot Basis	45.350	30.4	15.0	-	45.4	31.2	15.4	-	46.6	-	-	-	-	5.3	2.6	-	7.9
Sevices on Pilot Basis	15.000	10.1	5.0	-	15.0	10.1	5.0	-	15.0	-	-	-	-	1.7	0.8	-	2.6
Field Days	6.000	2.0	2.0	2.0	6.0	2.0	2.0	2.1	6.0	-	-	-	-	-	-	-	-
Subtotal DA Services on a Cost-recovery Basis		67.5	34.3	2.0	103.9	69.2	35.2	2.1	106.4	-	-	-	-	11.4	5.6	-	17.1

**Table 7: Component 1. Policy and Institutional Building – cont'd**

	Unit Cost	Base Cost ('000)				Expenditures by Financiers ('000)											
		2017	2018	2019	Total	IFAD				ASAP				The Government			
						2017	2018	2019	Total	2017	2018	2019	Total	2017	2018	2019	Total
I. Investment Costs																	
8. Meetings between Communities, Private Sector and Civil Society Organizations	178,07	7.1	7.1	3.6	17.8	7.1	7.2	3.6	17.9	-	-	-	-	0.1	0.1	0.1	0.3
9. Support to Technical Unit at Locality (to be established)	9,000	9.0	-	-	9.0	9.3	-	-	9.3	-	-	-	-	1.6	-	-	1.6
10. Training of Local Staff and Service Providers	35,088	2.6	2.6	-	5.3	2.6	2.6	-	5.3	-	-	-	-	0.4	0.4	-	0.9
11. Community & Pastoralists Land Use Maps																	
International TA for Land Use Plans	22,500	22.5	-	-	22.5	-	-	-	-	22.5	-	-	22.5	-	-	-	-
National TA for Climate Change & Environment	6,000	24.0	36.0	-	60.0	-	-	-	-	24.0	36.2	-	60.2	4.1	6.1	-	10.2
Field Days for staff preparing Land Use Plans	16,000	4.0	12.0	-	16.0	-	-	-	-	4.0	12.1	-	16.1	-	-	-	-
Community Meetings for Preparation of Land Use Plans	100	5.0	15.0	-	20.0	-	-	-	-	5.0	15.1	-	20.1	-	-	-	-
Inter-Community Meetings for Preparation of Land Use Plans	200	4.0	10.0	-	14.0	-	-	-	-	4.0	10.0	-	14.1	-	-	-	-
Remote Sensing and GIS Equipment	30,000	30.0	-	-	30.0	-	-	-	-	30.9	-	-	30.9	5.3	-	-	5.3
Subtotal Community & Pastoralists Land Use Maps		89.5	73.0	-	162.5	-	-	-	-	90.5	73.3	-	163.9	9.3	6.1	-	15.5
Subtotal Sub-component 1-2. Institutional Capacity Building		331.3	214.7	96.3	642.3	181.8	117.8	78.7	378.3	152.6	98.6	18.4	269.6	38.9	20.9	8.6	68.4
C. Sub-component 1.3 Knowledge Management																	
1. Knowledge Management																	
Support to KM Strategy to BIRDP Portfolio though CCU, etc.	5,400	1.8	1.8	1.8	5.4	1.8	1.8	1.8	5.4	-	-	-	-	-	-	-	-
Support on Climate Smart Agriculture Documents and Dissemination	2,000	40.0	20.0	20.0	80.0	-	-	-	-	40.1	20.1	20.2	80.3	6.8	3.4	3.4	13.7
Subtotal nowledge Management		41.8	21.8	21.8	85.4	1.8	1.8	1.8	5.4	40.1	20.1	20.2	80.3	6.8	3.4	3.4	13.7
2. Studies & Research on ENRM	2,000	20.0	20.0	20.0	60.0	-	-	-	-	20.0	20.1	20.2	60.3	2.4	2.4	2.4	7.2
3. Young Professional Program																	
Identification, Recruitment & Allow ances	1,200	120.0	72.0	48.0	240.0	120.2	72.3	48.4	240.9	-	-	-	-	-	-	-	-
Butana Region Policy on Young Professionals	3,000	3.0	-	-	3.0	3.0	-	-	3.0	-	-	-	-	0.3	-	-	0.3
Subtotal oung Professional Program		123.0	72.0	48.0	243.0	123.2	72.3	48.4	243.9	-	-	-	-	0.3	-	-	0.3
4. BDA Knowledge Outreach																	
TA for Documenting Success Stories & Extension Materials	4,500	4.5	4.5	-	9.0	4.5	4.5	-	9.0	-	-	-	-	0.8	0.8	-	1.5
Editing & Printing of Extension Materials	35,000	14.0	14.0	7.0	35.0	14.0	14.1	7.1	35.1	-	-	-	-	2.4	2.4	1.2	6.0
Subtotal DA Knowledge Outreach		18.5	18.5	7.0	44.0	18.5	18.6	7.1	44.2	-	-	-	-	3.1	3.2	1.2	7.5
Subtotal Sub-component 1.3 Knowledge Management		203.3	132.3	96.8	432.4	143.5	92.7	57.2	293.5	60.1	40.2	40.3	140.6	12.6	9.0	7.0	28.6
Total		635.6	438.8	237.1	1 311.5	355.9	231.9	152.0	739.8	283.3	209.6	86.9	579.8	62.6	41.0	19.8	123.4

**Table 8: Component 2: Natural Resources Management**

	Expenditures by Financiers ('000)																				
	Base Cost ('000)				IFAD				ASAP				Communities				The Government				
	Unit Cost	2017	2018	2019	Total	2017	2018	2019	Total	2017	2018	2019	Total	2017	2018	2019	Total	2017	2018	2019	Total
I. Investment Costs																					
A. Sub-component 2-1. Development of Water Infrastructure																					
1. Construction and rehabilitation of Drinking Water Systems																					
Technical Assistance for designing water structures (Water Infrastructure Advisor)	6.000	36.0	30.0	24.0	90.0	-	-	-	-	36.1	30.1	24.2	90.4	-	-	-	-	6.1	5.1	4.1	15.4
Construction of water yards	40.000	400.0	320.0	280.0	1 000.0	-	-	-	-	308.0	247.1	216.9	771.9	102.7	82.4	72.3	257.3	69.8	56.0	49.2	175.0
Construction of hafirs	60.000	300.0	240.0	180.0	720.0	-	-	-	-	231.0	185.3	139.4	555.7	77.0	61.8	46.5	185.2	52.4	42.0	31.6	126.0
Construction and installation of cisterns	10.000	100.0	100.0	80.0	280.0	-	-	-	-	77.0	77.2	62.0	216.2	25.7	20.7	17.5	64.9	17.5	14.0	11.0	42.5
Construction of dams	70.000	350.0	210.0	140.0	700.0	-	-	-	-	269.5	162.2	108.4	540.1	89.8	54.1	36.1	180.0	61.1	36.8	24.6	122.4
Subtotal Construction and rehabilitation of Drinking Water Systems		1 186.0	900.0	704.0	2 790.0	-	-	-	-	921.4	702.0	550.9	2 174.3	295.1	223.9	175.6	694.6	206.8	157.4	123.5	487.7
2. Water Infrastructures Management																					
Field days with Communities Regarding Water Infrastructure	5.000	2.0	1.7	1.4	5.0	-	-	-	-	2.0	1.7	1.4	5.0	-	-	-	-	-	-	-	-
Water Users Training & Capacity Building on Infrastructure Management	5.000	45.0	30.0	20.0	95.0	-	-	-	-	45.1	30.1	20.2	95.4	-	-	-	-	-	-	-	-
Subtotal Water Infrastructures Management		47.0	31.7	21.4	100.0	-	-	-	-	47.1	31.8	21.5	100.4	-	-	-	-	-	-	-	-
Subtotal Sub-component 2-1. Development of Water Infrastructure		1 233.0	931.7	725.4	2 890.0	-	-	-	-	968.5	733.8	572.4	2 274.6	295.1	223.9	175.6	694.6	206.8	157.4	123.5	487.7
B. Sub-component 2-2. Rainwater Harvesting, Range and Forest Management																					
1. Sustainable Land Management																					
Management Practices with focus on Public Range and Forest Land	0.75	56.3	37.5	18.8	112.5	58.0	38.8	19.5	116.3	-	-	-	-	-	-	-	-	-	0.0	0.0	0.0
Introduce Modified Traditional Terrace for Crop Land	0.75	15.0	7.5	7.5	30.0	7.7	3.9	3.9	15.5	-	-	-	-	7.7	3.9	3.9	15.5	0.0	0.0	-	0.0
Introduce Improved Depression Cultivation	1.25	0.6	0.3	0.3	1.3	0.3	0.2	0.2	0.6	-	-	-	-	0.3	0.2	0.2	0.6	-	0.0	-	0.0
Field Days for Land Management Techniques	14.000	14.0	8.8	5.2	28.0	14.0	8.9	5.2	28.1	-	-	-	-	-	-	-	-	-	-	-	-
Subtotal Sustainable Land Management		85.9	54.1	31.7	171.8	80.1	51.7	28.7	160.5	-	-	-	-	8.1	4.0	4.1	16.2	0.0	0.0	0.0	0.0
2. Irrigation System																					
Irrigation Systems Development	1.500	75.0	45.0	30.0	150.0	-	-	-	-	56.3	33.9	22.7	112.9	18.8	11.3	7.6	37.6	6.4	3.8	2.6	12.8
Field Days Supporting Establishing Irrigation Systems	1.750	1.8	1.1	0.7	3.5	-	-	-	-	1.8	1.1	0.7	3.5	-	-	-	-	-	-	-	-
Subtotal Irrigation System		76.8	46.1	30.7	153.5	-	-	-	-	58.1	35.0	23.4	116.4	18.8	11.3	7.6	37.6	6.4	3.8	2.6	12.8
3. Training on Water Harvesting & Land Management Techniques																					
Community Training on WH and LM	125	12.5	18.8	6.3	37.5	-	-	-	-	12.5	18.8	6.3	37.7	-	-	-	-	-	-	-	-
Field days for Support for the Training	3.850	1.3	1.9	0.7	3.9	1.3	1.9	0.7	3.9	-	-	-	-	-	-	-	-	0.0	-	-	0.0
Subtotal Training on Water Harvesting & Land Management Techniques		13.8	20.7	6.9	41.4	1.3	1.9	0.7	3.9	12.5	18.8	6.3	37.7	-	-	-	-	0.0	-	-	0.0
4. Jubraka																					
Scaling-up Jubraka by Communities (Goods and Operating Services)	250	250.0	200.0	175.0	625.0	187.8	150.7	132.2	470.7	-	-	-	-	62.6	50.2	44.1	156.9	25.5	20.5	18.0	64.0
Field days to Establish Individual HH home gardens - 10 per days	17.000	6.8	5.4	4.8	17.0	6.8	5.5	4.8	17.1	-	-	-	-	-	-	-	-	-	-	-	-
Subtotal Jubraka		256.8	205.4	179.8	642.0	194.6	156.1	137.0	487.8	-	-	-	-	62.6	50.2	44.1	156.9	25.5	20.5	18.0	64.0
5. Commercial Household tree nurseries																					
Establish Commercial HH tree nurseries (Goods & Operating Services)	70	7.0	7.0	5.6	19.6	5.3	5.3	4.2	14.8	-	-	-	-	1.8	1.8	1.4	4.9	0.7	0.7	0.6	2.0
Field days to establish Commercial HH Tree Nurseries	10.360	3.7	3.7	2.9	10.4	3.7	3.7	2.9	10.4	-	-	-	-	-	-	-	-	-	-	-	-
Subtotal Commercial Household tree nurseries		10.7	10.7	8.5	30.0	9.0	9.0	7.2	25.2	-	-	-	-	1.8	1.8	1.4	4.9	0.7	0.7	0.6	2.0
6. Sand Dune Fixation																					
Sand Dune Fixation (Goods & Operating Services)	500	25.0	22.5	5.0	52.5	18.8	17.0	3.8	39.5	-	-	-	-	6.3	5.7	1.3	13.2	2.6	2.3	0.5	5.4
Field days to Scale-up Sand Dune Fixation	5.600	2.0	2.0	1.6	5.6	2.0	2.0	1.6	5.6	-	-	-	-	-	-	-	-	-	-	-	-
Subtotal Sand Dune Fixation		27.0	24.5	6.6	58.1	20.8	19.0	5.4	45.1	-	-	-	-	6.3	5.7	1.3	13.2	2.6	2.3	0.5	5.4
7. Improve Range and Forest Management - Focus on Community Owned/Managed																					
Improve Protection and Managemnet of Community Owned Range and Forest	0,351	26.3	26.3	17.5	70.2	19.8	19.8	13.3	52.8	-	-	-	-	6.6	6.6	4.4	17.6	-0.0	-0.0	0.0	-0.0
Field Days to Expand Improved Range & Forest Management Practices, Including Protection	11.400	11.4	11.4	7.6	30.4	11.4	11.5	7.7	30.6	-	-	-	-	-	-	-	-	-	-	-	-
Subtotal Improve Range and Forest Management - Focus on Community Owned/Managed		37.7	37.7	25.2	100.6	31.2	31.3	21.0	83.4	-	-	-	-	6.6	6.6	4.4	17.6	-0.0	-0.0	0.0	-0.0
8. Community Irrigated Shelterbelts & Woodlots																					
Introduce Irrigated Woodlots and Shelterbelts	175,088	8.8	7.0	1.8	17.5	6.6	5.3	1.3	13.2	-	-	-	-	2.2	1.8	0.4	4.4	0.9	0.7	0.2	1.8
Field Days to Irrigate Community Shelterbelts & Woodlots	3.900	3.9	3.1	0.8	7.8	3.9	3.1	0.8	7.8	-	-	-	-	-	-	-	-	-	-	-	-
Subtotal community Irrigated Shelterbelts & Woodlots		12.7	10.1	2.5	25.3	10.5	8.4	2.1	21.0	-	-	-	-	2.2	1.8	0.4	4.4	0.9	0.7	0.2	1.8

**Table 8: Component 2: Natural Resources Management – cont'd**

	Unit Cost	Base Cost ('000)				IFAD				Expenditures by Financiers ('000)												
		2017	2018	2019	Total	2017	2018	2019	Total	ASAP			Communities				The Government				Total	
										2017	2018	2019	Total	2017	2018	2019	Total	2017	2018	2019		Total
I. Investment Costs																						
9. Introduction of Fire Lines		0,877	1.8	1.8	1.8	5.3	1.8	1.8	1.8	5.3	-	-	-	-	-	-	-	-	0.2	0.2	0.2	0.5
10. Operation and Maintainance of Heavy Machinery		250.000	100.0	100.0	49.0	249.0	100.2	100.5	49.4	250.0	-	-	-	-	-	-	-	-	33.0	33.1	16.3	82.5
11. Building Capacity in the Butana Forestry Subsector																						
a. Agroforestry																						
Awareness Training & Cap. Building in Agroforestry		6.000	6.0	6.0	-	12.0	6.0	6.0	-	12.0	-	-	-	-	-	-	-	-	1.0	1.0	-	2.0
Support to Farmers for Irrigated Plantations		75	37.5	37.5	-	75.0	28.2	28.3	-	56.4	-	-	-	-	-	-	-	-	9.4	9.4	-	18.8
Farm Tractors		35.000	70.0	-	-	70.0	72.2	-	-	72.2	-	-	-	-	-	-	-	-	12.3	-	-	12.3
Tractor Accesories		13.000	39.0	-	-	39.0	40.2	-	-	40.2	-	-	-	-	-	-	-	-	6.8	-	-	6.8
Subtotal Agroforestry			152.5	43.5	-	196.0	146.6	34.3	-	180.9	-	-	-	-	-	-	-	-	29.5	10.4	-	40.0
b. Sustainable Energy Technologies																						
Training Forestry Professionals and Policy Makers		2.000	30.0	30.0	-	60.0	30.0	30.1	-	60.2	-	-	-	-	-	-	-	-	3.1	3.1	-	6.1
Improved Stoves Distribution		30	30.0	30.0	-	60.0	30.9	31.0	-	62.0	-	-	-	-	-	-	-	-	5.3	5.3	-	10.5
Preparation & Disemination of Measures for Improved Stoves Use		30.000	15.0	15.0	-	30.0	15.0	15.1	-	30.1	-	-	-	-	-	-	-	-	1.5	1.5	-	3.1
Incentives for Use of Impr. Stoves, Tree Plantation & Forest Conservation		100.000	50.0	50.0	-	100.0	50.1	50.2	-	100.3	-	-	-	-	-	-	-	-	5.1	5.1	-	10.2
Subtotal Sustainable Energy Technologies			125.0	125.0	-	250.0	126.1	126.5	-	252.6	-	-	-	-	-	-	-	-	15.0	15.0	-	30.0
c. Awareness Creation in the Butana Region																						
Awareness Raising Sessions for State & Local Managers		7.500	45.0	-	-	45.0	45.1	-	-	45.1	-	-	-	-	-	-	-	-	3.8	-	-	3.8
Plan & Execution of 10 Events for 60 Technitians		10.000	50.0	50.0	-	100.0	50.1	50.2	-	100.3	-	-	-	-	-	-	-	-	4.3	4.3	-	8.5
Aw areness Campaigns at Local Communities		15.000	7.5	7.5	-	15.0	7.5	7.5	-	15.0	-	-	-	-	-	-	-	-	0.6	0.6	-	1.3
Training for Developing Non-w ood Products		30.000	30.0	30.0	-	60.0	30.0	30.1	-	60.2	-	-	-	-	-	-	-	-	2.6	2.6	-	5.1
Subtotal Awareness Creation in the Butana Region			132.5	87.5	-	220.0	132.7	87.9	-	220.6	-	-	-	-	-	-	-	-	11.3	7.5	-	18.8
d. Management																						
National Project Manager		453,509	5.4	5.4	-	10.9	5.5	5.5	-	10.9	-	-	-	-	-	-	-	-	-	-	-	-
M&E Officer		400	4.8	4.8	-	9.6	4.8	4.8	-	9.6	-	-	-	-	-	-	-	-	-	-	-	-
Financial Controller		350	4.2	4.2	-	8.4	4.2	4.2	-	8.4	-	-	-	-	-	-	-	-	-	-	-	-
Procurement Consultant		4,000	12.0	12.0	-	24.0	12.0	12.1	-	24.1	-	-	-	-	-	-	-	-	2.0	2.0	-	4.1
Project State Coordinator		200	4.8	4.8	-	9.6	4.8	4.8	-	9.6	-	-	-	-	-	-	-	-	-	-	-	-
Local Accountants		150	3.6	3.6	-	7.2	3.6	3.6	-	7.2	-	-	-	-	-	-	-	-	-	-	-	-
Additional Forest Guards		100,000	50.0	50.0	-	100.0	50.1	50.2	-	100.3	-	-	-	-	-	-	-	-	-	-	-	-
Annual Operating Costs		50.000	25.0	25.0	-	50.0	25.0	25.1	-	50.2	-	-	-	-	-	-	-	-	4.3	4.3	-	8.5
Subtotal Management			109.8	109.8	-	219.7	110.0	110.3	-	220.3	-	-	-	-	-	-	-	-	6.3	6.3	-	12.6
Subtotal Building Capacity in the Butana Forestry Subsector			519.8	365.8	-	885.7	515.4	359.0	-	874.4	-	-	-	-	-	-	-	-	62.1	39.2	-	101.3
Subtotal Sub-component 2-2. Rainwater Harvesting, Range and Forest Management			1 142.9	877.0	342.6	2 362.5	964.7	738.6	253.1	1 956.5	70.6	53.8	29.7	154.1	106.2	81.3	63.2	250.8	131.4	100.6	38.3	270.3
C. Sub-component 2-3. Crossings and Rural Roads																						
1. Civil Works for Final Completion of the Roads																						
Road Embankment		264.000	166.3	97.7	-	264.0	170.7	100.6	-	271.3	-	-	-	-	-	-	-	-	29.0	17.1	-	46.1
Low er sub-grade		410.000	258.3	151.7	-	410.0	265.2	156.2	-	421.3	-	-	-	-	-	-	-	-	45.1	26.6	-	71.6
Sub-grade		1,363.000	858.7	504.3	-	1 363.0	881.5	519.2	-	1 400.7	-	-	-	-	-	-	-	-	149.9	88.3	-	238.1
Sub-base		183.107	115.4	67.7	-	183.1	118.4	69.8	-	188.2	-	-	-	-	-	-	-	-	20.1	11.9	-	32.0
Subtotal Civil Works for Final Completion of the Roads			1 398.7	821.4	-	2 220.1	1 435.8	845.8	-	2 281.6	-	-	-	-	-	-	-	-	244.1	143.8	-	387.9
2. Supervision of construction		300.000	150.0	150.0	-	300.0	150.2	150.7	-	300.9	-	-	-	-	-	-	-	-	25.5	25.6	-	51.2
3. Arrangements for O&M - Community Road Fund		90.000	45.0	45.0	-	90.0	45.1	45.2	-	90.3	-	-	-	-	-	-	-	-	3.1	3.1	-	6.1
4. Conservation and water control works																						
Pilot activities		150.000	105.0	45.0	-	150.0	107.8	46.3	-	154.1	-	-	-	-	-	-	-	-	7.3	3.2	-	10.5
Training		25.000	21.0	4.0	-	25.0	21.0	4.0	-	25.0	-	-	-	-	-	-	-	-	1.4	0.3	-	1.7
Subtotal onservation and water control works			126.0	49.0	-	175.0	128.8	50.4	-	179.2	-	-	-	-	-	-	-	-	8.8	3.4	-	12.2
Subtotal Sub-component 2-3. Crossings and Rural Roads			1 719.7	1 065.4	-	2 785.1	1 759.9	1 092.0	-	2 851.9	-	-	-	-	-	-	-	-	281.4	175.9	-	457.3
Total			4 095.6	2 874.1	1 068.0	8 037.6	2 724.6	1 830.6	253.1	4 808.4	1 039.1	787.5	602.0	2 428.7	401.4	305.3	238.8	945.4	619.6	433.9	161.8	1 215.4

**Table 9: Component 3. Livestock and marketing development and activities**

	Unit Cost	Base Cost ('000)				Expenditures by Financiers ('000)											
						IFAD				Communities				The Government			
		2017	2018	2019	Total	2017	2018	2019	Total	2017	2018	2019	Total	2017	2018	2019	Total
<b>I. Investment Costs</b>																	
<b>A. Sub-component 3-1. Operation of Livestock Markets and Other Infrastructure</b>																	
Dissemination of information through media channels	3,600	3.6	3.6	3.6	10.8	3.6	3.6	3.6	10.8	-	-	-	-	-	-	-	-
Intercommunity Meetings	200	4.0	4.0	2.0	10.0	4.0	4.0	2.0	10.0	-	-	-	-	-	-	-	-
Establishing Primary Markets with Community Contributions	5,000	50.0	50.0	25.0	125.0	38.5	38.6	19.4	96.5	12.8	12.9	6.5	32.2	8.7	8.8	4.4	21.9
<b>Subtotal Sub-component 3-1. Operation of Livestock Markets and Other Infrastructure</b>		57.6	57.6	30.6	145.8	46.1	46.2	25.0	117.4	12.8	12.9	6.5	32.2	8.7	8.8	4.4	21.9
<b>B. Sub-component 3.2. Animal Husbandry and Management</b>																	
<b>1. Animal feeding innovations and initiatives</b>																	
ToT for Farmers on Animal Feeding; Comprehensive Extension and Vaccination; etc	400	30.0	10.0	-	40.0	30.0	10.0	-	40.1	-	-	-	-	-	-	-	-
ToT for Pastoralists on Animal Feeding; Comprehensive Extension & Vaccination; etc	400	4.0	-	-	4.0	4.0	-	-	4.0	-	-	-	-	-	-	-	-
Scaling up of Tr. (FFS) for Communities on Animal Feeding Practices (inter-community)	60	3.0	3.0	3.0	9.0	3.0	3.0	3.0	9.0	-	-	-	-	-	-	-	-
Training of pastoralists (FFS) on Feeding Practices	100	1.0	1.0	0.5	2.5	1.0	1.0	0.5	2.5	-	-	-	-	-	-	-	-
<b>Subtotal Animal feeding innovations and initiatives</b>		38.0	14.0	3.5	55.5	38.1	14.1	3.5	55.6	-	-	-	-	-	-	-	-
<b>2. Extension and Vaccination Campaigns</b>																	
Scaling-up Extension and Vaccination for Settled Farmers	25	1.5	1.5	2.0	5.0	1.5	1.5	2.0	5.0	-	-	-	-	-	-	-	-
General Extension and Vaccination for Pastoralists	40	0.8	0.6	0.6	2.0	0.8	0.6	0.6	2.0	-	-	-	-	-	-	-	-
<b>Subtotal Extension and Vaccination Campaigns</b>		2.3	2.1	2.6	7.0	2.3	2.1	2.6	7.0	-	-	-	-	-	-	-	-
<b>3. Animal Husbandry and Management (large and smallstock, incl. poultry)</b>																	
Fattening Field Schools	75	7.5	7.5	5.6	20.6	7.5	7.5	5.7	20.7	-	-	-	-	0.8	0.8	0.6	2.1
Poultry Field School	25	0.6	0.6	0.4	1.6	0.6	0.6	0.4	1.6	-	-	-	-	0.1	0.1	0.0	0.2
Exchange Visits for Farmers and Pastoralists	125	2.5	3.8	6.3	12.5	2.5	3.8	6.3	12.6	-	-	-	-	0.2	0.3	0.4	0.9
<b>Subtotal Animal Husbandry and Management (large and smallstock, incl. poultry)</b>		10.6	11.9	12.3	34.8	10.6	11.9	12.3	34.9	-	-	-	-	1.0	1.1	1.0	3.1
<b>Subtotal Sub-component 3.2. Animal Husbandry and Management</b>		50.9	28.0	18.4	97.3	51.0	28.1	18.5	97.6	-	-	-	-	1.0	1.1	1.0	3.1
<b>Total</b>		108.5	85.6	49.0	243.1	97.1	74.3	43.5	214.9	12.8	12.9	6.5	32.2	9.7	9.8	5.4	25.0

**Table 10: Component 4. Community Development & Business Options**

	Unit Cost	Base Cost ('000)				Expenditures by Financiers ('000)							
		2017	2018	2019	Total	IFAD				The Government			
						2017	2018	2019	Total	2017	2018	2019	Total
I. Investment Costs													
A. SubComponent 4.1 CBOs Organization and Management Training													
1. Formation and establishment of CD groups/networks													
Training of trainers (ToT)	15,088	3.9	3.9	-	7.8	3.9	3.9	-	7.9	0.3	0.3	-	0.5
Field days	3,900	3.9	3.9	-	7.8	3.9	3.9	-	7.8	0.1	0.1	-	0.3
Subtotal Formation and establishment of CD groups/networks		7.8	7.8	-	15.6	7.8	7.9	-	15.7	0.4	0.4	-	0.8
2. Formation of NRM groups/networks													
Training of trainers (ToT)	15,088	3.9	3.9	-	7.8	3.9	3.9	-	7.9	0.3	0.3	-	0.5
Field days	3,900	3.9	3.9	-	7.8	3.9	3.9	-	7.8	0.1	0.1	-	0.3
Subtotal Formation of NRM groups/networks		7.8	7.8	-	15.6	7.8	7.9	-	15.7	0.4	0.4	-	0.8
3. Leadership Training for Women.													
Training of trainers (ToT)	6,000	3.0	3.0	-	6.0	3.0	3.0	-	6.0	0.5	0.5	-	1.0
Field days	1,500	9.0	9.0	-	18.0	9.0	9.0	-	18.1	1.2	1.2	-	2.5
Subtotal Leadership Training for Women.		12.0	12.0	-	24.0	12.0	12.1	-	24.1	1.7	1.7	-	3.5
4. Formation and establishment of Youth groups/networks													
Training of trainers (ToT)	15,088	2.0	2.0	-	3.9	2.0	2.0	-	3.9	0.1	0.1	-	0.3
Field days	1,950	2.0	2.0	-	3.9	2.0	2.0	-	3.9	-	-	-	-
Subtotal Formation and establishment of Youth groups/networks		3.9	3.9	-	7.8	3.9	3.9	-	7.8	0.1	0.1	-	0.3
5. Legalization of Community Based Organizations - Registration Costs	120	12.0	3.0	3.0	18.0	12.0	3.0	3.0	18.1	0.4	0.1	0.1	0.6
6. Raising Capacity of Communities in Assessment/evaluation tools	75,088	3.0	1.5	-	4.5	3.0	1.5	-	4.5	0.5	0.3	-	0.8
7. Gender Empowerment: Community Level Meetings Managed by DTs	100	40.0	20.0	20.0	80.0	40.1	20.1	20.2	80.3	5.4	2.7	2.7	10.9
8. Infrastructure for Community Social Strengthening													
Engineer for "Social Development Infrastructure" Design and Construction Supervision	700	1.4	1.4	0.7	3.5	1.4	1.4	0.7	3.5	-	-	-	-
"Social Development Infrastructure" New / Rehabilitation	10,000	100.0	100.0	50.0	250.0	102.7	103.0	51.6	257.3	17.5	17.5	8.8	43.7
Social Skills Training to Beneficiaries at Community Level	8,07	40.4	44.4	28.2	113.0	40.4	44.6	28.5	113.5	1.4	1.5	1.0	3.9
Subtotal Infrastructure for Community Social Strengthening		141.8	145.8	78.9	366.5	144.5	149.0	80.8	374.2	18.8	19.0	9.7	47.6
9. Training on Income Generating Activities (IGA)													
TA for preparation of training material and delivering the training	6,000	6.0	-	-	6.0	6.0	-	-	6.0	1.0	-	-	1.0
Training Workshop for Development Teams	1,500	1.5	-	-	1.5	1.5	-	-	1.5	0.1	-	-	0.1
Communities Training by the DTs	100	2.5	2.5	5.0	10.0	2.5	2.5	5.0	10.1	0.1	0.1	0.2	0.3
Subtotal Training on Income Generating Activities (IGA)		10.0	2.5	5.0	17.5	10.0	2.5	5.0	17.6	1.2	0.1	0.2	1.4
Subtotal SubComponent 4.1 CBOs Organization and Management Training		238.3	204.3	106.9	549.6	241.2	207.8	109.0	558.0	29.0	24.9	12.8	66.7
B. SubComponent 4.2 Business Options through Microfinance													
1. Women's Savings and Credit Groups Model													
a. Development of Savings and Credit Groups													
Formation and development of savings and credit groups	61,404	12.3	16.6	-	28.9	12.3	16.7	-	29.0	0.7	0.9	-	1.6
Development of the CIGs as SCG Associations	263,158	10.5	7.9	-	18.4	10.5	7.9	-	18.5	0.6	0.4	-	1.0
Joint Follow-up, Practical Guidance and Monitoring by the PCU and SCUs	1,755	1.8	1.8	1.8	5.3	1.8	1.8	1.8	5.3	-	-	-	-
Subtotal Development of Savings and Credit Groups		24.6	26.2	1.8	52.5	24.6	26.3	1.8	52.7	1.3	1.4	-	2.7
b. Training of extension officers													
Updating SCG Manual Based on Implementation Experience	4,386	4.4	-	-	4.4	4.4	-	-	4.4	0.6	-	-	0.6
Training Workshop for Project Staff on Updated SCG Manual	2,632	5.3	-	-	5.3	5.3	-	-	5.3	0.2	-	-	0.2
Exposure Visit of Project Staff to Projects with SCG System	2,632	2.6	2.6	-	5.3	2.6	2.6	-	5.3	0.1	0.1	-	0.2
Subtotal Training of extension officers		12.3	2.6	-	14.9	12.3	2.6	-	14.9	0.8	0.1	-	0.9
c. Training Rural Finance Agents (Cost/training with 20-25 CT per batch) , 5 days	1,430	2.9	1.4	1.4	5.7	2.9	1.4	1.4	5.7	0.2	0.1	0.1	0.5
d. Research, Documentation, Dissemination													
Documentation of success stories and best practice	4,386	-	-	4.4	4.4	-	-	4.4	4.4	-	-	0.8	0.8
Project Level Knowledge Sharing Workshops	1,755	1.8	-	1.8	3.5	1.8	-	1.8	3.5	0.3	-	0.3	0.6
Subtotal Research, Documentation, Dissemination		1.8	-	6.1	7.9	1.8	-	6.2	7.9	0.3	-	1.1	1.4
Subtotal Women's Savings and Credit Groups Model		41.5	30.3	9.3	81.1	41.5	30.4	9.4	81.3	2.7	1.6	1.2	5.4

**Table 10: Component 4. Community Development & Business Options – cont'd**

	Unit Cost	Base Cost ('000)				Expenditures by Financiers ('000)							
						IFAD				The Government			
		2017	2018	2019	Total	2017	2018	2019	Total	2017	2018	2019	Total
<b>I. Investment Costs</b>													
<b>2. Development of ABSUMI</b>													
<b>a. Support for 2 Existing Units for 3 Years (infrastructure)</b>													
Vehicles: Double cabine	30.000	60.0	30.0	30.0	120.0	61.6	30.9	31.0	123.5	37.0	18.5	18.6	74.1
Furniture and office equipment	13.158	2.6	5.3	5.3	13.2	2.7	5.4	5.4	13.6	0.5	0.9	0.9	2.3
<b>Subtotal Support for 2 Existing Units for 3 Years (infrastructure)</b>		62.6	35.3	35.3	133.2	64.3	36.3	36.4	137.0	37.4	19.5	19.5	76.4
<b>b. Establishment of 1 new units for 3 years (infrastructure)</b>													
Vehicles: Double cabine	30.000	60.0	30.0	30.0	120.0	61.6	30.9	31.0	123.5	37.0	18.5	18.6	74.1
Furniture and office equipment	26.316	26.3	-	-	26.3	27.0	-	-	27.0	4.6	-	-	4.6
<b>Subtotal Establishment of 1 new units for 3 years (infrastructure)</b>		86.3	30.0	30.0	146.3	88.6	30.9	31.0	150.5	41.5	18.5	18.6	78.7
<b>c. Technical Assistance</b>													
Exposure Trips Training and TA	13.158	3.3	6.6	3.3	13.2	3.3	6.6	3.3	13.2	-	-	-	-
MIS license and installation	13.158	13.2	-	-	13.2	13.2	-	-	13.2	2.2	-	-	2.2
<b>Subtotal Technical Assistance</b>		16.4	6.6	3.3	26.3	16.5	6.6	3.3	26.4	2.2	-	-	2.2
<b>Subtotal Development of ABSUMI</b>		165.4	71.8	68.6	305.8	169.4	73.8	70.7	313.9	81.2	38.0	38.1	157.3
<b>3. Support to Microfinance Apex</b>													
<b>a. Contribution to Apex Capital</b>	210.526	105.3	105.3	-	210.5	105.4	105.7	-	211.2	-	-	-	-
<b>b. Start up Operations Costs</b>													
Staff Wages	42.105	31.6	21.1	10.5	63.2	31.6	21.1	10.6	63.4	-	-	-	-
Transportation	5.263	3.9	2.6	1.3	7.9	4.0	2.6	1.3	7.9	-	-	-	-
Stationery	2.632	2.0	1.3	0.7	3.9	2.0	1.4	0.7	4.1	0.3	0.2	0.1	0.7
Other admin costs	4.386	3.3	2.2	1.1	6.6	3.3	2.2	1.1	6.6	-	-	0.0	0.0
<b>Subtotal Start up Operations Costs</b>		40.8	27.2	13.6	81.6	40.9	27.3	13.7	82.0	0.3	0.2	0.1	0.7
<b>c. Technical Assistance</b>													
Business Plan development	15.790	15.8	-	-	15.8	15.8	-	-	15.8	2.7	-	-	2.7
Operations manual and staff training	15.790	15.8	-	-	15.8	15.8	-	-	15.8	2.7	-	-	2.7
MIS development	21.930	21.9	-	-	21.9	22.0	-	-	22.0	3.7	-	-	3.7
Staff exposure trip	13.158	-	13.2	13.2	26.3	-	13.2	13.3	26.5	-	-	-	-
<b>Subtotal Technical Assistance</b>		53.5	13.2	13.2	79.8	53.6	13.2	13.3	80.1	9.1	-	-	9.1
<b>d. Infrastructure support</b>													
Vehicles - Double Cab	30.000	60.0	30.0	-	90.0	61.6	30.9	-	92.5	37.0	18.5	-	55.5
Computers and peripherals	8.772	4.4	4.4	-	8.8	4.5	4.5	-	9.1	0.8	0.8	-	1.5
Furniture and equipment	13.158	6.6	6.6	-	13.2	6.8	6.8	-	13.5	1.1	1.2	-	2.3
<b>Subtotal Infrastructure support</b>		71.0	41.0	-	111.9	72.9	42.2	-	115.1	38.9	20.5	-	59.3
<b>Subtotal Support to Microfinance Apex</b>		270.5	186.6	26.8	483.9	272.8	188.5	27.0	488.3	48.3	20.7	0.1	69.1
<b>4. TA for Implementation Support</b>	22.500	22.5	22.5	22.5	67.5	22.5	22.6	22.7	67.8	-	-	-	-
<b>Subtotal SubComponent 4.2 Business Options through Microfinance</b>		499.9	311.2	127.1	938.2	506.2	315.3	129.7	951.3	132.2	60.3	39.4	231.8
<b>C. Sub-component 4.3 Community Extension Agents and Networks</b>													
ToTs at Community level (GALS and others)	5.000	15.0	15.0	-	30.0	15.0	15.1	-	30.1	0.5	0.5	-	1.0
Training of Community Agents (Basic and Tailore-made) for Communities	175,088	70.0	52.5	52.5	175.1	70.1	52.8	52.9	175.8	2.4	1.8	1.8	6.0
Training of new Community Agents for Pastoralist Communities	175,088	17.5	8.8	8.8	35.0	17.5	8.8	8.8	35.1	0.6	0.3	0.3	1.2
Tailor made and advanced business training of Community Agents	400	-	10.0	-	10.0	-	10.0	-	10.0	-	0.3	-	0.3
Support to Community Agents Active in Scaling-up Activities	80	16.0	24.0	-	40.0	16.0	24.1	-	40.1	0.5	0.8	-	1.4
Training of Community Members in Post-production, Processing & Marketing	1,754	10.5	14.0	10.5	35.1	10.5	14.1	10.6	35.2	0.4	0.5	0.4	1.2
<b>Subtotal Sub-component 4.3 Community Extension Agents and Networks</b>		129.1	124.3	71.8	325.2	129.3	124.9	72.3	326.5	4.4	4.2	2.5	11.1
<b>Total</b>		867.3	639.9	305.9	1 813.0	876.6	648.0	311.1	1 835.7	165.6	89.4	54.6	309.6

**Table 11: Component 5: Project Management**

	Unit Cost	Base Cost ('000)				Expenditures by Financiers ('000)							
						IFAD				The Government			
		2017	2018	2019	Total	2017	2018	2019	Total	2017	2018	2019	Total
<b>I. Investment Costs</b>													
<b>A. SubComponent 5.1 Butana Development Agency</b>													
1. CCU Support Contract	35.000	11.7	11.7	11.7	35.0	11.7	11.7	11.8	35.2	-	-	-	-
<b>2. Vehicles and Equipment</b>													
SUV Vehicles Replacement		-	-	-	-	-	-	-	-	-	-	-	-
Double Cabin Vehicle	30.000	60.0	-	-	60.0	61.6	-	-	61.6	37.0	-	-	37.0
Miscellaneous Equipment	23.000	23.0	-	-	23.0	23.7	-	-	23.7	4.0	-	-	4.0
<b>Subtotal Vehicles and Equipment</b>		83.0	-	-	83.0	85.3	-	-	85.3	41.0	-	-	41.0
<b>3. Monitoring and Evaluation</b>													
Project Completion	80.000	-	-	80.0	80.0	-	-	80.6	80.6	-	-	-	-
Supervision Missions	15.000	15.0	15.0	15.0	45.0	15.0	15.1	15.1	45.2	-	-	-	-
Impact and other studies	80.000	26.6	26.6	26.6	79.9	26.7	26.8	26.8	80.3	-	-	-	-
Annual Audit	10.000	10.0	10.0	10.0	30.0	10.0	10.0	10.1	30.1	-	-	-	-
<b>Subtotal Monitoring and Evaluation</b>		51.6	51.6	131.6	234.9	51.7	51.9	132.6	236.2	-	-	-	-
<b>4. Financial Managemnet and audit</b>													
One time internal audit (include in 2018)	5.000	-	5.0	-	5.0	-	5.0	-	5.0	-	-	-	-
Yearly Audit	1.000	1.0	1.0	1.0	3.0	1.0	1.0	1.0	3.0	-	-	-	-
Upgrade of Financial System	10.000	10.0	-	-	10.0	10.0	-	-	10.0	-	-	-	-
<b>Subtotal Financial Managemnet and audit</b>		11.0	6.0	1.0	18.0	11.0	6.0	1.0	18.1	-	-	-	-
<b>Subtotal SubComponent 5.1 Butana Development Agency</b>		157.3	69.3	144.3	370.9	159.7	69.6	145.4	374.7	41.0	-	-	41.0
<b>B. SubComponent 5.2 State Coordination Units</b>													
<b>1. Vehicles and Equipment</b>													
SUV Vehicles Replacement	30.000	90.0	-	-	90.0	92.4	-	-	92.4	15.7	-	-	15.7
Miscellaneous Equipment	22.982	23.0	-	-	23.0	23.7	-	-	23.7	4.0	-	-	4.0
<b>Subtotal Vehicles and Equipment</b>		113.0	-	-	113.0	116.1	-	-	116.1	19.7	-	-	19.7
<b>Total Investment Costs</b>		270.3	69.3	144.3	483.9	275.8	69.6	145.4	490.8	60.7	-	-	60.7



**Table 11: Component 5: Project Management – cont'd**

	Unit Cost	Base Cost ('000)				Expenditures by Financiers ('000)							
		2017	2018	2019	Total	IFAD				The Government			
						2017	2018	2019	Total	2017	2018	2019	Total
II. Recurrent Costs													
A. SubComponent 5.1 Butana Development Agency													
1. BIRDP Technical Support Staff Renumeration													
Butana Development Agency Director	3.500	42.0	42.0	42.0	126.0	31.5	31.6	31.7	94.9	10.5	10.5	10.6	31.6
BIRDP Project Coordinator	3.500	42.0	42.0	42.0	126.0	31.5	31.6	31.7	94.9	10.5	10.5	10.6	31.6
Financial Controller	2.900	34.8	34.8	34.8	104.4	26.1	26.2	26.3	78.7	8.7	8.7	8.8	26.2
Civil Engineer	2.000	24.0	24.0	24.0	72.0	18.0	18.1	18.1	54.2	6.0	6.0	6.0	18.1
Accountant and Financial Assistant	1.350	16.2	16.2	16.2	48.6	12.2	12.2	12.2	36.6	4.1	4.1	4.1	12.2
M&E officer	2.700	32.4	32.4	32.4	97.2	24.3	24.4	24.5	73.2	8.1	8.1	8.2	24.4
NRM officer	2.500	30.0	30.0	30.0	90.0	22.5	22.6	22.7	67.8	7.5	7.5	7.6	22.6
Institutional Officer	2.000	24.0	24.0	24.0	72.0	18.0	18.1	18.1	54.2	6.0	6.0	6.0	18.1
Senior Gender & Community Development Officer	2.400	28.8	28.8	28.8	86.4	21.6	21.7	21.8	65.1	7.2	7.2	7.3	21.7
Assistant Community Development Officer	1.200	14.4	14.4	14.4	43.2	10.8	10.8	10.9	32.5	3.6	3.6	3.6	10.8
Rural finance Officer / manager	2.105	25.3	25.3	25.3	75.8	19.0	19.0	19.1	57.1	6.3	6.3	6.4	19.0
Admin / Procurement Officer	1.800	21.6	21.6	21.6	64.8	16.2	16.3	16.3	48.8	5.4	5.4	5.4	16.3
Assistant Admin Officer	1.200	14.4	14.4	14.4	43.2	10.8	10.8	10.9	32.5	3.6	3.6	3.6	10.8
Subtotal BIRDP Technical Support Staff Renumeration		349.9	349.9	349.9	1 049.6	262.8	263.6	264.4	790.7	87.6	87.9	88.1	263.6
2. Support Staff Renumeration													
Secretary	500	6.0	6.0	6.0	18.0	4.5	4.5	4.5	13.6	1.5	1.5	1.5	4.5
Drivers	550	39.6	39.6	39.6	118.8	29.7	29.8	29.9	89.5	9.9	9.9	10.0	29.8
Guards	350	8.4	8.4	8.4	25.2	6.3	6.3	6.3	19.0	2.1	2.1	2.1	6.3
Office Helpers	350	8.4	8.4	8.4	25.2	6.3	6.3	6.3	19.0	2.1	2.1	2.1	6.3
Subtotal Support Staff Renumeration		62.4	62.4	62.4	187.2	46.9	47.0	47.2	141.0	15.6	15.7	15.7	47.0
3. BIRDP Staff Allowances													
Medical, Uniform and Annual Leave Allow ances		-	-	-	-	-	-	-	-	-	-	-	-
Social insurance (17%)	50.000	16.7	16.7	16.7	50.0	12.5	12.5	12.6	37.6	4.2	4.2	4.2	12.5
Benefits After Service	70.000	23.3	23.3	23.3	69.9	17.5	17.6	17.6	52.7	5.8	5.9	5.9	17.6
Subtotal BIRDP Staff Allowances		40.0	40.0	40.0	119.9	30.0	30.1	30.2	90.3	10.0	10.0	10.1	30.1
4. Operation and maintainance of vehicles	102.000	34.0	34.0	34.0	101.9	25.5	25.6	25.7	76.8	8.5	8.5	8.6	25.6
5. General Running Cost	180.000	59.9	59.9	59.9	179.8	45.0	45.2	45.3	135.5	15.0	15.1	15.1	45.2
Subtotal SubComponent 5.1 Butana Development Agency		546.1	546.1	546.1	1 638.4	410.2	411.4	412.7	1 234.3	136.7	137.1	137.6	411.4
B. SubComponent 5.2 State Coordination Units													
1. SCU salaries, allowances and running costs (5 units; one per each state)													
Topping for state coordinators	36.000	36.0	36.0	36.0	108.0	36.1	36.2	36.3	108.5	-	-	-	-
Topping for development agents	100.000	100.0	100.0	100.0	300.0	100.2	100.5	100.8	301.4	-	-	-	-
Topping for accountants	30.000	30.0	30.0	30.0	90.0	30.0	30.1	30.2	90.4	-	-	-	-
Topping for drivers	35.000	35.0	35.0	35.0	105.0	35.1	35.2	35.3	105.5	-	-	-	-
Topping for cleaners and guards	27.000	27.0	27.0	27.0	81.0	27.0	27.1	27.2	81.4	-	-	-	-
Subtotal SCU salaries, allowances and running costs (5 units; one per each state)		228.0	228.0	228.0	684.0	228.3	229.0	229.7	687.1	-	-	-	-
2. DSA and field days	40.000	40.0	40.0	40.0	120.0	40.1	40.2	40.3	120.5	-	-	-	-
3. Operation and maintainance of vehicles	60.000	60.0	60.0	60.0	180.0	60.1	60.3	60.5	180.8	-	-	-	-
4. General Running Cost	8.772	8.8	8.8	8.8	26.3	-	-	-	-	8.8	8.8	8.8	26.4
Subtotal SubComponent 5.2 State Coordination Units		336.8	336.8	336.8	1 010.3	328.5	329.5	330.5	988.4	8.8	8.8	8.8	26.4
Total Recurrent Costs		882.9	882.9	882.9	2 648.7	738.7	740.9	743.1	2 222.8	145.5	146.0	146.4	437.9
Total		1 153.2	952.2	1 027.2	3 132.6	1 014.5	810.5	888.5	2 713.6	206.2	146.0	146.4	498.6



## Appendix 5. Economic and Financial Analysis

1. A financial and economic analysis was undertaken to assess the financial and economic impacts of the programme on farmers, and Sudan. Benefits are expected to derive from (i) livestock activities; (ii) crop production; (iii) market development including storage facilities, infrastructure and market information; (iv) improved on-farm and off-farm incomes; and (v) increased sustainability of local institutions. Livestock, crop and farm models based on detailed data collected in five States surrounding the great Butana. In order to represent the programme financial benefits, four crop models, livestock model for meat and milk production and two dairy processing models, have been developed. The crop and farm models have also been used as building blocks for the economic analysis.

### Programme Benefits

2. The programme is expected to lead to generate and improve rural income from crop production, livestock activities, market development on-farm and off-farm incomes and increase sustainability of local institutions. Benefits are expected to derive from: (i) improved production and productivity of livestock, and its off-take, and crop production; (ii) improved marketing of agricultural products, mainly livestock production, dairy processing, market infrastructure and market information systems; (iii) increased income from off-farm activities and income generating activities, especially for women and poor households; and (iv) support to localities and technical departments in the project area to supply economic and social services.

3. Other benefits arising from the Project include the sustainable development of natural resources (range, land, and forests), gender equity and women involvement within the communities, greater community participation, better nutritional status and human health from the improved domestic water supplies and water investments. The main sources of quantified Project benefits come from: (i) increased livestock production on the rangeland; (ii) incremental crop production; and (iii) increased income from off-farm micro-enterprises.

4. **Number of beneficiaries.** The programme is expected to benefit about 384,000 direct and indirect beneficiaries or 64,000 households. The programme has an expected 75% as adoption rate.

### Financial Analysis

5. The primary objective of the financial analysis is to determine the financial viability and incentives of the target group for engaging in the programme activities, by examining the impact of programme interventions on family labour, cash flow and net incomes. Based on ongoing BIRDP phase from 20xx to 20xx, from which the Additional financing (AF) will scale up some of its activities, a number of indicative economic models were identified during the AF design process. Four representative financial models were prepared, covering different programme areas to depict variability in different farming systems and agro-ecological conditions of the project area (R): the modification of terrace cultivation (R1) in localities of Shindi, Ed dammar, Es Soubagh, Al Butana, Um algura, and Geizeira East, the improvement of wadis and depression cultivation in the Gadareif and Nile river states (R2); women gardens cultivation & shelterbelt establishment in Nile river State (R3); and Small scale irrigated schemes in Nahr Atbara Locality, and Kasala State (R4). The latter is used for irrigating fruit trees and vegetables.

6. Model 1 relates to the modification of terrace cultivation with cropping pattern based on sorghum (0.75 fed) and guar (0.25 fed). Model 2 represents a combination of livestock, food and cash crops. Crop production mix is corresponding to four crops: sorghum (2.5 fed), guar (1.3 fed), watermelon (0.6), and cucumber (0.6). Model 3 represents women gardens cultivation & shelterbelt establishment and relates to a mixture of cropping patterns: Fodder (0.125 feddan), Vegetables (0.125 feddan), Sheep/Goats (20), shelterbelt (6km). Finally, model 4 depicts a farm unit of 2 fed that represents small scale irrigated schemes with irrigated fruit trees and vegetables: grapefruit/tomatoes (1 fed) and lemon/onion (1 fed). A cash-flow analysis is finally carried out to present the "with" and "without" project analysis.

7. The stream of net economic benefits has been set for livestock production, off-farm activities that include cheese making, and liquid butter. The estimated incremental production of the farm, livestock and off farm models is estimated from the technical parameters of these enterprises and the expected improvement in productivity or increments due to the project interventions in different regions of the project. These are gradually built to approximate the pace of implementation of the interventions and the adoption rates of targeted producers.

8. The quantified benefit stream of production is based on the assumption of crop failure, due to natural hazards and prices collapse, once each three years. Incremental production from cattle, sheep, goat, and camel livestock is estimated in terms of the number of meat and milk production benefits, and dairy processing.

9. **Livestock and Crop Models.** Individual crop and livestock budgets have been used to calculate the value of production net of inputs and labor costs. Livestock models are included in the analysis and encompass sheep, goats, camel, and cattle models. Livestock activities are part of integrated and diversified small farming systems that could be adopted by smallholder farmers and agro-pastoralists.

10. In the “with project” situation, per unit livestock numbers are assumed to augment for females by 44% for sheep, by 84% for goats, and by 700% for cattle. The milk production is expected to increase by 207% for sheep, 140% for cattle, 32% for goats and 174% for camel. Livestock production augmentation characterizes the actual poor level of husbandry.

11. The prolificacy, animal mortality (adult and juvenile), milk lactation and meat production levels are shown in table 1. Animal mortality is expected to shrink in the project area. The culling rate varies between 0.05 for cattle to 0.2 for sheep. Livestock farms are assumed to participate to the project at an increasing rate over the project economic time frame. At full development (year 15), this rate will reach 20%.

**Table 1. Level of different parameters (livestock model)**

	Milk per lactation (kg)	Meat (kg/year/unit)	Prolificacy	Juvenile mortality rate	Adult mortality rate
Cattle	275	70	0.6	0.03	0.02
Sheep	80	20	0.9	0.05	0.02
Goats	110	14	0.9	0.05	0.02
Camels	560	120	0.4	0.02	0.01

12. **Farm Models.** Farm models estimate the impact on farm incomes and the returns to family labour in the project area. Five basic farm-household models were developed: Model 1 for the production of sorghum (3 fed) and guar (2 fed), and livestock (40 sheep, 10 camels) in the terrace cultivation region (R1) in localities of Shindi, Ed dammar, Es Soubagh, Al Butana, Um algura, and Geizeira East. Model 2 represents a combination of livestock, food and cash crops in the Gadareif and Nile river states. Crop production mix is corresponding to four crops: sorghum (2.5 fed), guar (1.3 fed), watermelon (0.6), and cucumber (0.6). Livestock activity is represented by 30 sheep, 20 goats, and 10 camels. Model 3 stands for a combination of vegetables (0.125 fed), fodder (0.125 fed), and 20 sheep/goats. Model 4 is dedicated to irrigated crops such as grape fruit/ tomato (1 fed), and lemon/onion (1 fed), and 10 sheep/goats.

13. The farm Models built characterize typical farming households that reflect the predominantly mixed farming systems of the project area and focus on the integration of crops and livestock to help cope with the risk of production failure. The presence of crops and animals in these models helps to improve farmer’s cash flow, attenuate risk, creates job opportunities and contributes to household diet (milk, cheese, liquid butter and other dairy processing products).

14. Most models are expected to provide farmers with physical outputs and financial returns that are attractive in relation to their extra labor and other inputs and financial investment. Incremental

production from Model 1 and Model 2 is higher for livestock as compared with crop production. The increase for livestock is estimated respectively to 391% and 253% for models 1 and 2 against about 100% for food and cash crops in models 1 and 2. Increase in operating inputs is higher for input livestock, transport of grains and residues, sacks, seeds for models 1 and 2.

15. Demand for labor provides opportunities for the poorest to gain employment. The cost of farm labor set at going market rate varies from SDG 4.73 for livestock to SDG 5.96 for crop production. Returns to labor as well as net farm income within different models increases by a rate that is substantial and much higher than the prevalent wage rate for inexperienced labor in the area.

16. All these four crop models present a higher financial efficiency in terms of financial Net Present Value (FNPV), financial internal rate of return (IRR), and the financial benefits-cost ratio (BCR). For instance, NPV is positive for the four models (US\$ 0.41 million for model 1, US\$ 0.43 million for model 2, US\$ 0.03 million for model 3, US\$ 0.3 million for model 4). Changes in financial indicators illustrate the predicted transformation in agricultural practices in the project area. Analyses of the farm models confirm that the impact of the project at the farm level is financially attractive for family households and net farm incomes are expected to increase. While including aggregate financial project costs and benefits of livestock (sheep, goats, cattle, camels, and liquid butter and cheese), aggregate FIRR is 13,78% presents a higher level than the opportunity cost of capital of 10%.

### **Economic Analysis**

17. The objectives of the economic analysis are: (i) to assess the overall programme viability; and (ii) to estimate the programme's impact by calculating the economic rate of return. The computation of economic costs is derived from financial project costs, by excluding transfers such as duties, taxes, and price contingencies. Production inputs and outputs, labour, and other items have been shadow priced to stand for market imperfections. Economic costs in border prices for major agricultural inputs and products were computed using the associated conversion factors to adjust the local content of costs and goods assumed to be non-traded. Prices requiring a different conversion factor are introduced. Employment opportunities in the project area are relatively limited; therefore the opportunity cost of farm labour is low. Hence, the related labor financial price is adjusted downward by using a standard conversion factor of 0.6, used in similar projects and programmes in Sudan.

18. **Programme economic costs and benefits.** The economic analyses include the investment and incremental recurrent costs of the programme components. The programme financial costs have been converted to economic values by removal of price contingencies, taxes and duties. In order to avoid double counting, the final aggregation considered only those costs that were not included in the financial models. Furthermore, it has been assumed that after the 11th year, economic costs will represent 70% of total costs (investment and recurrent costs). Costs of replacing/maintaining of some specific equipment are considered.

19. **Benefits estimation.** The estimated incremental production from livestock and food and cash crops production is estimated from livestock using the great Butana rangelands, and the economic budgets of crop production of the modification and improvement of traditional terrace system, the improvement of wadis and depression cultivation, the contour plowing for improving dry land water management in semi-mechanized schemes, and women gardens, and small scale irrigated schemes. Incremental production was calculated by calibrating the incremental benefits by the standard conversion factors and then aggregating them, based on the phasing of household uptake during the Project implementation period.

20. On the conjecture of farming system failure, due to natural hazards and collapse of produce prices once every three years it is more realistic to reflect this cyclical nature in deriving the benefit streams. Thus a drop in production of 50% is assumed for food and cash crops, and livestock and related off-farm activities.

21. Based on the expected farmers' responsiveness to the project, the assumption on farmers' participation is smooth the first years, and increases from project activities such as extension, market

development, technical assistance, training and awareness, and infrastructure. Incremental aggregated financial and economic budgets, production and inputs including labor, financial and economic efficiency measures, and other technical and economic indicators were then calculated. The phasing of farm participation to the Project activities was based on the rate at which farms are projected to contribute to Project output. The estimated economic value of net benefit at full development (Year 13) is USD 12.99 million.

**Table 2. Incremental net economic benefit at the project level (USD million)**

	PY 1	PY 2	PY 3	PY 4	PY 5	PY 6	PY 7	PY 8	PY 9	PY 10	PY 11	PY 12	PY 13	PY 14	PY 15
<b>Total livestock</b>	0,004	0,06	0,12	0,38	0,77	1,05	1,65	2,39	2,83	3,27	4,16	8,87	14,58	15,97	17,37
<b>Total crops</b>	-0,0002	0,05	-0,01	0,18	0,21	0,05	0,27	0,33	0,06	0,34	0,34	0,09	0,34	0,34	0,09
<b>Total benefits</b>	0,003	0,11	0,11	0,56	0,98	1,10	1,92	2,72	2,89	3,61	4,50	8,96	14,92	16,31	17,46
<b>Total economic costs</b>	3,39	3,12	3,52	2,13	5,30	4,50	4,08	2,03	6,31	4,53	2,48	0,50	0,50	0,50	0,50
<b>Additional Net Economic benefits</b>	<b>-3,39</b>	<b>-3,01</b>	<b>-3,41</b>	<b>-1,57</b>	<b>-4,32</b>	<b>-3,40</b>	<b>-2,16</b>	<b>0,69</b>	<b>-3,42</b>	<b>-0,92</b>	<b>2,02</b>	<b>8,46</b>	<b>14,43</b>	<b>15,81</b>	<b>16,96</b>

22. Incremental aggregated financial and economic budgets, production and inputs, financial and economic efficiency measures, and other technical and economic indicators were then calculated. The phasing of farm participation to the Project activities was based on the rate at which farms are projected to contribute to Project output. The estimated economic value of net benefit at the end of the economic period of the project is US\$ 17.8 million. The drop of net benefit each three years reflects the production failure due to drought (Table 2).

23. Incremental production of livestock and crop production will either be consumed by the households in the Project area or sold to local and external traders in the primary, secondary and terminal markets. The market for livestock is primarily within the State in villages and urban areas. Sales are made both for consumption in large cities such as Khartoum and for the export market and the trade tend to be dominated by a small number of large merchant buyers. Milk that is surplus to household requirements will be sold locally as fresh milk or processed dairy products.

24. The incremental production can be anticipated to be marketed either in the region or to neighboring states and abroad, especially for livestock animals. Marketing prospects will be improved with marketing development investments. Additional crop production will represent a relatively minor proportion of total existing production in the region.

25. **Assumptions.** Economic pricing has been based on the following assumptions: (i) the conversion of financial project costs into economic costs have been undertaken by multiplying the domestic value added by the standard conversion factor (SCF), and adding-in the foreign exchange costs to convert financial values to economic values; (ii) A SCF equal to 1 has been applied when converting financial prices into economic prices and the opportunity cost of labor was 75% which represents a conversion factor from financial to economic costs; (iii) the exchange rate used in the analysis is fixed at US\$ 1 equal to SDG 6,41 computed as an average of the exchange rate prevailing in 2016; and (iv) an economic life time of 20 years have been taken to assess the improvement in technology used.

26. The Economic Internal Rate of Return (EIRR) on the investments in the Project area over 20 years is estimated at 16.70% and the Net present value (NPV) of the project is positive (US\$ 16,26 Million ). The economic analysis suggests that the BIRDP Project is feasible. An estimate made over 25 years economic life time of the project would generate an EIRR greater than that the 20 years period and a higher NPV. With an OCC of 11%, the NPV is still positive and the EIRR is higher than the OCC. All these worthiness indicators establish the economic feasibility of the project. The Benefit cost ratio estimated is 1.65:1 showing that for each 1 SDG spent in the programme will generate a 1.65 SDG of benefits, which is in favor of the programme.

27. **Sensitivity Analysis.** In order to include risk factors, a sensitivity analysis in terms of "variable by variable" and "scenario" analysis was done to test changes in economic indicators in

conjunction with aggregate costs, benefits, and delays in the realization of project costs and benefits. The EIRR drops to 15.4% with an increase in costs of 10%. With an increase of costs by 20%, the project is still worthy (ERR of 14.2%). However, with an increase of the aggregate costs by 80%, the EIRR with 8.9% is less than the OCC and the project is not feasible. A decrease of benefits by 10% to 40% still yields an EIRR greater than the 10% OCC. However, a decrease of benefits by more than 40% with constant costs shows an EIRR smaller than the OCC, and therefore a non-viable project.

28. A change of the recurrent costs fixed at 20%<sup>45</sup> of recurrent cost starting year 12 (and plus) to 100% still yield a profitable project; the EIRR will be 15.37%, that is a diminution of 1.33 points.

29. In terms of scenario analysis, the project remains feasible with an increase in project costs by 10% to 20% and a simultaneous decrease in benefits by 10%. But an increase of costs by 30% with a simultaneous decrease in benefits by 20% and more will generate an EIRR less than the OCC. The decrease of benefits by 30% with increases of costs by 10% and more produce an EIRR smaller than the OCC, and a non-feasible project as it is for the case for a delay of benefits by one year.

30. The sensitivity tests of the project suggest that the project is robust and worthwhile, especially if we consider the conservative assumptions made in the computation of the benefits. The project therefore has a positive impact on household welfare and allows farmers a higher propensity to participate to its activities. Moreover, the project will have a multiplier effect and higher marketing value added such as sacking, processing, new services, marketed incremental production to other States, and abroad Sudan.

**Table 3. Sensitivity analysis**

Assumptions		Related risk	ERR	NPV (\$ million)
Programme base case			16.70%	16.27
Decrease in programme benefits	-20%	Market/prices fluctuations, low crop yields and yield failure	13.60%	8.02
	-30%		11.9%	3.90
	-40%		9.9%	-0.22
Increase in programme costs	20%	Market/prices fluctuations, low crop yields and yield failure	14.2%	11.28
	30%		13.1%	8.78
	40%		12.1%	6.29

31. Further analysis reveals which are the most influent inputs on different economic indicators (ERR, NPV and B/C ratio). The result of the analysis called “what-If” conducted with TopRank® software, are shown in figures of annexes. The tornado figure (the former) ranks inputs according their impact on ERR<sup>46</sup>. For instance the most dominant parameter is the number of productive units of cattle, then, of sheep followed by the prolificacy rates of cattle and sheep. The ERR is also influenced by cattle and sheep meat prices.

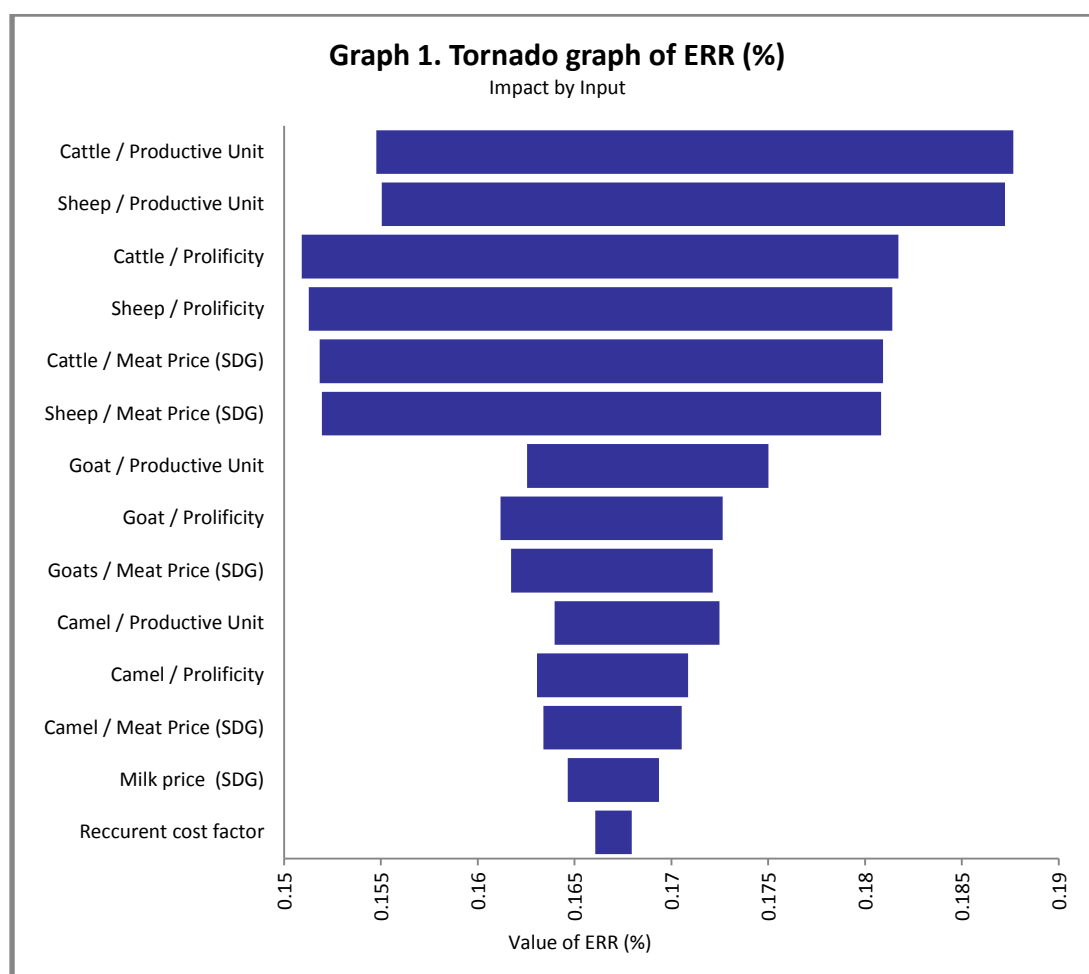
**Table 4. Example of Input variation and ERR variation**

Input Name	Input Variation			Output Variation		
	Value	Change	Change (%)	Value	Change	Change (%)
Cattle / Meat Price (SDG)	35	-15	-30,00%	15,18%	-1,52%	-9,08%
	42,5	-7,5	-15,00%	15,96%	-0,74%	-4,44%

<sup>45</sup> Recurrent costs are considered as 20% of recurrent cost starting year 12 to the last year for the economic lifespan of the project. This means that localities and local communities will take care of the recurrent costs of the project implementation period. This amount is quite reasonable if we take into consideration the poor endowment of beneficiaries and local states of the great Butana.

<sup>46</sup> Each blue bar on the figure shows the spread of the impact. The value of each input was changed from up and down to 30% of its actual value. For instance, the average meat price of cattle is 50 SDG/kg, when it is 65 SDG, the ERR is 18,09% while with as a lower meat price as 35 SDG the programme is still economically viable since the new value of ERR is 15,18%.

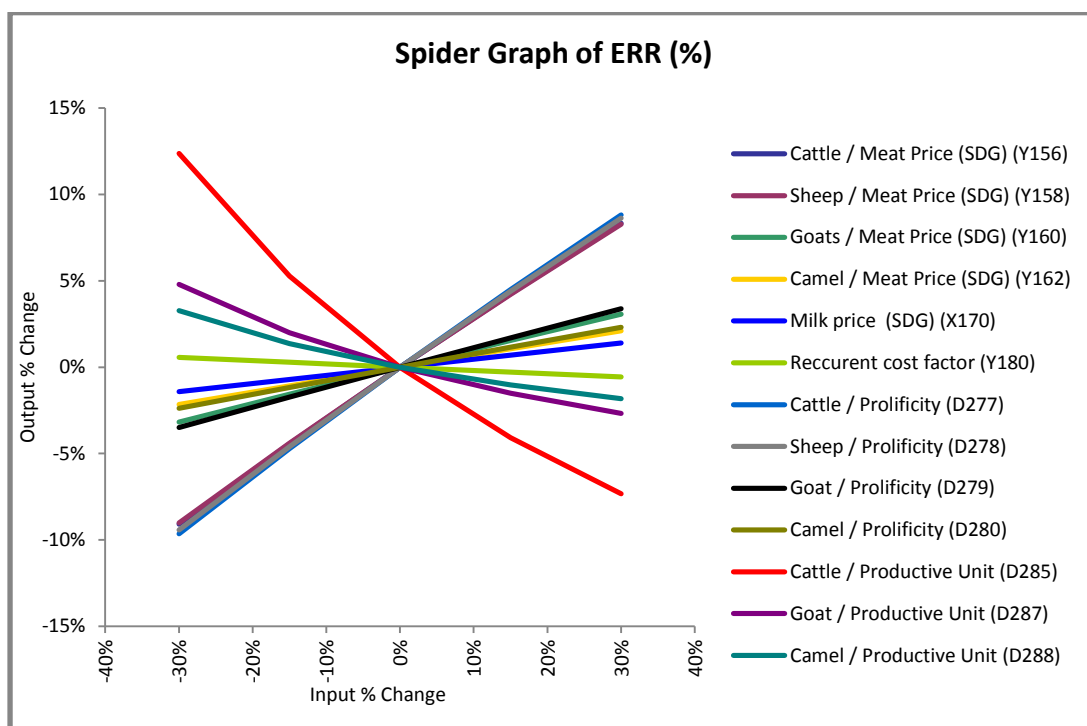
50	0	0,00%	16,70%	0,00%	0,00%
57,5	7,5	15,00%	17,41%	0,71%	4,25%
65	15	30,00%	18,09%	1,39%	8,33%



32. The Spider graph completes the information shown in the tornado graph. In fact, if the tornado graph shows the spread of the impact, the spider graph represents the direction of the impact. If the slope of the line is increasing the impact on the indicator is also increasing (case of meat prices), and vice-versa.



### Spider Graph of ERR (%)

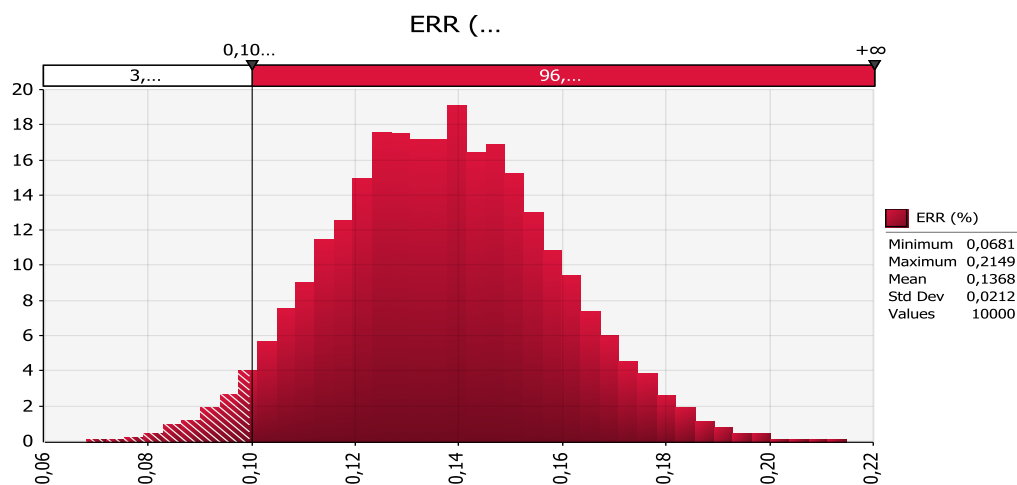


33. All the inputs shown in the analysis have over 1% on the impact on indicators. This shows that in a scenario with 30% drop of each factor, ERR is still attractive ( $>10 = \text{COC}$ ). Conducting the sensitivity analysis on B/C ratio and NPV shows approximately the same results.

34. **Risk Analysis.** The sensitivity analysis performed until now, changes one parameter at the time, which is not realistic. Performing an in depth analysis using Monte Carlo simulation (@Risk®) is therefore necessary. This analysis has the advantage of changing all parameters at once respecting the probabilities distribution of each input.

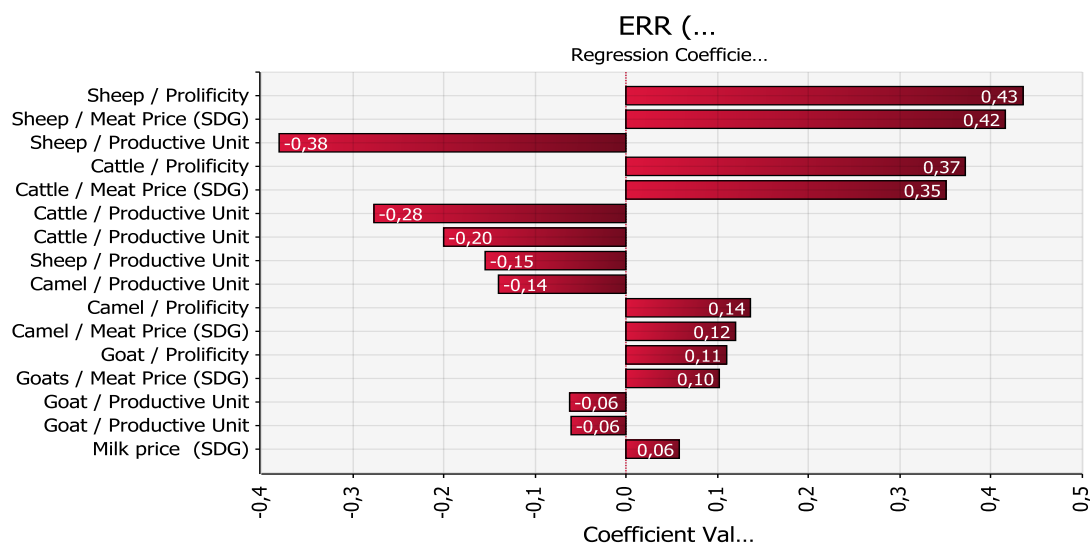
35. The simulation shows (graph below) that ERR is greater than 10% (COC) 96% of the time, with an average value of (13.7%). The minimum expected is 6.81% which will occur in the worst case scenario where all inputs have minimum values. In the probabilistic environment, the programme has nearly 4% chance to fall under the viability threshold. Also, in the best case scenario, ERR might reach a level of 21.5% but with a narrow chance of this happening.

**Figure 1. Probability Distribution of ERR**



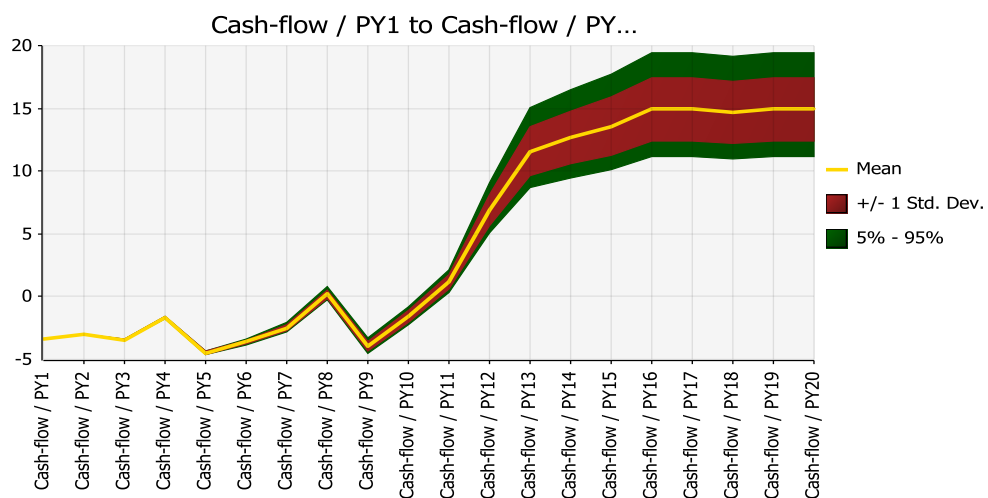
36. The figure below, represents the Regression coefficients for the ERR and shows the same ranking as the sensitivity analysis conducted before. Each variation of one standard variation in a parameter is matched with an impact on the variation in the standard variation of the ERR (%). In this sense, the larger the bar, the more impact is on the viability of the programme. To continue with the meat prices example, a one unit change in standard variation of cattle meat prices, will increase the variability of the ERR with +0.35.

**Figure 1. Regression analysis for BIRDP project**



37. The distribution of probabilities of cash flow over 20 years of the programme is another output of the risk analysis. The yellow line in figure 3 shows the average cash flow value per year, enveloped in two bands, red and green. The red one shows the +/- 1 standard deviation change above the mean and the green shows the 5% and the 95% percentiles. In this manner, we can see the risk trend. The first years of the programme we have a negative cash flow with a tight band. With time uncertainty increases and with it the risk over the years, meaning larger bands starting the 11<sup>th</sup> year of the programme. We can also note the break from the negative side of the graph at the year 10 followed by a positive increase in cash flow.

**Figure 2. Distribution of probabilities of cash flow of the programme**



## **Annexes to Appendix 5**

Annex 1: Sensitivity and Risk Analysis

Annex 2: EFA Summary tables

Annex 3: Financial Cost benefits

Annex 4: Economic Cost benefits

Annex 5: Economic Farm Models

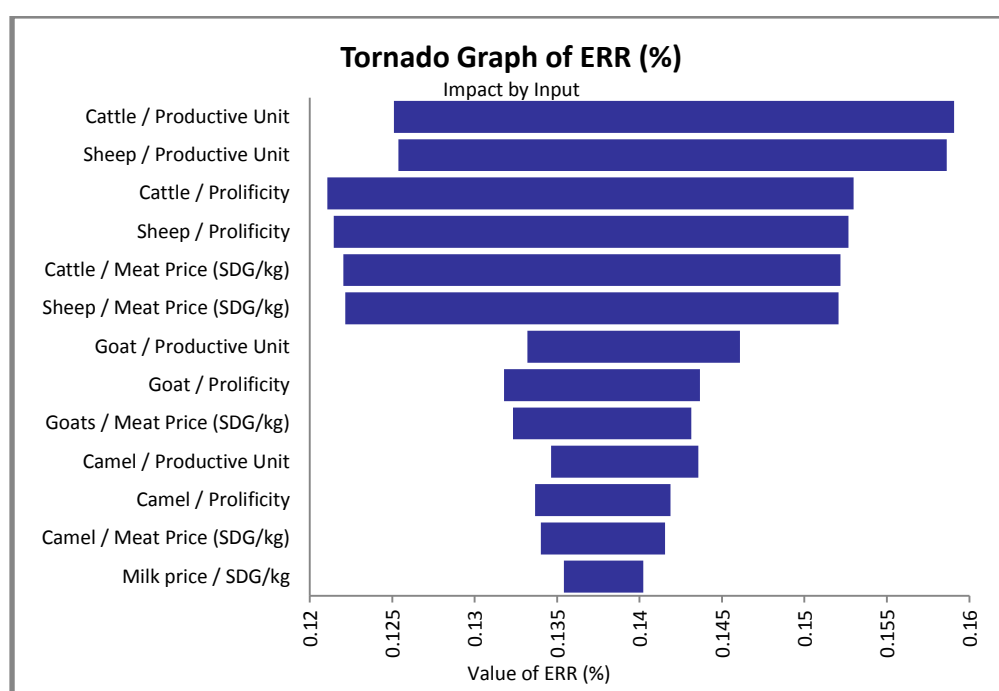
Annex 6: Financial Farm Models

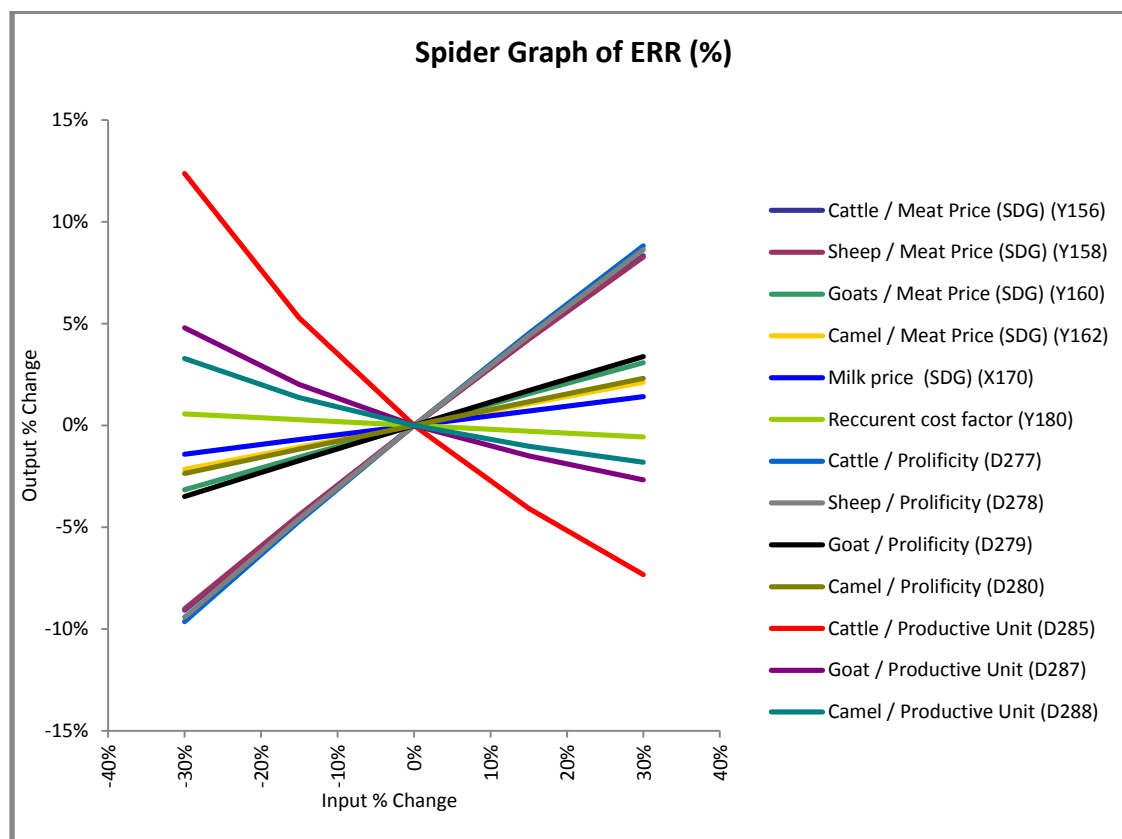
## Annex 1: Sensitivity and Risk Analysis

### 1. Sensitivity analysis using TopRank – summary of analysis

What-If Analysis Summary Information	Value
Runs (Simulations)	1
Recalculations (Iterations)	515
Total Outputs	3
Outputs Selected	3
Outputs without Reports (Variation below threshold)	0
Total Inputs	102
Standard Inputs	102
Auto-Vary Inputs	0
Multi-Way Recalculations	0
Maximum Number of Inputs	20
Threshold of Inputs	0,01

#### 1.1. Sensitivity analysis - ERR (%)





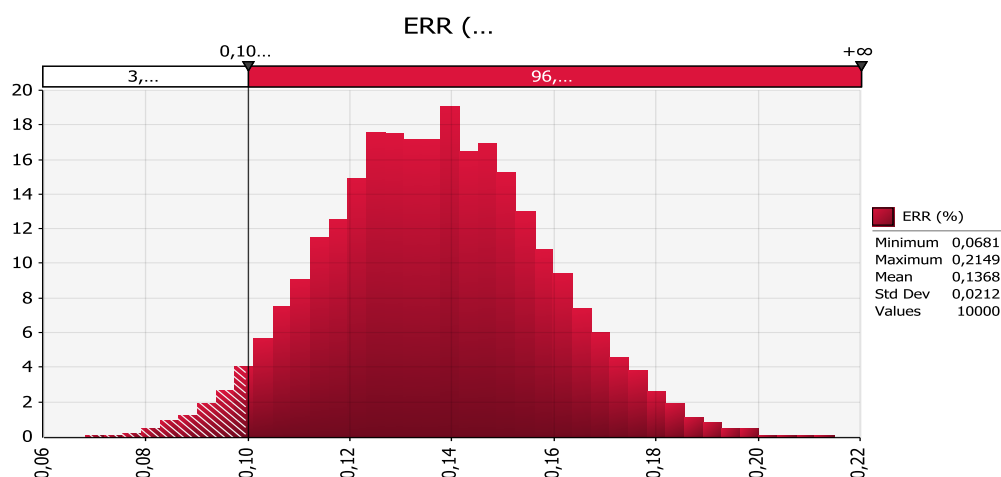
### “What-If” Analysis Summary for Output ERR (%)

Top 14 Inputs Ranked By Change in Actual Value

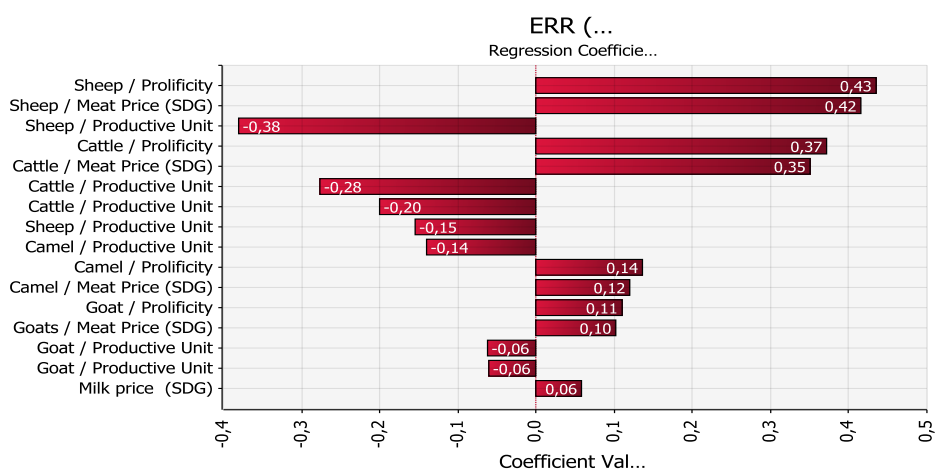
Rank	Input Name	Minimum			Maximum		
		Value	Change (%)	Input Value	Value	Change (%)	Input Value
1	Cattle / Productive Unit	15,48%	-7,34%	2,925	18,77%	12,37%	1,575
2	Sheep / Productive Unit	15,50%	-7,17%	4,225	18,72%	12,11%	2,275
3	Cattle / Prolificity	15,09%	-9,65%	0,42	18,17%	8,81%	0,78
4	Sheep / Prolificity	15,13%	-9,42%	0,63	18,14%	8,62%	1,17
5	Cattle / Meat Price (SDG)	15,18%	-9,08%	35	18,09%	8,33%	65
6	Sheep / Meat Price (SDG)	15,20%	-9,01%	49	18,08%	8,27%	91
7	Goat / Productive Unit	16,25%	-2,68%	3,9	17,50%	4,79%	2,1
8	Goat / Prolificity	16,12%	-3,49%	0,63	17,27%	3,38%	1,17
9	Goats / Meat Price (SDG)	16,17%	-3,17%	35	17,21%	3,07%	65
10	Camel / Productive Unit	16,40%	-1,82%	2,093	17,25%	3,28%	1,127
11	Camel / Prolificity	16,31%	-2,37%	0,14	17,09%	2,31%	0,26
12	Camel / Meat Price (SDG)	16,34%	-2,17%	35	17,05%	2,11%	65
13	Milk price (SDG)	16,46%	-1,42%	0,7	16,94%	1,40%	1,3
14	Reccurent cost factor	16,61%	-0,57%	0,26	16,79%	0,56%	0,14

## 2. Risk Analysis

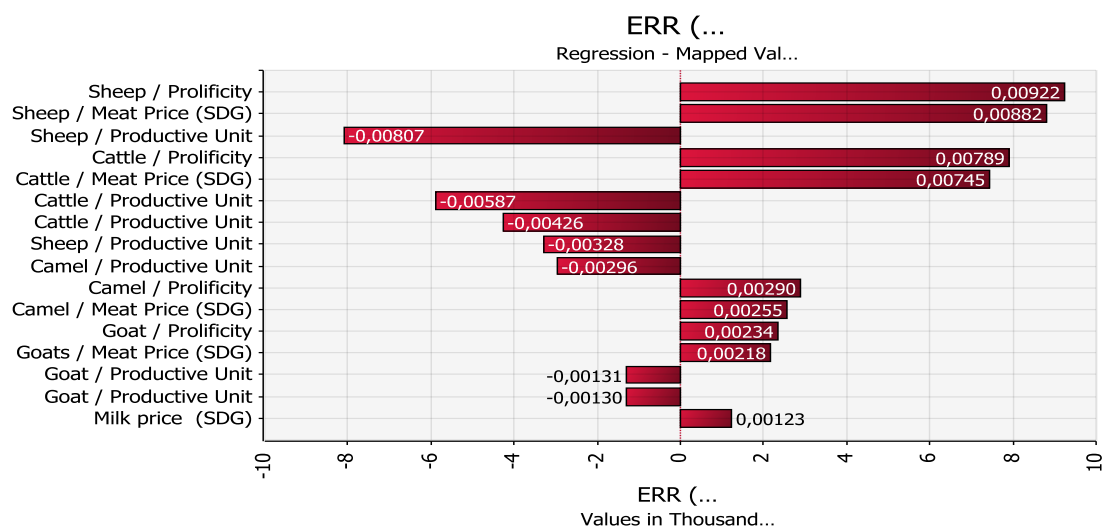
### 2.1. ERR Probability distribution



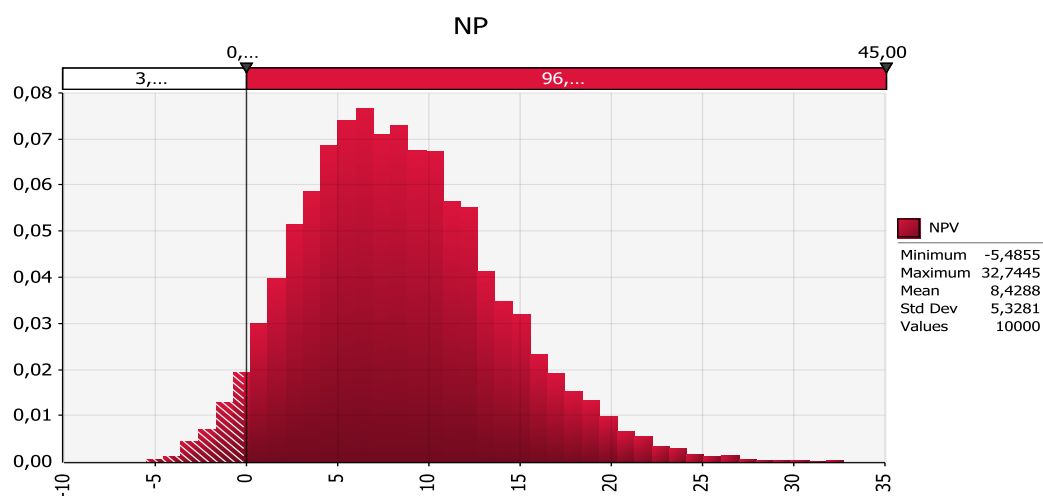
### 2.2. ERR regression coefficients



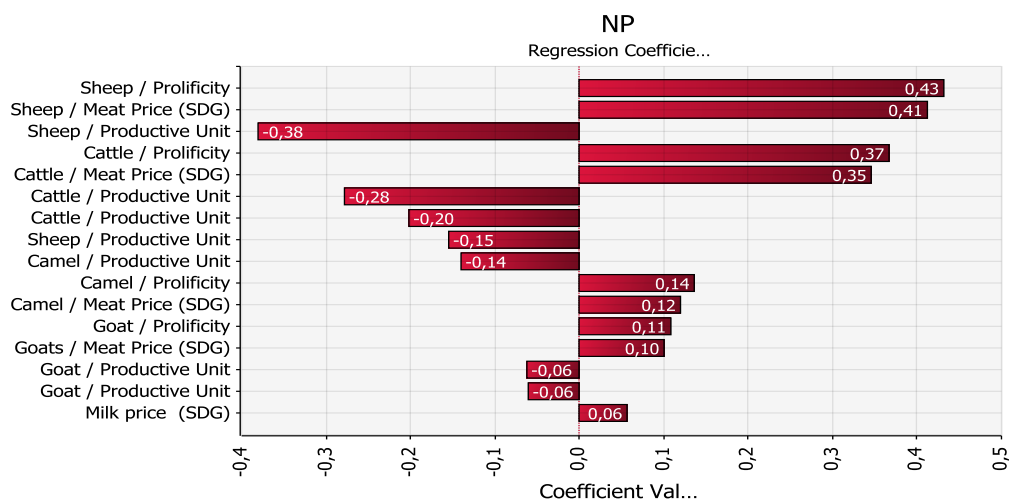
### 2.3. ERR regression coefficients – mapped values



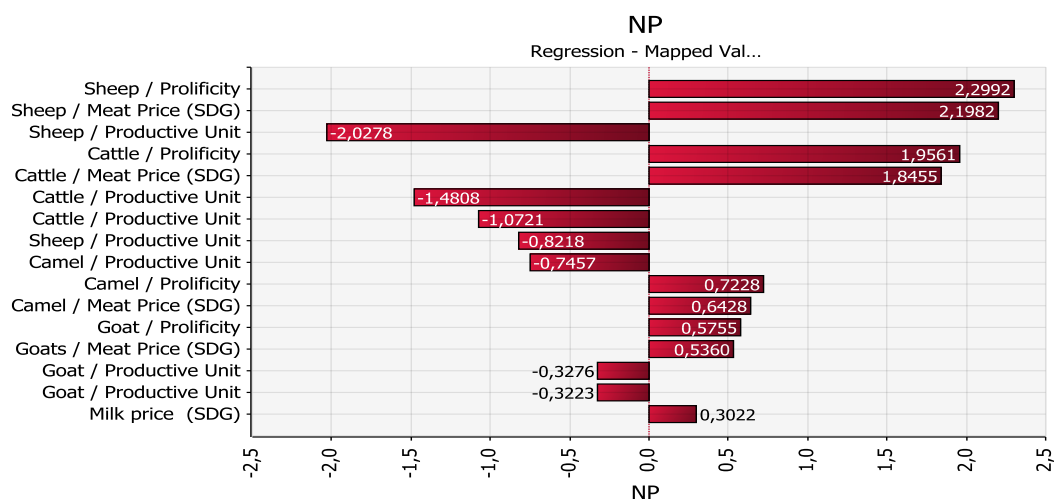
## 2.4. NPV probability distribution



## 2.5. NPV regression coefficients

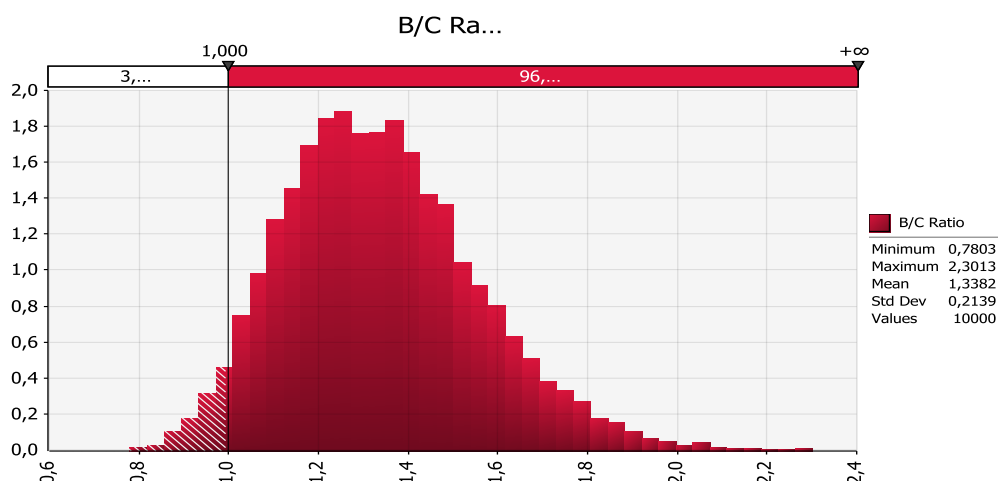


## 2.6. NPV regression mapped values

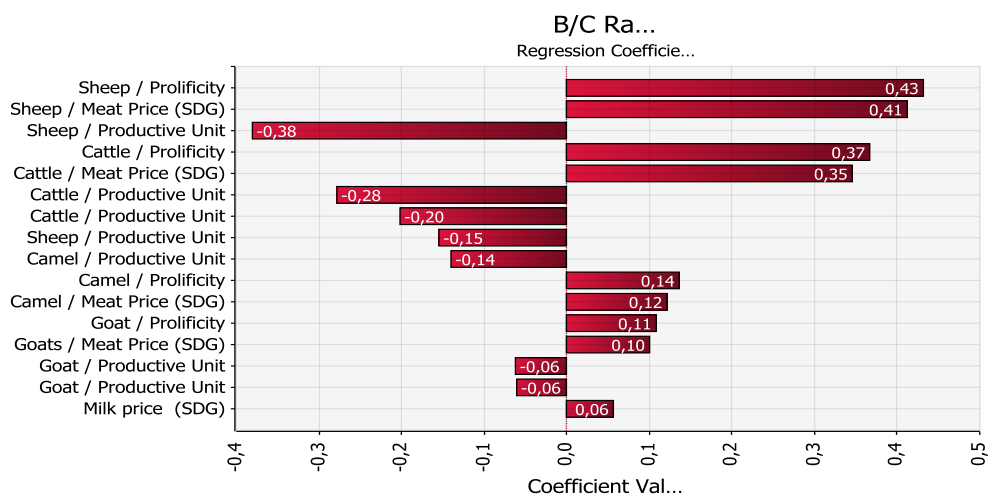




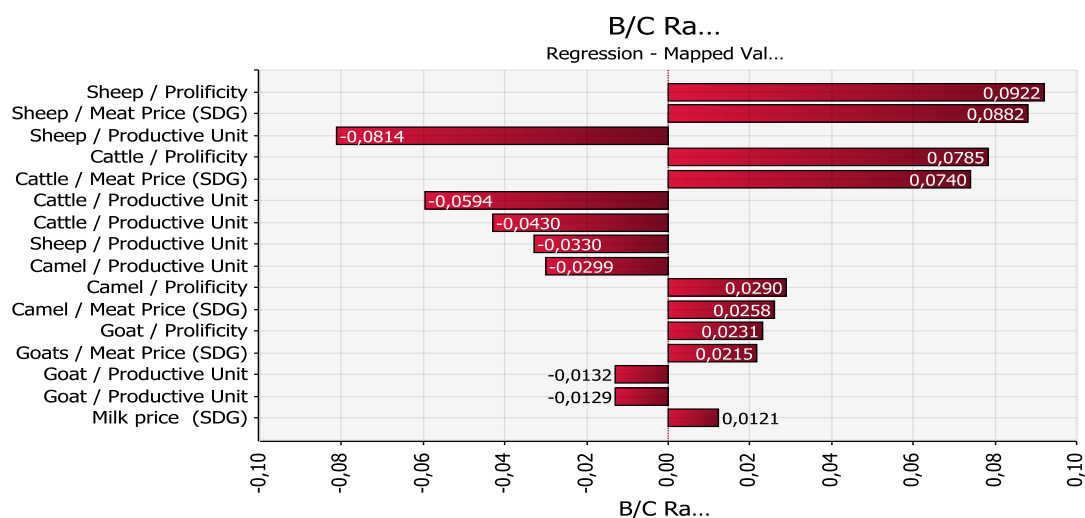
## 2.7. B/C ratio probability distribution



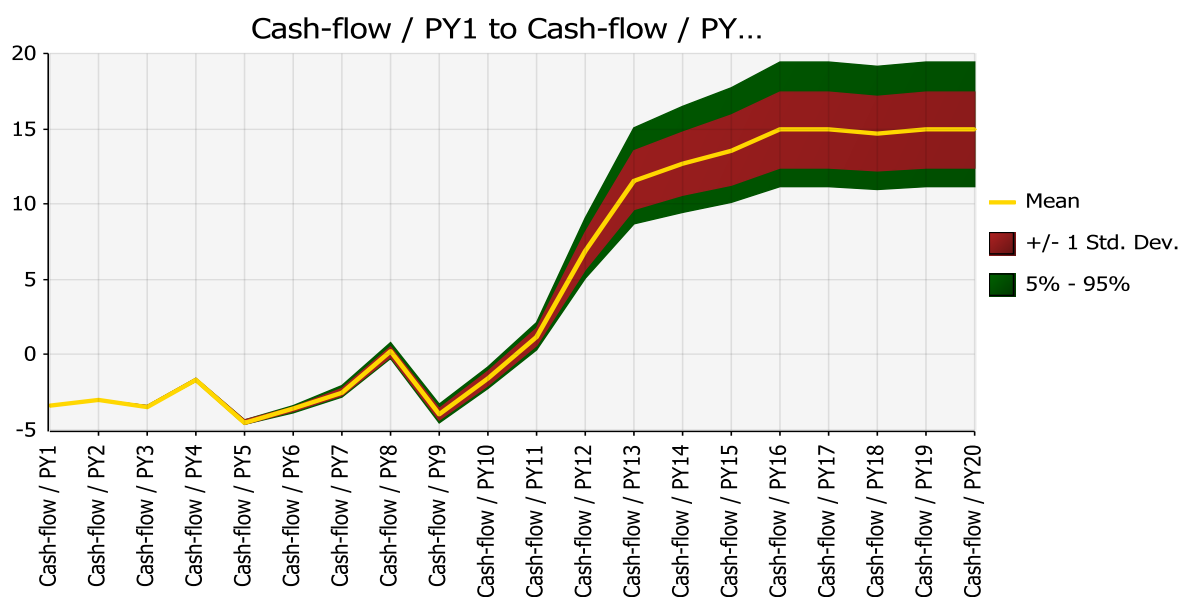
## 2.8. B/C ratio regression coefficients



## 2.9. B/C ratio regression mapped values



## 2.10. Cash flow risk trend



## Annex 2: EFA Summary tables

FINANCIAL INCREMENTAL NET BENEFIT PER FARM MODEL (in Million USD)																			
	PY1	PY2	PY3	PY4	PY5	PY6	PY7	PY8	PY9	PY10	PY11	PY12	PY13	PY14	PY15	PY16	PY17	PY18	PY19-PY20
Model 1: Modification of terrace cultivation (Fed)	- 0.001	0.004	- 0.01	0.06	0.07	-	0.09	0.11	0.02	0.1100	0.11	0.02	0.11	0.11	0.02	0.11	0.11	0.02	0.11
Model 2 : Improvement of wades/depression cultivation	- 0.003	0.03	- 0.03	0.05	0.06	- 0.01	0.09	0.13	- 0.02	0.1300	0.13	0.01	0.13	0.13	0.01	0.13	0.13	0.01	0.13
Model 3: Women gardens cultivation & shelterbelt establishment	0.001	0.001	0.0005	0.00	0.00	0.00	0.01	0.01	0.00	0.0060	0.01	0.00	0.01	0.01	0.00	0.01	0.01	0.00	0.01
Model 4: Small - Scale irrigated schemes : irrigated fruit trees and vegetables	-0.0001	0.005	0.0002	0.03	0.04	0.02	0.05	0.05	0.03	0.0700	0.07	0.03	0.07	0.07	0.03	0.07	0.07	0.03	0.07
Model 5: Livestock	0.0036	0.063	0.1206	0.38	0.77	1.05	1.65	2.39	2.83	3.2733	4.16	8.87	14.58	15.97	17.37	18.77	18.77	18.77	18.77
<b>Total additional net benefit</b>	0.001	0.103	0.0813	0.52	0.95	1.06	1.89	2.69	2.86	3.5893	4.48	8.93	14.90	16.28	17.43	19.09	19.09	18.83	19.09

ACRAGE (in Fedan), INCREASES AND PHASING									
	1 500	1 500	4 000	4 000	4 000	4 000	4 000	4 000	4 000
	1 000	1 000	1 000	2 000	2 000	2 000	2 000	2 000	2 000
	10	10	15	15	20	30	30	40	40
	20	20	40	40	40	40	40	40	40

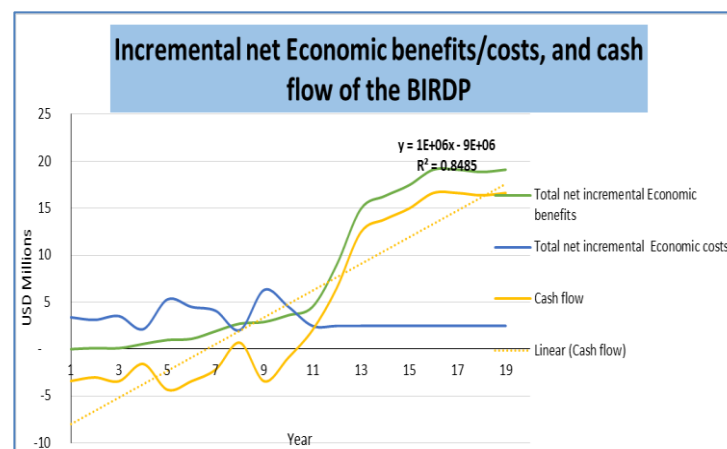
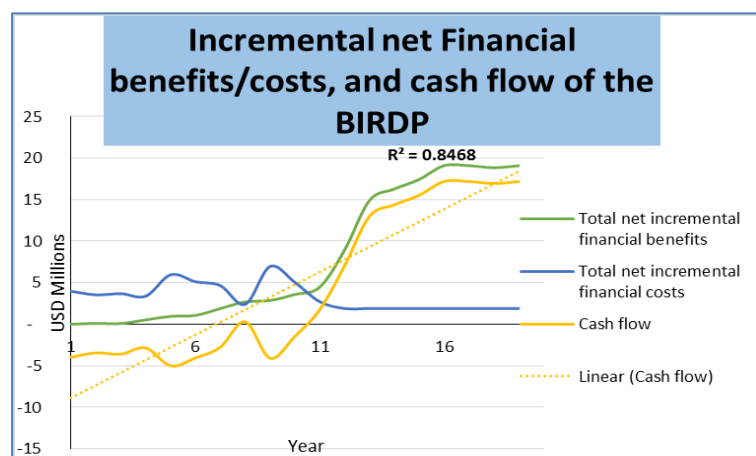
SENSITIVITY ANALYSIS (VARIABLE BY VARIABLE & SCENARIO ANALYSIS)				
Scenarii	ERR	NPV	ERR (%)	NPV (USD Million)
Base scenario	13.78%	9.61	16.70%	16.27
Diminution Bénéfices add. de: 10%	12.3%	5.51	15.20%	12.14
Diminution Bénéfices add. de: 20%	10.6%	1.42	13.60%	8.02
Diminution Bénéfices add. de: 30%	8.7%	-2.68	11.90%	3.9
augmentation couts de : 10%	12.4%	6.47	15.40%	13.77
augmentation couts de : 20%	11.2%	3.34	14.20%	11.28
augmentation couts de : 30%	10.1%	0.20	13.10%	8.78
dim ben 10% & Aug cout 10%	10.9%	2.38	14.00%	9.65
dim ben 10% & Aug cout 20%	9.7%	-0.76	12.80%	7.16
dim ben 20% & Aug cout 10%	9.3%	-1.72	12.40%	5.53

Components and Cost ('000 USD)	
Policy & Institutional Building	2 560
Agricultural development	8 262
Livestock & Marketing Development	113
Community development & Business Option	2 115
Project Management	3 212
<b>Total BASELINE COSTS</b>	<b>16 263</b>
Physical Contingencies	187
Price Contingencies	56
<b>Total PROJECT COSTS</b>	<b>16 506</b>

PROJECT COSTS AND INDICATORS FOR LOGFRAME			
<b>TOTAL PROJECT COSTS</b>	16.5M \$/ Base 16.23 M \$	3.2M PMU	
<b>Beneficiaries (direct &amp; indirect)</b>	384 000 people	64,000 Households	
<b>Cost per beneficiary</b>	43	Adoption rates:	75%

Financial analysis at the project level (USD million)																			
	PY1	PY2	PY3	PY4	PY5	PY6	PY7	PY8	PY9	PY10	PY11	PY12	PY13	PY14	PY15	PY16	PY17	PY18	PY19-PY20
Total net incremental financial benefits	- 291	99 228	82 311	530 949	948 541	1 066 921	1 888 525	2 687 775	2 860 135	3 580 297	4 469 375	8 926 703	14 888 315	16 275 081	17 426 499	19 079 506	19 079 506	18 833 756	19 079 398
Total net incremental financial costs	3 960 000	3 540 000	3 680 000	3 380 000	5 960 000	5 120 000	4 650 000	2 390 000	6 950 000	5 040 000	2 710 000	1 900 000	1 900 000	1 900 000	1 900 000	1 900 000	1 900 000	1 900 000	1 900 000
Cash flow	- 3 960 291	- 3 440 772	- 3 597 689	- 2 849 052	- 5 011 459	- 4 053 079	- 2 761 475	297 775	- 4 089 865	- 1 459 703	1 759 375	7 026 703	12 988 315	14 375 081	15 526 499	17 179 506	17 179 506	16 933 756	17 179 398
IRR: 13.78%																			
NPV: 9.61 Million USD																			
B/C ratio : 1.31																			

Economic analysis at the project level (USD million)																			
	PY1	PY2	PY3	PY4	PY5	PY6	PY7	PY8	PY9	PY10	PY11	PY12	PY13	PY14	PY15	PY16	PY17	PY18	PY19-PY20
Total net incremental Economic benefits	3 410	113 400	109 250	559 590	978 410	1 097 310	1 920 240	2 721 090	2 893 820	3 613 970	4 503 060	8 960 390	14 922 000	16 308 760	17 460 180	19 113 190	19 113 190	18 867 440	19 113 080
Total net incremental Economic costs	3 390 000	3 120 000	3 520 000	2 130 000	5 300 000	4 500 000	4 080 000	2 030 000	6 310 000	4 530 000	2 480 000	2 480 000	2 480 000	2 480 000	2 480 000	2 480 000	2 480 000	2 480 000	2 480 000
Cash flow	- 3 386 590	- 3 006 600	- 3 410 750	- 1 570 410	- 4 321 590	- 3 402 690	- 2 159 760	691 090	- 3 416 180	- 916 030	2 023 060	6 480 390	12 442 000	13 828 760	14 980 180	16 633 190	16 633 190	16 387 440	16 633 080
ERR : 16.70%																			
NPV : 16.27 Million USD																			
B/C ratio : 1.65																			



### Annex 3: Financial Cost benefits

	Current Situation	Expected Additional Production																																		
		App		App		App		App		MTR		MTR		MTR		MTR		Add. Fin		Add. Fin		Add. Fin														
		Y0	Y1	2009	Y2	2010	Y3	2011	Y4	2012	Y5	2013	Y6	2014	Y7	2015	Y8	2016	Y9	2017	Y10	2018	Y11	2019	Y12	Y13	2021	Y14	2022	Y15	2023	Y16	2024	Y17	Y18	Y19
Meat	Meat/Kg/year	70	0	0.01	0.02	0.03	0.04	0.04	0.05	0.06	0.06	0.06	0.08	0.12	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Cattle		70	0	0.01	0.02	0.03	0.04	0.04	0.05	0.06	0.06	0.06	0.08	0.12	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
Sheep		20	0	0.01	0.02	0.03	0.04	0.04	0.05	0.06	0.06	0.06	0.08	0.15	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
Goat		14	0	0.01	0.02	0.03	0.04	0.04	0.05	0.06	0.06	0.06	0.08	0.15	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
Camel		100	0	0	0	0.01	0.02	0.02	0.03	0.04	0.04	0.04	0.05	0.06	0.07	0.08	0.09	0.1	0.11	0.12	0.13	0.14	0.15	0.16	0.17	0.18	0.19	0.20	0.21	0.22	0.23	0.24	0.25	0.26	0.27	
Milk																																				
Cattle		270	0.00	0.01	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.1	0.11	0.12	0.13	0.14	0.15	0.16	0.17	0.18	0.19	0.20	0.21	0.22	0.23	0.24	0.25	0.26	0.27	0.28	0.29	0.30	0.31	
Sheep		80	0.00	0.01	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.1	0.11	0.12	0.13	0.14	0.15	0.16	0.17	0.18	0.19	0.20	0.21	0.22	0.23	0.24	0.25	0.26	0.27	0.28	0.29	0.30	0.31	
Goat		90	0.00	0.01	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.1	0.11	0.12	0.13	0.14	0.15	0.16	0.17	0.18	0.19	0.20	0.21	0.22	0.23	0.24	0.25	0.26	0.27	0.28	0.29	0.30	0.31	
Camel		550	0.00	0.01	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.1	0.11	0.12	0.13	0.14	0.15	0.16	0.17	0.18	0.19	0.20	0.21	0.22	0.23	0.24	0.25	0.26	0.27	0.28	0.29	0.30	0.31	
Ho/ annual increase																																				
Cattle		0.2	0	0.01	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.1	0.11	0.12	0.13	0.14	0.15	0.16	0.17	0.18	0.19	0.20	0.21	0.22	0.23	0.24	0.25	0.26	0.27	0.28	0.29	0.30	0.31	
Sheep		0.2	0	0.01	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.1	0.11	0.12	0.13	0.14	0.15	0.16	0.17	0.18	0.19	0.20	0.21	0.22	0.23	0.24	0.25	0.26	0.27	0.28	0.29	0.30	0.31	
Goat		0.2	0	0.01	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.1	0.11	0.12	0.13	0.14	0.15	0.16	0.17	0.18	0.19	0.20	0.21	0.22	0.23	0.24	0.25	0.26	0.27	0.28	0.29	0.30	0.31	
Camel		0.2	0	0.01	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.1	0.11	0.12	0.13	0.14	0.15	0.16	0.17	0.18	0.19	0.20	0.21	0.22	0.23	0.24	0.25	0.26	0.27	0.28	0.29	0.30	0.31	
Meat in kg	current situation																																			
Cattle		30 933 541	-	3 093	6 187	18 560	37 120	49 484	77 334	111 361	129 921	148 481	222 721	371 202	680 538	742 405	804 272	866 139	928 006	989 873	1 051 740	1 113 607														
Sheep		21 812 284	-	2 181	4 362	13 087	26 175	34 900	54 531	78 524	91 612	104 699	117 786	327 184	479 870	523 495	567 119	610 744	654 369	697 993	741 618	785 242														
Goat		11 390 102	-	1 139	2 278	6 834	13 668	18 224	28 475	41 004	47 838	54 672	61 507	113 901	250 582	273 362	296 143	318 923	341 703	364 483	387 263	410 044														
Camel		8 453 416	-	-	-	1 691	5 072	6 763	12 680	20 288	23 670	27 051	30 432	126 801	185 975	202 882	219 789	236 696	253 602	270 509	287 416	304 323														
Total		72 589 343	-	6 414	12 827	40 172	82 035	109 380	173 020	251 178	293 040	334 903	432 447	939 089	1 596 966	1 742 144	1 887 323	2 032 502	2 032 502	2 032 502	2 032 502	2 032 502														
	Q*price meat CATTLE (SDG)		-	154 668	309 335	928 006	1 856 012	2 474 683	3 866 693	5 568 037	6 496 044	7 424 050	11 136 075	18 560 125	34 026 895	37 120 250	40 213 604	43 306 958	43 306 958	43 306 958	43 306 958	43 306 958														
	\$		-	0.0241291	0.05	0.14	0.29	0.39	0.60	0.87	1.01	1.16	1.74	2.90	5.31	5.79	6.27	6.76	6.76	6.76	6.76	6.76														
	*price meat SHEEP (SDG)		-	152 686	305 372	916 116	1 832 232	2 442 976	3 817 150	5 496 695	6 412 811	7 328 927	8 245 043	22 902 898	33 590 917	36 644 637	39 698 356	42 752 076	42 752 076	42 752 076	42 752 076	42 752 076														
	\$		-	0.02	0.05	0.14	0.29	0.38	0.60	0.86	1.00	1.14	1.29	3.57	5.24	5.72	6.19	6.67	6.67	6.67	6.67	6.67														
	*price meat GOAT (SDG)		-	56 951	113 901	341 703	683 406	911 208	1 423 763	2 050 218	2 391 921	2 733 624	3 075 327	5 695 051	12 529 112	13 668 122	14 807 132	15 946 143	15 946 143	15 946 143	15 946 143	15 946 143														
	\$		-	0.01	0.02	0.05	0.11	0.14	0.22	0.32	0.37	0.43	0.48	0.89	1.95	2.13	2.49	2.49	2.49	2.49	2.49	2.49														
	*price meat CAMEL (SDG)		-	-	-	84 534	253 602	338 137	634 006	1 014 410	1 183 478	1 352 547	1 521 615	6 340 062	9 298 758	10 144 099	10 989 441	11 834 783	11 834 783	11 834 783	11 834 783	11 834 783														
	\$		-	-	-	0.01	0.04	0.05	0.10	0.16	0.18	0.21	0.24	0.99	1.45	1.58	1.71	1.85	1.85	1.85	1.85	1.85														
Total MEAT	Millions \$		-	0.057	0.114	0.35	0.72	0.96	1.52	2.20	2.57	2.94	3.74	8.35	13.95	15.22	16.49	17.76	17.76	17.76	17.76	17.76														
Milk in Kg	Current situation																																			
Cattle		119 315 088	-	5 966	5 966	47 726	107 384	190 904	298 288	429 534	584 644	763 617	966 452	1 193 151	1 443 713	1 718 137	2 016 425	2 338 576	2 684 589	3 054 466	3 448 206	3 865 809														
Sheep		87 249 135	-	4 362	4 362	34 900	78 524	139 599	218 123	314 097	427 521	558 394	706 718	872 491	1 055 715	1 256 388	1 474 510	1 710 083	1 963 106	2 233 578	2 521 500	2 826 872														
Goat		73 222 083	-	3 661	3 661	29 289	65 900	117 155	183 055	263 599	358 788	468 621	593 099	732 221	885 987	1 054 398	1 237 453	1 435 153	1 647 497	1 874 485	2 116 118	2 372 395														
Camel		46 493 789	-	2 325	2 325	18 598	41 844	74 390	116 234	167 378	227 820	297 560	376 600	464 938	562 575	669 511	785 745	911 278	1 046 110	1 190 241	1 343 670	1 506 399												</		



## Annex 4: Economic Cost benefits

	Current Situation	Expected Additional Production																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
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## Annex 5: Economic Farm Models

Table 1.a - Physical quantities

MODEL 1		Model 1: Modification of terrace cultivation (Fed)-quantities and prices																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
		Cropping pattern: Sorghum (0.75)+Cowpea( 0.25)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
		Locality: Shindi, Eddamir, Alsubag, Albutana, Um algura, Gezira East																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
Parameter	Unit	before the project	Crop failure each three years																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				

**Table 1.b - Monetary values**

	before the project	Value(SD)																			
		Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13	Y14	Y15	Y16	Y17	Y18	Y19	Y20
	999	1 073	1 480	925	2 405	2 590	1 388	2 960	2 960	1 480	2 960	2 960	1 480	2 960	2 960	1 480	2 960	2 960	1 480	2 960	2 960
	2	2	3	2	5	6	3	8	9	4	9	9	4	9	9	4	9	9	4	9	9
	3 000	3 000	3 375	1 875	4 125	4 350	2 250	4 800	6 000	3 000	6 000	6 000	3 000	6 000	6 000	3 000	6 000	6 000	3 000	6 000	6 000
	1	1	1	1	2	2	1	3	4	2	4	4	2	4	4	2	4	4	2	4	4
	4 002	4 076	4 859	2 803	6 537	6 948	3 642	7 771	8 973	4 486	8 973	8 973	4 486	8 973	8 973	4 486	8 973	8 973	4 486	8 973	8 973
	15	15	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	-	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120
	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180
	420	420	420	420	420	420	420	420	420	420	420	420	420	420	420	420	420	420	420	420	420
	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180
	195	195	234	234	234	234	234	234	234	234	234	234	234	234	234	234	234	234	234	234	234
	15	25	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
	150	180	210	270	300	330	345	360	390	390	390	390	390	390	390	390	390	390	390	390	390
	60	100	120	160	200	200	220	220	240	240	240	240	240	240	240	240	240	240	240	240	240
	9	15	18	24	30	30	33	33	36	36	36	36	36	36	36	36	36	36	36	36	36
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1 224	1 430	1 532	1 638	1 714	1 744	1 782	1 797	1 850	1 850	1 850	1 850	1 850	1 850	1 850	1 850	1 850	1 850	1 850	1 850	1 850
	Before the project																				
Net value of prod	2 777.6	2 646.0	3 326.9	1 164.9	4 823.1	5 204.0	1 860.4	5 973.8	7 122.8	2 636.5	7 122.8	7 122.8	2 636.5	7 122.8	7 122.8	2 636.5	7 122.8	7 122.8	2 636.5	7 122.8	7 122.8
Acrage in FED	1 500	1 500	1 500	4 000	4 000	4 000	4 000	4 000	4 000	4 000	4 000	4 000	4 000	4 000	4 000	4 000	4 000	4 000	4 000	4 000	4 000
total net margin	4 166 460.0	3 969 072.0	4 990 317.0	4 659 512.0	19 292 512.0	20 816 112.0	7 441 612.0	23 895 112.0	28 491 112.0	10 546 112	28 491 112	28 491 112	10 546 112	28 491 112	28 491 112	10 546 112	28 491 112	28 491 112	10 546 112	28 491 112	28 491 112
Incremental net margin		(197 388.0)	823 857.0	493 052.0	15 126 052.0	16 649 652.0	3 275 152.0	19 728 652.0	24 324 652.0	6 379 652	24 324 652	24 324 652	6 379 652	24 324 652	24 324 652	6 379 652	24 324 652	24 324 652	6 379 652	24 324 652	24 324 652
in USD	200	(986.9)	4 119.3	2 465.3	75 630.3	83 248.3	16 375.8	98 643.3	121 623.3	31 898.3	121 623.3	121 623.3	31 898.3	121 623.3	121 623.3	31 898.3	121 623.3	121 623.3	31 898.3	121 623.3	121 623.3
in million USD	1 000 000.0	(0.00)	0.00	0.00	0.08	0.08	0.02	0.10	0.12	0.03	0.12	0.12	0.03	0.12	0.12	0.03	0.12	0.12	0.03	0.12	0.12
	Additional Benefit	74.25	857.00	(1 199.00)	2 535.25	2 946.25	(359.38)	3 769.00	4 971.00	484.75	4 971.00	4 971.00	484.75	4 971.00	4 971.00	484.75	4 971.00	4 971.00	484.75	4 971.00	4 971.00
	Additional Cost	205.84	307.76	413.76	489.76	519.86	557.86	572.86	625.86	625.86	625.86	625.86	625.86	625.86	625.86	625.86	625.86	625.86	625.86	625.86	625.86
		0%	0%	167%	167%	167%	167%	167%	167%	167%	167%	167%	167%	167%	167%	167%	167%	167%	167%	167%	167%

**Table 2.a - Physical quantities**

MODEL 2	Model 2: Improvement of wadis / depression cultivation-quantities and pri Cropping pattern: Sorghum (0.5 feddan), Cowpea (0.25 feddan), watermelon (0.125 fedan), cucumber (0.125 feddan) State: Gadref and Nahir AlNeil																					
Parameter	Unit	before the project	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13	Y14	Y15	Y16	Y17	Y18	Y19	Y20
Output:																						
Crop1(sorghum grain)	Kg	426	426	500	275	650	700	375	900	956	478	956	956	478	956	956	478	956	956	478	956	956
Crop1(sorghum residues)	000'bundle	0.8	0.9	1	0.8	2.2	2.5	1.5	3.5	4	2	4	4	2	4	4	2	4	4	2	4	4
Crop2 (guar grain)	Kg	0	200	225	125	275	290	150	320	400	200	400	400	200	400	400	200	400	400	200	400	400
Crop2 (guar fodder)	000' bundle	0	0.3	0.4	0.25	0.7	0.8	0.5	1.2	1.5	0.75	1.5	1.5	0.75	1.5	1.5	0.75	1.5	1.5	0.75	1.5	1.5
Crop3(watermelon)	Ton	1.5	1.5	1.7	1	2.5	2.7	1.4	2.9	3	1.5	3	3	1.5	3	3	1.5	3	3	1.5	3	3
Crop4(cucumber)	Ton	2	2	2.3	1.2	3	3.3	2	4.2	5	1.3	5	5	2.5	5	5	2.5	5	5	2.5	5	5
Crop(3&4) fodder residues	000'bundle	0	0.5	0.7	0.45	1.2	1.6	1	2.3	2.5	1.25	2.5	2.5	1.25	2.5	2.5	1.25	2.5	2.5	1.25	2.5	2.5
Crop 5 (Okra)																						
changes in cucumber & watermelon output:was null before!																						
Inputs																						
Seeds and chemical:																						
Seeds sorghum	kg	Seeds sorghum	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Seeds Guar	kg																					
Seeds watermelon	Lb		0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Seeds cucumber	Lb		0	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Seeds derssing	kg		0	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Seeds Okra	kg																					
Labor:																						
Sowing	md		10	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
First weeding	md		6	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Second weeding	md		5	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Harvesting (Sorghum and guar)	Sack		4	7	8	9	10	10	11	12	14	14	14	14	14	14	14	14	14	14	14	14
Threshing	md		0	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Harvesting watermelon	md		0	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Harvesting cucumber	md		5	6	7	9	10	11	11	12	13	13	13	13	13	13	13	13	13	13	13	13
Harvesting Okra																						
Cutting of residues	md		0	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Others:																						
Sack	sack		4	7	8	9	10	10	11	12	14	14	14	14	14	14	14	14	14	14	14	14
Transport of grain	truck		1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Transport of okra	truck																					
Transport of residues	truck		0	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Transport of watermelon	truck		0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Transport of cucumber	truck		0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

**Table 2.b - Monetary values**

	Cost/unit (SD)	before the project	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13	Y14	Y15	Y16	Y17	Y18	Y19	Y20
M2 - sorghum grain		1576.2	1576.2	1850	1017.5	2405	2590	1387.5	3330	3537.2	1768.6	3537.2	3537.2	1768.6	3537.2	3537.2	1768.6	3537.2	3537.2	1768.6	3537.2	3537.2
M2- sorghum residues		1.472	1.656	1.84	1.472	4.048	4.6	2.76	6.44	7.36	3.68	7.36	7.36	3.68	7.36	7.36	3.68	7.36	7.36	3.68	7.36	7.36
M2 - Cowpea grain		0	3000	3375	1875	4125	4350	2250	4800	6000	3000	6000	6000	3000	6000	6000	3000	6000	6000	3000	6000	6000
M2 - Cowpea fodder		0	0.75	1	0.625	1.75	2	1.25	3	3.75	1.875	3.75	3.75	1.875	3.75	3.75	1.875	3.75	3.75	1.875	3.75	3.75
M2 - watermelon		360	360	408	240	600	648	336	696	720	360	720	720	360	720	720	360	720	720	360	720	720
M2 - Cucumber		5000	5000	5750	3000	7500	8250	5000	10500	12500	3250	12500	12500	6250	12500	12500	6250	12500	12500	6250	12500	12500
M2 - Crop(3&4) fodder residues		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		<b>6 937.7</b>	<b>9 938.6</b>	<b>11 385.8</b>	<b>6 134.6</b>	<b>14 635.8</b>	<b>15 844.6</b>	<b>8 977.5</b>	<b>19 335.4</b>	<b>22 768.3</b>	<b>8 384.2</b>	<b>22 768.3</b>	<b>22 768.3</b>	<b>11 384.2</b>	<b>22 768.3</b>	<b>22 768.3</b>	<b>11 384.2</b>	<b>22 768.3</b>	<b>22 768.3</b>	<b>11 384.2</b>	<b>22 768.3</b>	<b>22 768.3</b>
M2 Seeds sorghum		15	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
M2 Seeds Cowpea																						
M2 Seeds watermelon		0	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180
M2 Seeds cucumber		0	810	810	810	810	810	810	810	810	810	810	810	810	810	810	810	810	810	810	810	810
M2 Seeds derssing		0	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
M2 Sowing		360	288	288	288	288	288	288	288	288	288	288	288	288	288	288	288	288	288	288	288	288
M2 First weeding		306	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255
M2 Second weeding		195	195	234	234	234	234	234	234	234	234	234	234	234	234	234	234	234	234	234	234	234
M2 Harvesting		180	315	360	405	450	450	495	540	630	630	630	630	630	630	630	630	630	630	630	630	630
M2 Threshing		0	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
M2 Harvesting watermelon		0	540	540	540	540	540	540	540	540	540	540	540	540	540	540	540	540	540	540	540	540
M2 Harvesting cucumber		450	540	630	810	900	990	990	1080	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170
M2 Cutting of residues		0	360	360	360	360	360	360	360	360	360	360	360	360	360	360	360	360	360	360	360	360
M2 Sack		80	140	160	180	200	200	220	240	280	280	280	280	280	280	280	280	280	280	280	280	280
M2 Transport of grain		5	5	5	5	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
M2 Transport of residues		0	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48
M2 Transport of watermelon		0	850	850	850	850	850	850	850	850	850	850	850	850	850	850	850	850	850	850	850	850
M2 Transport of cucumber		0	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
<b>Sub-total</b>		<b>1 591</b>	<b>4 538</b>	<b>4 732</b>	<b>4 977</b>	<b>5 137</b>	<b>5 227</b>	<b>5 292</b>	<b>5 447</b>	<b>5 667</b>	<b>5 667</b>	<b>5 667</b>	<b>5 667</b>	<b>5 667</b>	<b>5 667</b>	<b>5 667</b>	<b>5 667</b>	<b>5 667</b>	<b>5 667</b>	<b>5 667</b>	<b>5 667</b>	<b>5 667</b>
<b>Net value of prod</b>		<b>5 347</b>	<b>5 400</b>	<b>6 653</b>	<b>1 157</b>	9 498	10 617	3 685	13 888	17 101	2 717	17 101	17 101	5 717	17 101	17 101	5 717	17 101	17 101	5 717	17 101	17 101
<b>Acragre in FED</b>	<b>1000</b>	<b>1000</b>	<b>2000</b>	<b>2000</b>	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
<b>total net margin</b>	<b>5 346 672</b>	<b>5 400 125</b>	<b>13 306 717</b>	<b>2 314 231</b>	18 996 633	21 234 237	7 370 057	27 775 917	34 201 657	5 433 347	34 201 657	34 201 657	34 201 657	11 433 347	34 201 657	34 201 657	11 433 347	34 201 657	34 201 657	11 433 347	34 201 657	34 201 657
<b>Incremental net margin</b>		<b>53 452</b>	<b>7 960 045</b>	<b>(3 032 441)</b>	13 649 961	15 887 565	2 023 385	22 429 245	28 854 985	86 675	28 854 985	28 854 985	28 854 985	6 086 675	28 854 985	28 854 985	6 086 675	28 854 985	28 854 985	6 086 675	28 854 985	28 854 985
<b>in USD</b>	<b>200</b>	<b>267.26</b>	<b>39 800.23</b>	<b>(15 162.21)</b>	68 249.81	79 437.83	10 116.93	112 146.23	144 274.93	433.38	144 274.93	144 274.93	30 433.38	144 274.93	144 274.93	30 433.38	144 274.93	144 274.93	30 433.38	144 274.93	144 274.93	144 274.93
<b>in Millions USD</b>	<b>1 000 000</b>	<b>0.00</b>	<b>0.04</b>	<b>(0.02)</b>	<b>0.07</b>	<b>0.08</b>	<b>0.01</b>	<b>0.11</b>	<b>0.14</b>	<b>0.00</b>	<b>0.14</b>	<b>0.14</b>	<b>0.03</b>	<b>0.14</b>	<b>0.14</b>	<b>0.03</b>	<b>0.14</b>	<b>0.14</b>	<b>0.03</b>	<b>0.14</b>	<b>0.14</b>	<b>0.14</b>
Additional Benefit		3 000.93	4 448.17	(803.08)	7 698.13	8 906.93	2 039.84	12 397.77	15 830.64	1 446.48	15 830.64	15 830.64	4 446.48	15 830.64	15 830.64	4 446.48	15 830.64	15 830.64	4 446.48	15 830.64	15 830.64	15 830.64
Additional Cost		2 947.48	3 141.48	3 386.48	3 546.48	3 636.48	3 701.48	3 856.48	4 076.48	4 076.48	4 076.48	4 076.48	4 076.48	4 076.48	4 076.48	4 076.48	4 076.48	4 076.48	4 076.48	4 076.48	4 076.48	4 076.48

**Table 3.a - Physical quantities**

<b>MODEL 3</b>		<b>Model 3: Women gardens cultivation &amp; shelterbelt establishment</b>																					
		<b>Cropping pattern: Fodder (0.125 feddan), Vegetables (0.125 feddan), Sheep/Goats (20), shelterbelt ( 6km)</b>																					
		<b>State: Nahir AlNeil</b>																					
<b>Parameter</b>	<b>Unit</b>		<b>before the project</b>	<b>Q</b>																			
				Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13	Y14	Y15	Y16	Y17	Y18	Y19	Y20
Output:																							
Crop1(Fodder)	ton	M4 - Fodder (ton)	0	2	2.5	1.65	4	5	3	7	8	4	8	8	4	8	8	4	8	8	4	8	8
Crop2 (Vegetables)	ton		0	2	3	2	4.5	5	2.75	6	6	3	6	6	3	6	6	3	6	6	3	6	6
inputs:																							
Seeds and chemical:																							
Seeds (Fodder)	Lb		0	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Seeds (Vegetables)	kg		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Seeds derssing	kg		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Inseticides	kg		0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Urea	kg		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Labor:																							
Sowing	md		7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
First weeding	md		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Second weeding	md		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Irrigation	md		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Fertilization/Spraying	md		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Harvesting vegetables	md		6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Collect vegetables	basket		50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Cutting of Fodder	md		40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
Others:																							
Transport of vegetable	truck		1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Transport of fodders	md		5	6	7	9	10	11	13	12	13	15	13	13	15	13	13	15	13	13	15	13	13
Fuel (diesel)	gal		0	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Fuel transport	gal		0	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15

**Table 3.b - Monetary values**

Cost/unit (SD)	before the project	Q																			
		Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13	Y14	Y15	Y16	Y17	Y18	Y19	Y20
-	4 000	5 000	3 300	8 000	10 000	6 000	14 000	16 000	8 000	16 000	16 000	8 000	16 000	16 000	8 000	16 000	16 000	8 000	16 000	16 000	16 000
-	7 000	10 500	7 000	15 750	17 500	9 625	21 000	21 000	10 500	21 000	21 000	10 500	21 000	21 000	10 500	21 000	21 000	10 500	21 000	21 000	21 000
-	11 000	15 500	10 300	23 750	27 500	15 625	35 000	37 000	18 500	37 000	37 000	18 500	37 000	37 000	18 500	37 000	37 000	18 500	37 000	37 000	37 000
-	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
90	90	90	90	90	90	90	90	90	90	270	270	270	270	270	270	270	270	270	810	810	810
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500
-	189	189	189	189	189	189	189	189	189	189	189	189	189	189	189	189	189	189	189	189	189
150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120
60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
126	126	126	126	126	126	126	126	126	126	126	126	126	126	126	126	126	126	126	126	126	126
3 000	3 000	3 000	3 000	3 000	3 000	3 000	3 000	3 000	3 000	3 000	3 000	3 000	3 000	3 000	3 000	3 000	3 000	3 000	3 000	3 000	3 000
1 200	1 200	1 200	1 200	1 200	1 200	1 200	1 200	1 200	1 200	1 200	1 200	1 200	1 200	1 200	1 200	1 200	1 200	1 200	1 200	1 200	1 200
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	4	5	6	7	7	8	8	8	10	8	8	10	8	8	10	8	8	10	8	8	8
-	405	405	405	405	405	405	405	405	405	405	405	405	405	405	405	405	405	405	405	405	405
-	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240
<b>Sub total</b>	<b>5 441</b>	<b>6 237</b>	<b>6 238</b>	<b>6 239</b>	<b>6 240</b>	<b>6 240</b>	<b>6 242</b>	<b>6 241</b>	<b>6 242</b>	<b>6 423</b>	<b>6 422</b>	<b>6 422</b>	<b>6 423</b>	<b>6 422</b>	<b>6 422</b>	<b>6 423</b>	<b>6 422</b>	<b>6 422</b>	<b>6 963</b>	<b>6 962</b>	<b>6 962</b>
<b>Net value of prod</b>	(5 441)	4 763	9 262	4 061	17 510	21 260	9 383	28 759	30 758	12 077	30 578	30 578	12 077	30 578	30 578	12 077	30 578	30 578	11 537	30 038	30 038
<b>Acragre in FED</b>	10	10	15	15	20	30	30	40	40	40	40	40	40	40	40	40	40	40	40	40	40
<b>total net margin</b>	(54 413)	47 630	138 936	60 916	350 208	637 792	281 503	1 150 364	1 230 338	483 086	1 223 138	1 223 138	483 086	1 223 138	1 223 138	483 086	1 223 138	1 223 138	461 486	1 201 538	1 201 538
<b>Incremental net benefit</b>	<b>102 044</b>	<b>193 349</b>	<b>115 329</b>	<b>404 622</b>	<b>692 206</b>	<b>335 917</b>	<b>1 204 777</b>	<b>1 284 751</b>	<b>537 499</b>	<b>1 277 551</b>	<b>1 277 551</b>	<b>537 499</b>	<b>1 277 551</b>	<b>1 277 551</b>	<b>537 499</b>	<b>1 277 551</b>	<b>1 277 551</b>	<b>515 899</b>	<b>1 255 951</b>	<b>1 255 951</b>	<b>1 255 951</b>
<b>in USD</b>	200	510	967	577	2 023	3 461	1 680	6 024	6 424	2 687	6 388	6 388	2 687	6 388	6 388	2 687	6 388	6 388	2 579	6 280	6 280
<b>in Millions USD</b>	1 000 000	0.0005	0.0010	0.0006	0.0020	0.0035	0.0017	0.0060	0.0064	0.0027	0.0064	0.0064	0.0027	0.0064	0.0064	0.0027	0.0064	0.0064	0.0026	0.0063	0.0063
Additional Benefit	11 000.00	15 500.00	10 300.00	23 750.00	27 500.00	15 625.00	35 000.00	37 000.00	18 500.00	37 000.00	37 000.00	18 500.00	37 000.00	37 000.00	18 500.00	37 000.00	37 000.00	18 500.00	37 000.00	37 000.00	37 000.00
Additional Cost	795.65	796.30	797.60	798.25	798.93	800.23	799.58	800.23	981.53	980.23	980.23	981.53	980.23	980.23	981.53	980.23	980.23	1 521.53	1 520.23	1 520.23	1 520.23

**Table 4.a - Physical quantities**

Model 4			Model 4: Small - Scale irrigated schemes : irrigated fruit trees and vegetables																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
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**Table 4.b - Monetary values**

Cost/unit (SD)	before the project	Value(SD)																			
		Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13	Y14	Y15	Y16	Y17	Y18	Y19	Y20
	25000	25000	35000	22500	60000	65000	35000	70000	75000	37500	75000	75000	37500	75000	75000	37500	75000	75000	37500	75000	75000
	11900	17000	20400	11900	27200	30600	15300	34000	34000	17000	34000	34000	17000	34000	34000	17000	34000	34000	17000	34000	34000
	0	0	0	0	98000	112000	70000	154000	168000	84000	168000	168000	84000	168000	168000	84000	168000	168000	84000	168000	168000
	0	0	0	0	20000	25000	13500	28000	30000	15000	30000	30000	15000	30000	30000	15000	30000	30000	15000	30000	30000
	<b>36 900</b>	<b>42000</b>	<b>55400</b>	<b>34400</b>	<b>205200</b>	<b>232600</b>	<b>133800</b>	<b>286000</b>	<b>307000</b>	<b>153500</b>	<b>307000</b>	<b>307000</b>	<b>153500</b>	<b>307000</b>	<b>307000</b>	<b>153500</b>	<b>307000</b>	<b>307000</b>	<b>153500</b>	<b>307000</b>	<b>307000</b>
	1408	3200	3200	3200	3200	3200	3200	3200	3200	3200	3200	3200	3200	3200	3200	3200	3200	3200	3200	3200	3200
	1300	2080	2080	2080	2080	2080	2080	2080	2080	2080	2080	2080	2080	2080	2080	2080	2080	2080	2080	2080	2080
	0	600	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
	288	320	320	320	320	320	320	320	320	320	320	320	320	320	320	320	320	320	320	320	320
	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75
	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500
	600	900	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600
	3840	4320	3840	3840	3840	3840	3840	3840	3840	3840	3840	3840	3840	3840	3840	3840	3840	3840	3840	3840	3840
	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200
	720	720	720	720	720	720	720	720	720	720	720	720	720	720	720	720	720	720	720	720	720
	150	150	210	270	360	390	420	420	450	450	420	450	450	450	450	450	450	450	450	450	450
	420	600	720	840	960	1080	1080	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200
	0	0	0	0	1320	1500	1620	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
	0	0	0	0	900	1020	1080	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200
	1560	2220	2660	3120	3560	4000	4000	4440	4440	4440	4440	4440	4440	4440	4440	4440	4440	4440	4440	4440	4440
	780	1110	1330	1560	1780	2000	2000	2220	2220	2220	2220	2220	2220	2220	2220	2220	2220	2220	2220	2220	2220
<b>Sub total</b>	<b>12 841</b>	<b>17995</b>	<b>17655</b>	<b>18525</b>	<b>21615</b>	<b>22725</b>	<b>22935</b>	<b>24015</b>	<b>24045</b>	<b>24045</b>	<b>24015</b>	<b>24045</b>	<b>24045</b>	<b>24045</b>	<b>24045</b>	<b>24045</b>	<b>24045</b>	<b>24045</b>	<b>24045</b>	<b>24045</b>	<b>24045</b>
<b>Net value of prod</b>	24 059	24 005	37 745	15 875	183 585	209 875	110 865	261 985	282 955	129 455	282 985	282 955	129 455	282 955	282 955	129 455	282 955	282 955	129 455	282 955	282 955
<b>Acrae in FED</b>	20	20	40	40	40	40	40	40	40	50	50	50	50	50	50	50	50	50	50	50	50
<b>total net margin</b>	481 180	480 100	1 509 800	635 000	7 343 400	8 395 000	4 434 600	10 479 400	11 318 200	6 472 750	14 149 250	14 147 750	6 472 750	14 147 750	14 147 750	6 472 750	14 147 750	14 147 750	6 472 750	14 147 750	14 147 750
<b>Incremental net margin</b>		(1 080)	1 028 620	153 820	6 862 220	7 913 820	3 953 420	9 998 220	10 837 020	5 991 570	13 668 070	13 666 570	5 991 570	13 666 570	13 666 570	5 991 570	13 666 570	13 666 570	5 991 570	13 666 570	13 666 570
<b>in USD</b>	200	(5)	5 143	769	34 311	39 569	19 767	49 991	54 185	29 958	68 340	68 333	29 958	68 333	68 333	29 958	68 333	68 333	29 958	68 333	68 333
<b>in Millions USD</b>	1 000 000	(0.00)	0.005	0.001	0.03	0.04	0.02	0.05	0.05	0.03	0.07	0.07	0.03	0.07	0.07	0.03	0.07	0.07	0.03	0.07	0.07
Additional Benefit	5 100.00	18 500.00	(2 500.00)	168 300.00	195 700.00	96 900.00	249 100.00	270 100.00	116 600.00	270 100.00	270 100.00	116 600.00	270 100.00	270 100.00	270 100.00	116 600.00	270 100.00	270 100.00	116 600.00	270 100.00	270 100.00
Additional Cost	5 154.00	4 814.00	5 684.00	8 774.00	9 884.00	10 094.00	11 174.00	11 204.00	11 204.00	11 174.00	11 204.00	11 204.00	11 204.00	11 204.00	11 204.00	11 204.00	11 204.00	11 204.00	11 204.00	11 204.00	11 204.00



## Annex 6: Financial Farm Models

Table 1.a - Physical quantities

MODEL 1	Model 1: Modification of terrace cultivation (Fed )-quantities and prices																											
	Cropping pattern: Sorghum (0.75) + Cowpea (0.25)																											
	Locality: Shindi, Eddamir, Alsubag, Albutana, Um algura, Gezira East																											
Parameter	Unit	before the project	Crop failure each three years																									
			Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13	Y14	Y15	Y16	Y17	Y18	Y19	Y20						
Output:																												
Crop1(sorghum grain)	Kg	270	290	400	250	650	700	375	800	800	400	800	800	400	800	800	400	800	800	400	800	800						
Crop1(sorghum residues)	kg	1	1	1	1	2	2	1	3	4	2	4	4	2	4	4	2	4	4	2	4	4						
Crop2 (Guar grain)	Kg	200	200	225	125	275	290	150	320	400	200	400	400	200	400	400	200	400	400	200	400	400						
Crop2 (Guar fodder)	Kg	0	0	0	0	1	1	1	1	2	1	2	2	1	2	2	1	2	2	1	2	2						
Crop3 (Okra)	Kg	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx						
inputs:																												
Seeds and chemical:																												
Seeds sorghum	kg	3	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4						
Seeds dressing	kg	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
Seed guar	kg	-	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8						
Seed okra	kg																											
Labor: Sowing	md	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6						
First weeding	md	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10						
Second weeding	md	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6						
Harvesting (Sorghum and guar)	md	5	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6						
Harvesting (Okra)	md																											
Threshing	Sack	3	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6						
Cutting & residues	md	5	6	7	9	10	11	12	12	13	13	13	13	13	13	13	13	13	13	13	13	13						
Others:																												
Sack	No.	3	5	6	8	10	10	11	11	12	12	12	12	12	12	12	12	12	12	12	12	12						
Transport of grain	sack	3	5	6	8	10	10	11	11	12	12	12	12	12	12	12	12	12	12	12	12	12						
Transport of residues	truck	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2						

**Table 1.b - Monetary values**

	before the project	Value(SD)																			
		Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13	Y14	Y15	Y16	Y17	Y18	Y19	Y20
M1																					
M1- sorghum grain	999	1 073	1 480	925	2 405	2 590	1 388	2 960	2 960	1 480	2 960	2 960	1 480	2 960	2 960	1 480	2 960	2 960	1 480	2 960	2 960
M1- sorghum residues	2	2	3	2	5	6	3	8	9	4	9	9	4	9	9	4	9	9	4	9	9
	3 000	3 000	3 375	1 875	4 125	4 350	2 250	4 800	6 000	3 000	6 000	6 000	3 000	6 000	6 000	3 000	6 000	6 000	3 000	6 000	6 000
	1	1	1	1	2	2	1	3	4	2	4	4	2	4	4	2	4	4	2	4	4
	4 002	4 076	4 859	2 803	6 537	6 948	3 642	7 771	8 973	4 486	8 973	8 973	4 486	8 973	8 973	4 486	8 973	8 973	4 486	8 973	8 973
M1 Seeds sorghum	15	15	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
M1 Seeds dressing	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M1 Seed cowpea	-	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120
M1 Labor: Sowing	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300
M1 First weeding	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700
M1 Second weeding	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300
M1 Harvesting	325	325	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390
M1 Threshing	25	41	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49
M1 Cutting & residues	250	300	350	450	500	550	575	600	650	650	650	650	650	650	650	650	650	650	650	650	650
M1 Sack	60	100	120	160	200	200	220	220	240	240	240	240	240	240	240	240	240	240	240	240	240
M1 Transport of grain	9	15	18	24	30	30	33	33	36	36	36	36	36	36	36	36	36	36	36	36	36
M1 Transport of residues	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1 984	2 216	2 367	2 513	2 609	2 659	2 707	2 732	2 805	2 805	2 805	2 805	2 805	2 805	2 805	2 805	2 805	2 805	2 805	2 805	2 805
Before the project																					
Net value of prod	2 017.8	1 859.6	2 491.2	289.2	3 927.4	4 288.3	934.7	5 038.1	6 167.1	1 680.8	6 167.1	6 167.1	1 680.8	6 167.1	6 167.1	1 680.8	6 167.1	6 167.1	1 680.8	6 167.1	6 167.1
Acrage in FED	1 500	1 500	1 500	4 000	4 000	4 000	4 000	4 000	4 000	4 000	4 000	4 000	4 000	4 000	4 000	4 000	4 000	4 000	4 000	4 000	4 000
total net margin	3 026 700.0	2 789 472.0	3 736 797.0	1 156 792.0	15 709 792.0	17 153 392.0	3 738 892.0	20 152 392.0	24 668 392.0	6 723 392	24 668 392	24 668 392	6 723 392	24 668 392	24 668 392	6 723 392	24 668 392	24 668 392	6 723 392	24 668 392	24 668 392
Incremental net margin		(237 228.0)	710 097.0	(1 869 908.0)	12 683 092.0	14 126 692.0	712 192.0	17 125 692.0	21 641 692.0	3 696 692	21 641 692	21 641 692	3 696 692	21 641 692	21 641 692	3 696 692	21 641 692	21 641 692	3 696 692	21 641 692	21 641 692
in USD	200	(1 186.1)	3 550.5	(9 349.5)	63 415.5	70 633.5	3 561.0	85 628.5	108 208.5	18 483.5	108 208.5	108 208.5	18 483.5	108 208.5	108 208.5	18 483.5	108 208.5	108 208.5	18 483.5	108 208.5	108 208.5
in millions USD	1 000 000.0	(0.00)	0.00	(0.01)	0.06	0.07	0.00	0.09	0.11	0.02	0.11	0.11	0.02	0.11	0.11	0.02	0.11	0.11	0.02	0.11	0.11
Additional Benefit		74.25	857.00	(1 199.00)	2 535.25	2 946.25	(359.38)	3 769.00	4 971.00	484.75	4 971.00	4 971.00	484.75	4 971.00	4 971.00	484.75	4 971.00	4 971.00	484.75	4 971.00	4 971.00
Additional Cost		232.40	383.60	529.60	625.60	675.70	723.70	748.70	821.70	821.70	821.70	821.70	821.70	821.70	821.70	821.70	821.70	821.70	821.70	821.70	821.70
		0%	0%	167%	167%	167%	167%	167%	167%	167%	167%	167%	167%	167%	167%	167%	167%	167%	167%	167%	167%

**Table 2.a - Physical quantities**

MODEL 2			Model 2: Improvement of wades / depression cultivation-quantities and prices																				
			Cropping pattern: Sorghum (0.5 feddan), Cowpea (0.25 feddan) , watermelon( .125 fedan),cucumber(0.125 feddan)																				
			State: Gadref and Nahir AlNeil																				
Parameter	Unit		before the project																				
			Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13	Y14	Y15	Y16	Y17	Y18	Y19	Y20	
Output:																							
Crop1(sorghum grain)	Kg		426	426	500	275	650	700	375	900	956	478	956	956	478	956	956	478	956	956	478	956	956
Crop1(sorghum residues)	000'bundle		0.8	0.9	1	0.8	2.2	2.5	1.5	3.5	4	2	4	4	2	4	4	2	4	4	2	4	4
Crop2 (guar grain)	Kg		0	200	225	125	275	290	150	320	400	200	400	400	200	400	400	200	400	400	200	400	400
Crop2 (guar fodder)	000' bundle		0	0.3	0.4	0.25	0.7	0.8	0.5	1.2	1.5	0.75	1.5	1.5	0.75	1.5	1.5	0.75	1.5	1.5	0.75	1.5	1.5
Crop3(watermelon)	Ton		1.5	1.5	1.7	1	2.5	2.7	1.4	2.9	3	1.5	3	3	1.5	3	3	1.5	3	3	1.5	3	3
Crop4(cucumber)	Ton		2	2	2.3	1.2	3	3.3	2	4.2	5	1.3	5	5	2.5	5	5	2.5	5	5	2.5	5	5
Crop(3&4) fodder residues	000'bundle		0	0.5	0.7	0.45	1.2	1.6	1	2.3	2.5	1.25	2.5	2.5	1.25	2.5	2.5	1.25	2.5	2.5	1.25	2.5	2.5
Crop 5 (Okra)																							
changes in cucumber & watermelon output: was null before!																							
Inputs																							
Seeds and chemical:																							
		M2 Seeds sorghum																					
Seeds sorghum	kg		3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Seeds Guar	kg																						
Seeds watermelon	Lb		0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Seeds cucumber	Lb		0	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Seeds derssing	kg		0	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Seeds Okra	kg																						
Labor:																							
Sowing	md		10	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
First weeding	md		6	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Second weeding	md		5	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Harvesting (Sorghum and guar)	Sack		4	7	8	9	10	10	11	12	14	14	14	14	14	14	14	14	14	14	14	14	14
Threshing	md		0	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Harvesting watermelon	md		0	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Harvesting cucumber	md		5	6	7	9	10	11	11	12	13	13	13	13	13	13	13	13	13	13	13	13	13
Harvesting Okra																							
Cutting of residues	md		0	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Others:																							
Sack	sack		4	7	8	9	10	10	11	12	14	14	14	14	14	14	14	14	14	14	14	14	14
Transport of grain	truck		1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Transport of okra	truck																						
Transport of residues	truck		0	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Transport of watermelon	truck		0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Transport of cucumber	truck		0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

**Table 2.b - Monetary values**

M2 Seeds sorghum	15	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
M2 Seeds Cowpea																						
M2 Seeds watermelon	0	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180
M2 Seeds cucumber	0	810	810	810	810	810	810	810	810	810	810	810	810	810	810	810	810	810	810	810	810	810
M2 Seeds dressing	0	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
M2 Sowing	600	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480
M2 First weeding	510	425	425	425	425	425	425	425	425	425	425	425	425	425	425	425	425	425	425	425	425	425
M2 Second weeding	325	325	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390
M2 Harvesting	300	525	600	675	750	750	825	900	1050	1050	1050	1050	1050	1050	1050	1050	1050	1050	1050	1050	1050	1050
M2 Threshing	0	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
M2 Harvesting watermelon	0	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900
M2 Harvesting cucumber	750	900	1050	1350	1500	1650	1650	1800	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950
M2 Cutting of residues	0	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600
M2 Sack	80	140	160	180	200	200	220	240	280	280	280	280	280	280	280	280	280	280	280	280	280	280
M2 Transport of grain	5	5	5	5	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
M2 Transport of residues	0	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48
M2 Transport of watermelon	0	850	850	850	850	850	850	850	850	850	850	850	850	850	850	850	850	850	850	850	850	850
M2 Transport of cucumber	0	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Sub-total		2 585	6 220	6 530	6 925	7 175	7 325	7 420	7 665	8 005	8 005	8 005	8 005	8 005	8 005	8 005	8 005	8 005	8 005	8 005	8 005	8 005
Net value of prod	4 353	3 718	4 855	(791)	7 460	8 519	1 557	11 670	14 763	379	14 763	14 763	3 379	14 763	14 763	3 379	14 763	14 763	3 379	14 763	14 763	14 763
Acrage in FED	1000	1000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
total net margin	4 352 672	3 718 125	9 710 717	(1 581 769)	14 920 633	17 038 237	3 114 057	23 339 917	29 525 657	757 347	29 525 657	29 525 657	6 757 347	29 525 657	29 525 657	6 757 347	29 525 657	29 525 657	6 757 347	29 525 657	29 525 657	29 525 657
Incremental net margin		(634 548)	5 358 045	(5 934 441)	10 567 961	12 685 565	(1 238 615)	18 987 245	25 172 985	(3 595 325)	25 172 985	25 172 985	2 404 675	25 172 985	25 172 985	2 404 675	25 172 985	25 172 985	2 404 675	25 172 985	25 172 985	25 172 985
in USD	200	(3 172.74)	26 790.23	(29 672.21)	52 839.81	63 427.83	(6 193.08)	94 936.23	125 864.93	(17 976.63)	125 864.93	125 864.93	12 023.38	125 864.93	125 864.93	12 023.38	125 864.93	125 864.93	12 023.38	125 864.93	125 864.93	125 864.93
in Millions USD	1 000 000	(0.00)	0.03	(0.03)	0.05	0.06	(0.01)	0.09	0.13	(0.02)	0.13	0.13	0.01	0.13	0.13	0.01	0.13	0.13	0.01	0.13	0.13	0.13
Additional Benefit		3 000.93	4 448.17	(803.08)	7 698.13	8 906.93	2 039.84	12 397.77	15 830.64	1 446.48	15 830.64	15 830.64	4 446.48	15 830.64	15 830.64	4 446.48	15 830.64	15 830.64	4 446.48	15 830.64	15 830.64	15 830.64
Additional Cost		3 635.48	3 945.48	4 340.48	4 590.48	4 740.48	4 835.48	5 080.48	5 420.48	5 420.48	5 420.48	5 420.48	5 420.48	5 420.48	5 420.48	5 420.48	5 420.48	5 420.48	5 420.48	5 420.48	5 420.48	5 420.48

**Table 3.a - Physical quantities**

MODEL 3			Model 3: Women gardens cultivation & shelterbelt establishment																					
			Cropping pattern: Fodder (0.125 feddan), Vegetables (0.125 feddan), Sheep/Goats (20), shelterbelt ( 6km)																					
			State: Nahir AlNeil																					
Parameter	Unit		before the project	Q																				
				Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13	Y14	Y15	Y16	Y17	Y18	Y19	Y20	
Output:				Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13	Y14	Y15	Y16	Y17	Y18	Y19	Y20	
Crop1(Fodder)	ton	M4 - Fodder (ton)	2	1.5	1.75	1.65	2	3	3	7	8	4	8	8	4	8	8	4	8	8	4	8	8	
Crop2 (Vegetables)	ton		2	2	3	2	4.5	5	2.75	6	6	3	6	6	3	6	6	3	6	6	3	6	6	
inputs:																								
Seeds and chemical:																								
Seeds (Fodder)	Lb		10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
Seeds (Vegetables)	kg		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
Seeds derssing	kg		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	
Insecticides	kg		0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	
Urea	kg		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	
Labor:																								
Sowing	md		7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	
First weeding	md		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
Second weeding	md		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
Irrigation	md		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	
Fertilization/Spraying	md		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Harvesting vegetables	md		6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	
Collect vegetables	basket		50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	
Cutting of Fodder	md		40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	
Others:																								
Transport of vegetable	truck		1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
Transport of fodders	md		6	6	7	9	10	11	13	12	13	15	13	13	15	13	13	15	13	13	15	13	13	
Fuel (diesel)	gal		15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	
Fuel transport	gal		15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	

**Table 3.b - Monetary values**

	Cost/unit (SD)	Value(SD)																				
		before the project	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13	Y14	Y15	Y16	Y17	Y18	Y19	Y20
<b>M3</b>																						
M3 - Fodder (ton)		4 000	3 000	3 500	3 300	4 000	6 000	6 000	14 000	16 000	8 000	16 000	16 000	8 000	16 000	16 000	8 000	16 000	16 000	8 000	16 000	16 000
M3 - Vegetables (ton)		7 000	7 000	10 500	7 000	15 750	17 500	9 625	21 000	21 000	10 500	21 000	21 000	10 500	21 000	21 000	10 500	21 000	21 000	10 500	21 000	21 000
		<b>11 000</b>	<b>10 000</b>	<b>14 000</b>	<b>10 300</b>	<b>19 750</b>	<b>23 500</b>	<b>15 625</b>	<b>35 000</b>	<b>37 000</b>	<b>18 500</b>	<b>37 000</b>	<b>37 000</b>	<b>18 500</b>	<b>37 000</b>	<b>37 000</b>	<b>18 500</b>	<b>37 000</b>	<b>37 000</b>	<b>18 500</b>	<b>37 000</b>	<b>37 000</b>
M3 - Seeds (Fodder) (lb)	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
M3- Seeds (Vegetables) (kg)	90	90	90	90	90	90	90	90	90	90	270	270	270	270	270	270	270	270	270	810	810	810
M3 - Seeds dressing (kg)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M3 - Insecticides (kg)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M3 - Urea (kg)	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500
M3 - Sowing (md)	315	315	315	315	315	315	315	315	315	315	315	315	315	315	315	315	315	315	315	315	315	315
M3 - First weeding (md)	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250
M3 - Second weeding (md)	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
M3 - Irrigation (md)	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
M3 - Fertilization/Spraying (md)	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
M3 - Harvesting vegetables (md)	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210
M3 - Collect vegetables (basket)	5 000	5 000	5 000	5 000	5 000	5 000	5 000	5 000	5 000	5 000	5 000	5 000	5 000	5 000	5 000	5 000	5 000	5 000	5 000	5 000	5 000	5 000
M3 - Cutting of Fodder (md)	2 000	2 000	2 000	2 000	2 000	2 000	2 000	2 000	2 000	2 000	2 000	2 000	2 000	2 000	2 000	2 000	2 000	2 000	2 000	2 000	2 000	2 000
M3 - Transport of vegetable (truck)																						
M3 - Transport of fodders (md)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M3 - Fuel (diesel) (gal)	4	4	5	6	7	7	8	8	8	10	8	8	8	10	8	8	10	8	8	10	8	8
M3 - Fuel transport (gal)	405	405	405	405	405	405	405	405	405	405	405	405	405	405	405	405	405	405	405	405	405	405
	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240
<b>Sub total</b>		<b>9 469</b>	<b>9 469</b>	<b>9 470</b>	<b>9 471</b>	<b>9 472</b>	<b>9 472</b>	<b>9 474</b>	<b>9 473</b>	<b>9 474</b>	<b>9 655</b>	<b>9 654</b>	<b>9 654</b>	<b>9 655</b>	<b>9 654</b>	<b>9 654</b>	<b>9 655</b>	<b>9 654</b>	<b>9 654</b>	<b>10 195</b>	<b>10 194</b>	<b>10 194</b>
<b>Net value of prod</b>	1 531	531	4 530	829	10 278	14 028	6 151	25 527	27 526	8 845	27 346	27 346	8 845	27 346	27 346	8 845	27 346	27 346	8 305	26 806	26 806	26 806
<b>Acrag in FED</b>	10	10	15	15	20	30	30	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
<b>total net margin</b>	15 310	5 310	67 956	12 436	205 568	420 832	184 543	1 021 084	1 101 058	353 806	1 093 858	1 093 858	353 806	1 093 858	1 093 858	353 806	1 093 858	1 093 858	332 206	1 072 258	1 072 258	1 072 258
<b>Incremental net benefit</b>	(10 000)	52 645	(2 874)	190 258	405 522	169 233	1 005 773	1 085 747	338 495	1 078 547	1 078 547	338 495	1 078 547	1 078 547	338 495	1 078 547	1 078 547	1 078 547	316 895	1 056 947	1 056 947	1 056 947
<b>in USD</b>	200	(50)	263	(14)	951	2 028	846	5 029	5 429	1 692	5 393	5 393	1 692	5 393	5 393	1 692	5 393	5 393	1 584	5 285	5 285	5 285
<b>in million USD</b>	1 000 000	(0.0001)	0.0003	(0.0000)	0.0010	0.0020	0.0008	0.0050	0.0054	0.0017	0.0054	0.0054	0.0017	0.0054	0.0017	0.0054	0.0017	0.0054	0.0016	0.0053	0.0053	0.0053
<b>Additional Benefit</b>		(1 000.00)	3 000.00	(700.00)	8 750.00	12 500.00	4 625.00	24 000.00	26 000.00	7 500.00	26 000.00	26 000.00	7 500.00	26 000.00	26 000.00	7 500.00	26 000.00	26 000.00	7 500.00	26 000.00	26 000.00	26 000.00

**Table 4.a - Physical quantities**

Model 4			Model 4: Small - Scale irrigated schemes : irrigated fruit trees and vegetables																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
			Farm unit : 2 fed																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
			Cropping pattern : grapefruit/ Tomatoes(1fed)+Lemon/Onion (1fed)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
			Locality: Nahir Atbara, Kassala State																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
Parameter	Unit		before the project	Q																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						

**Table 4.b - Monetary values**

	Cost/unit (SD)	before the project	Value(SD)																			
			Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13	Y14	Y15	Y16	Y17	Y18	Y19	Y20
<b>M4</b>																						
M4 - Tomatoes (ton)		25000	25000	35000	22500	60000	65000	35000	70000	75000	37500	75000	75000	37500	75000	75000	37500	75000	75000	37500	75000	75000
M4 - Onion (ton )		11900	17000	20400	11900	27200	30600	15300	34000	34000	17000	34000	34000	17000	34000	34000	17000	34000	34000	17000	34000	34000
M4 - Grapefruit (ton )		0	0	0	0	98000	112000	70000	154000	168000	84000	168000	168000	84000	168000	168000	84000	168000	168000	84000	168000	168000
M4 - Lemon (ton )		0	0	0	0	20000	25000	13500	28000	30000	15000	30000	30000	15000	30000	30000	15000	30000	30000	15000	30000	30000
		<b>36 900</b>	<b>42000</b>	<b>55400</b>	<b>34400</b>	<b>205200</b>	<b>232600</b>	<b>133800</b>	<b>286000</b>	<b>307000</b>	<b>153500</b>	<b>307000</b>	<b>307000</b>	<b>153500</b>	<b>307000</b>	<b>307000</b>	<b>153500</b>	<b>307000</b>	<b>307000</b>	<b>153500</b>	<b>307000</b>	<b>307000</b>
M4 Fuel (Diesel) (Gal)		1408	3200	3200	3200	3200	3200	3200	3200	3200	3200	3200	3200	3200	3200	3200	3200	3200	3200	3200	3200	3200
M4 Oil / Lubricant (Gal)		1300	2080	2080	2080	2080	2080	2080	2080	2080	2080	2080	2080	2080	2080	2080	2080	2080	2080	2080	2080	2080
M4 tree pit excavation (md)		0	600	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
M4 Seeds Tomatoes (gm)		288	320	320	320	320	320	320	320	320	320	320	320	320	320	320	320	320	320	320	320	320
M4 Seeds Onion (lb)		75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75
M4 Fertilizer (kg)		500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500
M4 Sowing(Tomatoes+grapefruit) (md)		1000	1500	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
M4 Sowing(Onion+Lemon) (md)		6400	7200	6400	6400	6400	6400	6400	6400	6400	6400	6400	6400	6400	6400	6400	6400	6400	6400	6400	6400	6400
M4 First weeding (md)		2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
M4 Second weeding (md)		1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200
M4 Harvesting tomatoes (ton )		250	250	350	450	600	650	700	700	750	750	700	750	750	750	750	750	750	750	750	750	750
M4 Harvesting onion (ton )		700	1000	1200	1400	1600	1800	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
M4 Harvesting grapefruit (md)		0	0	0	0	2200	2500	2700	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000
M4 Harvesting lemon (md)		0	0	0	0	1500	1700	1800	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
M4 Sack onion (sack)		1560	2220	2660	3120	3560	4000	4000	4440	4440	4440	4440	4440	4440	4440	4440	4440	4440	4440	4440	4440	4440
M4 Transport of onion (sack)		780	1110	1330	1560	1780	2000	2000	2220	2220	2220	2220	2220	2220	2220	2220	2220	2220	2220	2220	2220	2220
<b>Sub total</b>		<b>17 461</b>	<b>23255</b>	<b>22515</b>	<b>23505</b>	<b>28215</b>	<b>29625</b>	<b>29975</b>	<b>31335</b>	<b>31385</b>	<b>31385</b>	<b>31335</b>	<b>31385</b>	<b>31385</b>	<b>31385</b>	<b>31385</b>	<b>31385</b>	<b>31385</b>	<b>31385</b>	<b>31385</b>	<b>31385</b>	<b>31385</b>
<b>Net value of prod</b>		<b>19 439</b>	<b>18 745</b>	<b>32 885</b>	<b>10 895</b>	<b>176 985</b>	<b>202 975</b>	<b>103 825</b>	<b>254 665</b>	<b>275 615</b>	<b>122 115</b>	<b>275 665</b>	<b>275 615</b>	<b>122 115</b>	<b>275 615</b>	<b>275 615</b>	<b>122 115</b>	<b>275 615</b>	<b>275 615</b>	<b>122 115</b>	<b>275 615</b>	<b>275 615</b>
<b>Acragre in FED</b>		<b>20</b>	<b>20</b>	<b>40</b>	<b>40</b>	<b>40</b>	<b>40</b>	<b>40</b>	<b>40</b>	<b>40</b>	<b>50</b>	<b>50</b>	<b>50</b>	<b>50</b>	<b>50</b>	<b>50</b>	<b>50</b>	<b>50</b>	<b>50</b>	<b>50</b>	<b>50</b>	<b>50</b>
<b>total net margin</b>		<b>388 780</b>	<b>374 900</b>	<b>1 315 400</b>	<b>435 800</b>	<b>7 079 400</b>	<b>8 119 000</b>	<b>4 153 000</b>	<b>10 186 600</b>	<b>11 024 600</b>	<b>6 105 750</b>	<b>13 783 250</b>	<b>13 780 750</b>	<b>6 105 750</b>	<b>13 780 750</b>	<b>13 780 750</b>	<b>6 105 750</b>	<b>13 780 750</b>	<b>13 780 750</b>	<b>6 105 750</b>	<b>13 780 750</b>	<b>13 780 750</b>
<b>Incremental net margin</b>		<b>(13 880)</b>	<b>926 620</b>	<b>47 020</b>	<b>6 690 620</b>	<b>7 730 220</b>	<b>3 764 220</b>	<b>9 797 820</b>	<b>10 635 820</b>	<b>5 716 970</b>	<b>13 394 470</b>	<b>13 391 970</b>	<b>5 716 970</b>	<b>13 391 970</b>	<b>13 391 970</b>	<b>5 716 970</b>	<b>13 391 970</b>	<b>13 391 970</b>	<b>5 716 970</b>	<b>13 391 970</b>	<b>13 391 970</b>	<b>13 391 970</b>
<b>in USD</b>		<b>200</b>	<b>(69)</b>	<b>4 633</b>	<b>235</b>	<b>33 453</b>	<b>38 651</b>	<b>18 821</b>	<b>48 989</b>	<b>53 179</b>	<b>28 585</b>	<b>66 972</b>	<b>66 960</b>	<b>28 585</b>	<b>66 960</b>	<b>66 960</b>	<b>28 585</b>	<b>66 960</b>	<b>66 960</b>	<b>28 585</b>	<b>66 960</b>	<b>66 960</b>
<b>in million USD</b>		<b>1 000 000</b>	<b>(0.00)</b>	<b>0.005</b>	<b>0.000</b>	<b>0.03</b>	<b>0.04</b>	<b>0.02</b>	<b>0.05</b>	<b>0.05</b>	<b>0.03</b>	<b>0.07</b>	<b>0.07</b>	<b>0.03</b>	<b>0.07</b>	<b>0.07</b>	<b>0.03</b>	<b>0.07</b>	<b>0.07</b>	<b>0.03</b>	<b>0.07</b>	<b>0.07</b>
		<b>Additional Benefit</b>	<b>5 100.00</b>	<b>18 500.00</b>	<b>(2 500.00)</b>	<b>168 300.00</b>	<b>195 700.00</b>	<b>96 900.00</b>	<b>249 100.00</b>	<b>270 100.00</b>	<b>116 600.00</b>	<b>270 100.00</b>	<b>270 100.00</b>	<b>116 600.00</b>	<b>270 100.00</b>	<b>270 100.00</b>	<b>116 600.00</b>	<b>270 100.00</b>	<b>270 100.00</b>	<b>116 600.00</b>	<b>270 100.00</b>	<b>270 100.00</b>
		<b>Additional Cost</b>	<b>5 794.00</b>	<b>5 054.00</b>	<b>6 044.00</b>	<b>10 754.00</b>	<b>12 164.00</b>	<b>12 514.00</b>	<b>13 874.00</b>	<b>13 924.00</b>	<b>13 924.00</b>	<b>13 874.00</b>	<b>13 924.00</b>	<b>13 924.00</b>	<b>13 924.00</b>	<b>13 924.00</b>	<b>13 924.00</b>	<b>13 924.00</b>	<b>13 924.00</b>	<b>13 924.00</b>	<b>13 924.00</b>	<b>13 924.00</b>
<b>TOTAL BENEF (USD)</b>			<b>(0.00)</b>	<b>0.04</b>	<b>(0.04)</b>	<b>0.15</b>	<b>0.17</b>	<b>0.02</b>	<b>0.23</b>	<b>0.29</b>	<b>0.03</b>	<b>0.31</b>	<b>0.31</b>	<b>0.06</b>	<b>0.31</b>	<b>0.31</b>	<b>0.06</b>	<b>0.31</b>	<b>0.31</b>	<b>0.06</b>	<b>0.31</b>	<b>0.31</b>



## Appendix 6. BIRDP Achievements

BIRDP: 2015 Actuals vs Appraisal target				
Results	Unit	Cumulative		
		Appraisal target	Actual	% of Appraisal
Total Outreach				
Communities receiving project services	Number	140	140	100%
Households receiving project services	Number	33 000	34 381	104%
People receiving project services	Male	20 000	48 201	241%
People receiving project services	Female	20 000	39 029	195%
Institutional support				
Staff of service providers trained	Number	88	124	141%
Pro-poor legislation and regulations enforced at the local or central level	Number	6	4	67%
Drinking water/sanitation				
Drinking water systems constructed/rehabilitated	Number	75	118	157%
Rangeland/pastures				
Environmental management plans formulated	Number	140	140	100%
Groups involved in NRM formed/strengthened-rangelands	Number	140	744	531%
Land under improved management practices	Ha	333 060	423 977	127%
People in natural resources management groups formed/strengthened	Number	45 000	75 871	169%
People in natural resources management groups formed/strengthened	Number	45 000	61 323	136%
People trained in crop production and technologies	Number	4 500	11 181	248%
Common property resources under improved management practice-rangelands	Ha	50 000	35 523	71%
Number of groups operational/functional-rangelands	Number	500	1 108	222%
Animal production				
Government officials and staff trained	Number	10	70	700%
Households receiving animal health services	Number	4 000	7 238	181%
People accessing advisory services facilitated by project	Number	1 800	2 675	149%
People trained in livestock production and technologies	Number	280	2 210	789%
Farmers reporting increased herd sizes (men/women)	Number	1 350	1 232	91%
Market infrastructure				
Marketing facilities constructed/rehabilitated	Number	5	5	100%
Market facilities constructed/rehabilitated-other - veterinary services centers/pharmacies	Number	5	7	140%
Marketing groups formed/strengthened	Number	280	22	8%
People in marketing groups formed/strengthened	Number	5 600	811	14%
People trained in post-production, processing and marketing	Number	1 400	1 403	100%
Market, storage or processing facilities operating after 3 years- market	Number	6	5	83%
Community Development				
Community groups formed/strengthened	Number	700	1 162	166%
People in community groups formed/strengthened	Number	10 500	10 290	98%
People trained in income generating activities	Number	2 340	3 476	149%
Village/Community plans formulated	Number	140	141	101%
Number of groups operational/functional	Number	700	893	128%