CEO ENDORSEMENT
PROJECT TYPE: FULL SIZE PROJECT
TYPE OF TRUST FUND: LDCF

For more information about GEF, visit TheGEF.org

PART I: PROJECT INFORMATION

Project Title: CLIMATE RESILIENT LIVESTOCK MANAGEMENT PROJECT (CRLMP)			
Country(ies):	Zambia	GEF Project ID:[1]	5394
GEF Agency(ies):	AfDB (select) (select)	GEF Agency Project ID:	
Other Executing Partner(s):	Ministry of Agriculture and Livestock	Submission Date:	2015-09-16
GEF Focal Area (s):	Climate Change	Project Duration(Months)	60
Name of Parent Program (if applicable): ➢ For SFM/REDD+ ☐ ➢ For SGP ☐ ➢ For PPP ☐		Project Agency Fee ($):	589,950

A. FOCAL AREA STRATEGY FRAMEWORK[2]

Focal Area Objectives	Expected FA Outcomes	Expected FA Outputs	Trust Fund	Grant Amount ($)	Co-financing ($)
CCA-1	Outcome 1.3: Diversified and strengthened livelihoods and sources of income for vulnerable people in targeted areas	Output 1.3.1: Targeted individual and community livelihood strategies strengthened in relation to climate change impacts, including variability	LDCF	5,110,000	15,205,500
CCA-2	Outcome 2.3: Strengthened awareness and ownership of adaptation and climate risk reduction processes at local level	Output 2.3.1: Targeted population groups participating in adaptation and risk reduction awareness activities	LDCF	1,100,000	5,502,500
Total project costs				6,210,000	20,708,000

B. PROJECT FRAMEWORK

Project Objective: To strengthen the adaptive capacity of Zambian livestock farmers to the impacts of Climate Change						
Project Component	**Grant Type**	**Expected Outcomes**	**Expected Outputs**	**Trust Fund**	**Grant Amount ($)**	**Confirmed Co-financing ($)**
1. Promoting Climate Resilient Livestock investments and increasing climate change adaptive capacity of livestock farmers	Inv	**1.1** - Livestock farmers able to cope with climate change through adoption of improved practices that enhance livelihoods	**1.1.1** - Livestock farmers acquire **3 450** LUs of breeds resilient to climate change **1.1.2** - Livestock farmers set up **2 250** ha of sustainable livestock pastures, fodder banks & rangeland and **292** water harvesting systems	LDCF	4,195,749	13,226,279

[1] Project ID number will be assigned by GEFSEC.
[2] Refer to the Focal Area Results Framework and LDCF/SCCF Framework when completing Table A.

Project Objective: To strengthen the adaptive capacity of Zambian livestock farmers to the impacts of Climate Change						
Project Component	**Grant Type**	**Expected Outcomes**	**Expected Outputs**	**Trust Fund**	**Grant Amount ($)**	**Confirmed Co-financing ($)**
			1.1.3 - Effective practices developed for the community to manage indigenous livestock **1.1.4 –** Operational livestock index-based insurance scheme **1.1.5 –** Operational Livestock Early Warning Information System			
	Inv	**1.2 -** Resilience of natural resources to climate change enhanced	**1.2.1 -** Restoration of **4 500** ha of degraded pasture and increased vegetation cover with different drought tolerant perennials	LDCF	331,396	1,044,660
	Inv	**1.3 -** Increased resilience of infrastructure to climate change threats	**1.3.1 – 11** Climate resilient infrastructure designs in place **1.3.2 – 217** Climate resilient infrastructure constructed and maintained	LDCF	43,606	137,459
	Inv	**1.4 -** Reduced GHG emissions from LISP infrastructure and processes	**1.4.1 – 11** LISP infrastructure designs for reduced GHG emissions in place **1.4.2 – 11** LISP infrastructure designs with GHG emissions reduction technologies	LDCF	94,249	297,102
2. Capacity Building on climate change Adaptation for stakeholders	TA	**2.1 -** Increased knowledge and risk preparedness and adaptive capacity to climate variability at country and targeted community levels	**2.1.1 -** Country: **160** technical staff of Government trained in climate risk assessment and adaptation skills for livestock farmers **2.1.2 -** Community level: Training **80** artisans in manufacturing livestock-related material as a source of income diversification	LDCF	631,177	2,631,694

Project Objective: To strengthen the adaptive capacity of Zambian livestock farmers to the impacts of Climate Change						
Project Component	**Grant Type**	**Expected Outcomes**	**Expected Outputs**	**Trust Fund**	**Grant Amount ($)**	**Confirmed Co-financing ($)**
	TA	**2.2 -** Diversification and strengthened livelihoods and source of incomes for rural population (artisan and livestock farmers)	**2.2.1 - 180** Livestock farmers (30% F) equipped with skills for livestock feed conservation for dry season and implement other adaptation measures autonomously **2.2.2 –** Strengthened adaptive capacity for sustainable land use management for **180** villages **2.2.3 –** Technical and business capacity developed for construction of biogas plants for **180** livestock farmers	LDCF	368,823	1,537,806
3. Knowledge, Monitoring and Evaluation	TA	M&E management and lessons learnt are captured and appropriately disseminated	**3.1 –** Compile **5** knowledge adaptation products **3.2 -** Participate in **30** adaptation practitioners events **3.3 -** Produce **29** Monitoring and evaluation reports	LDCF	250,000	500,000
Subtotal					5,915,000	19,375,000
Project management Cost (PMC)[3]				LDCF	295,000	1,333,000
Total project costs					6,210,000	20,708,000

C. SOURCES OF CONFIRMED CO-FINANCING FOR THE PROJECT BY SOURCE AND BY NAME ($)

Please include letters confirming co-financing for the project with this form

Sources of Co-financing	**Name of Co-financier (source)**	**Type of Co-financing**	**Co-financing Amount** ($)
GEF Agency	African Development Bank/Fund	Soft Loan	18,600,000
National Government	Republic of Zambia	In-kind	2,108,000
Total Co-financing			20,708,000

D. TRUST FUND RESOURCES REQUESTED BY AGENCY, FOCAL AREA AND COUNTRY[1]

GEF Agency	**Type of Trust Fund**	**Focal Area**	**Country Name/ Global**	**(in $)**		
				Grant Amount (a)	**Agency Fee** (b)[2]	**Total** c=a+b
AfDB	LDCF	Climate Change	Zambia	6,210,000	589,950	6,799,950

[3] PMC should be charged proportionately to focal areas based on focal area project grant amount in Table D below.

Total Grant Resources	6,210,000	589,950	6,799,950

[1] In case of a single focal area, single country, single GEF Agency project, and single trust fund project, no need to provide information for this table. PMC amount from Table B should be included proportionately to the focal area amount in this table.

[2] Indicate fees related to this project.

F. CONSULTANTS WORKING FOR TECHNICAL ASSISTANCE COMPONENTS:

Component	Grant Amount ($)	Co-financing ($)	Project Total ($)
International Consultants	290,500	525,300	290,500
National/Local Consultants	301,000	544,300	301,000

G. DOES THE PROJECT INCLUDE A "NON-GRANT" INSTRUMENT? No

(If non-grant instruments are used, provide in Annex D an indicative calendar of expected reflows to your Agency and to the GEF/LDCF/SCCF/NPIF Trust Fund).

PART II: PROJECT JUSTIFICATION

A. DESCRIBE ANY CHANGES IN ALIGNMENT WITH THE PROJECT DESIGN OF THE ORIGINAL PIF[4]

A.1 National strategies and plans or reports and assessments under relevant conventions, if applicable, i.e. NAPAS, NAPs, NBSAPs, national communications, TNAs, NCSA, NIPs, PRSPs, NPFE, Biennial Update Reports, etc.

N/A

A.2. GEF focal area and/or fund(s) strategies, eligibility criteria and priorities.

N/A

A.3 The GEF Agency's comparative advantage:

N/A

A.4. The baseline project and the problem that it seeks to address:

N/A

A. 5. Incremental /Additional cost reasoning: describe the incremental (GEF Trust Fund/NPIF) or additional (LDCF/SCCF) activities requested for GEF/LDCF/SCCF/NPIF financing and the associated global environmental benefits (GEF Trust Fund) or associated adaptation benefits (LDCF/SCCF) to be delivered by the project:

A few definitional changes, as well as an increase in number of Outcomes under **Component 1** (an increase from two to four) and an increase in the number of Outputs for selected Outcomes (from nine to sixteen) were made between

[4] For questions A.1 –A.7 in Part II, if there are no changes since PIF and if not specifically requested in the review sheet at PIF stage, then no need to respond, please enter "NA" after the respective question.

the PIF approval and the full proposal (set within the GEF CEO Endorsement Form) submission. Attention was also paid to the comments raised, and recommendations made by the GEF/STAP during its review of the initial PIF. The changes made in the current full project proposal formulation in relation to material in the approved PIF https://www.thegef.org/gef/project_detail?projID=5394 are as follows:

I. Definitional changes

a) Change from "Stock breeders" to" Livestock farmers/keepers"

In the context of the Zambia livestock sector, the main actors and end-user beneficiaries of the proposed CRLMP, and those in the baseline project (the Livestock Infrastructure Support Project, LISP), are commonly referred to as "livestock farmers/keepers". These livestock farmers or keepers are in almost all cases also crop farmers and practice crop-livestock mixed farming at different level of integration (ranging from minimal associations between crops and livestock, to higher level of integration where exchanges between crop-residues as feed, manure and animal traction for land preparation occur). Other potential beneficiaries are specialized herd/flock-based livestock multipliers, and specialized animal improvement societies or scientific research groups. However, the latter groups are relatively few in number. Therefore, the terminology "Stockbreeders" has been dropped in favour of "Livestock farmers/keepers" to reflect common usage in Zambia. Such a change in nomenclature was agreed upon during the stakeholder Inception Workshop (Nakonde, Muchinga Province, 11-12 August, 2015) conducted as part of the project formulation.

b) Endemic livestock and habitat to Indigenous livestock and habitat

In the context of the two administrative provinces selected for the implementation of LISP and CRLMP, the term "indigenous livestock" is more recognizable than "endemic livestock". Only in the very few situations where imported dairy breeds such as the Friesian or Jersey or crosses between these and local breeds will the term "indigenous"not be used. However, these exotic breeds and crossbreds are very few and are used by relatively fewer livestock farmers/keepers. Thus, the term "indigenous livestock" is used in place of "endemic livestock" in this submission.

II. Changes in the number of Outcomes and justification for addition

Component 1

The two original Outcomes defined for Component 1 were considered not adequate for the range of activities that needed to be carried out to attain the intended results of this component. Therefore, two additional Outcomes were created over and above that provided under the PIF, and coresponding Activities identified during interactions with stakeholders at the Inception Workshop.

Additional Outcomes:

1.3 Increased resilience of infrastructure to climate change threats

The justification for this new Outcome stems from the consideration of what CRLMP was set up to accomplish relative to the baseline project, LISP. As LISP deals with installation of livestock infrastructure, there were concerns during its Appraisal phase that the installed facililities and some of the planned activities/processes might negatively affect the environment and contribute to climate change. Therefore, the CRLMP PIF recognized the need to promote climate resilient investments including infrastructure (paragraph 3 page 6, Component 1). It was for these concerns that LISP initiated a Consultancy service to conduct an Environmental Risk Assessment for LISP activities, including the installed

infrastructure. Similarly, the CRLMP project preparation was also encouraged to prepare a Climate Risk Assessment Report to accompany the CEO Endorsement Form. However, Outcome 1.1 and Outcome 1.2 were considered not to have addressed infrastructure so there was need to have an Outcome that will make the installed infrastructure resilent to climate change threats. The two Outputs 1.3.1 and 1.3.2 will result or materialize to ensure the new Outcome when quick and strategic actions (activities) are undertaken with LISP to review and modify the infrastructure which are yet to be installed (Activity 1.3.1.1) and to realign the locations of LISP infrastructure (Activity 1.3.1.2) and to establish and construct climate resilient interventions around infrastructure (Activity 1.3.1.3).

Outcome 1.4: Reduced GHG emissions from LISP infrastructure and processes

The justification for this new Outcome stems from the recognition that some processes/activities and infrastructure installed by the LISP are bound to have negative impacts on the environment. For example, the introduction of additional livestock into the two provinces through LISP "restocking" and "pass-on" schemes" will over time increase the amount of solid manure dropped in the holding and marketing areas. Improper handling of manure stands a good chance to add to greenhouse gas (GHG) emission. Poor quality feeds eaten by ruminant livestock will add greater production and release of methane into the environment. Similarly, there was the consideration that the acquisition of the materials used for building infrastructure such as wooden crushes, human and livestock housing, and animal holding pens should not leave huge "carbon footprints" in the areas where the materials came from. Furthermore, the process of rehabilitation of feeder roads and access to newly constructed livestock markets should not lead to unwanton cutting of trees and destruction of ecosystems that incease GHG emission. Hence an Outcome of "Reduced GHG emissions from LISP infrastructure and processes" and the associated Output (1.4.1) - "LISP infrastructure designs for reduced GHG emissions in place" and the associated Activity (1.4.1.1) - "Review and modify LISP infrastructure designs to reduce GHG emissions" are justified and strategic in reducing potential negative future climate change impacts. Similarly the awareness creation and knowledge acquisition in the use of products from bio-gas digesters and generation of incomes from the alternative livelihoods offered from operation of bio-gas digesters will put farmers in a better position to adapt to current and future climate change impacts. Project support for demonstrating these benefits and to build skills to install and use them is therefore justified as an adaptation activity (1.4.2.1) of Output 1.4.2- (LISP infrastructure fitted or constructed with GHG emissions reduction technologiesactivity).

Component 2

The two original Outcomes defined for Component 2 in the PIF, namely, Outcome 2.1: - Increased knowledge and risk preparedness and adaptive capacity to climate variability at country and targeted community levels; and Outcome 2.2 - Diversification and strengthened livelihoods and source of incomes for rural population (artisan and livestock farmers) were retained . Two additional Outputs were added as it was considered that the range of activities that needed to be carried out to reach the specified Outcome were not adequately covered by the single Output 2.2.1 (Livestock farmers equipped with skills for livestock feed conservation for dry season and implement other adaptation measures autonomously) for Outcome 2.2. The additional outputs are as follows:

2.2.2 – Strengthened adaptive capacity for sustainable land use management; and

2.2.3 – Technical and business capacity developed for construction of biogas plants for livestock farmers.

The main argument for Outputs 2.2.2 that concern the strengthening of adaptive capacies is that improvement in skills in sustainable land management could open the way for new or diversified livelihoods. With respect to the economic benefits that can arise from use of products of biogas, and from sale of same for cash a realization of the stated Output (2.2.3) technical and busuness capacity development are considered to be a "game changer" for livestock farmers to earn cash income and still use the manure that has passed through the bio-digester. This Output will bring synegies to the LISP activities of introducing bio-gas construction and use at selected sites in the Project area.

Additional Detail on Project Activities for Components 1, 2, and 3

The CRLMP is primarily about adaptation by farmers, especially livestock farmers, to climate change impact, and how their farming practices, their installed facilities and equipment (from LISP investments) and processes in the implentation of the LISP could affect the environment and subsequently climate change. It is also recognized that traditionally, approaches to combat the negative impacts of climate change and climate variability have included adaptation and mitigation. Adaptation measures allow farmers and communities to confront the impacts of climate change and climate variability in the short to medium term. Some of these adaptation pracitices improve the conditions of the production base and the environment in general. Long term options that contribute to climate change mitigation are being sought at the same by those responsible for higher level development. For example, in the livestock subsector, farmers keeping livestock in the face of climate change impacts might change their crop-mix to include drought tolerant varieties of sorghum or millet (rather than maize) that are more likely to survive drought better, and might also select those varieties that give moderate yield of grains and reasonable quantities of fodder to feed livestock (rather than very high yield of grains but no fodder as crop residues for livestock feeding). Farmers may also introduce leguminous crops such as cowpeas, grounduts, soyabean and trees such as glyricedia with the view to increase the quality of crop residues for livestock as the aforementioned crops have higher protein content than ceareal crop residues. However, the nitrogen fixation attributes of leguminous plants improve soil quality and their growing patterns provide more soil cover, and hence better prevent soil GHG emissions. Thus, some of the adaptation activities proposed under CRLMP may also have addional benefits for contributing to climate change mitigation. These dual benefits of the CRLMP were recognized and advocated for by stakeholders during the Inception Workshop, conducted as part of the project preparation. Thus, some relatively few Outputs and their associated activities proposed for the Project may have both climate change adaptation and climate change mitigation outlook. However, even for these few cases the activities are generally carried out from the perspectives of adaptation. In general the focus of the CRLMP activities/outputs was to complement and/or supplement LISP's (baseline project) activities/outputs.

As a result of stakeholder consultation (both Inception and Validation Workshops) and project preparation activities, additional detail has been developed in describing the additional project orientations and activities requested for LDCF financing and the associated adaptation benefits to be delivered by the project. They are described in detail below:

Component 1: Promoting Climate Resilient Livestock investments and increasing climate change adaptive capacity of livestock farmers

This component will entail implementing a financing mechanism to enable livestock farmers to acquire livestock breeds resilient to climate change and set up sustainable livestock management practices; development of effective models for community management of indigenous livestock breeds and grazing resources; demonstrations for livestock feed conservation for dry season use and restoration of degraded pastures or rangelands through planting of drought tolerant perennials and annuals; development of models on how local communities they can be enhanced to mitigate the effects of climate change; and exploring and identifying water harvesting technologies that are best suited to guarantee good water supply (rainwater, boreholes etc.) for livestock watering. This Component comprises of four outcomes as follows:

i. Livestock farmers able to cope with climate change through adoption of improved practices that enhance livelihoods;
ii. Resilience of natural resources to climate change enhanced;
iii. Increased resilience of infrastructure to climate change threats. This outcome will be achieved through two (2) key outputs - Climate resilient infrastructure designs in place, and Climate resilient infrastructure constructed and maintained; and
iv. Reduced GHG emissions from LISP infrastructure. This outcome will be achieved through two (2) key outputs - LISP infrastructure designs for reduced GHG emissions in place, and LISP infrastructure fitted or constructed with GHG emissions reduction technologies.

These four outcomes under Component 1 will be achieved through ten key outputs – (i) Livestock farmers acquire breeds resilient to climate change, (ii) Livestock farmers set up sustainable livestock pastures, fodder banks, rangeland and water harvesting systems, (iii) Effective practises developed for the community to manage indigenous livestock, (iv) Operational livestock index-based insurance scheme, (v) Operational Livestock Early Warning Information System, (vi) Restoration of degraded pasture and increased vegetation cover with different drought tolerant perennials, (vii) Climate resilient infrastructure designs in place, (viii) Climate resilient infrastructure constructed and maintained, (ix) LISP infrastructure designs for reduced GHG emissions in place, and (x) LISP infrastructure fitted or constructed with GHG emissions reduction technologies

Description of Detailed Ouputs and Activities

Outcome 1.1: Livestock farmers able to cope with climate change through adoption of improved practices that enhance livelihoods

1.1.1 Livestock farmers acquire breeds resilient to climate change

Existing known indigenous livestock species and breds and breeding systems

It is acknowledged that the majority of livestock breeds in all the major ruminant species (cattle, goats and sheep) kept by smallholder farmers in Zambia are of local origin. In a general sense these breeds are considered by some actors in the livestock sector to be less productive than their high-yielding 'exotic' relatives, but they are well adapted to the prevailing harsh environments. These indigenous breeds in majority of cases are more disease resistant and drought

tolerant; furthermore, they are crucial to the effective management of the environments in which they were developed. However, in the case of cross-bred cattle used in some of the dairy schemes they had been developed by crossing exotic dairy cattle breeds with indigenous beef-type cattle breeds. In this case while the crossbreds end up producing more milk and meat than the indigenous breeds, the level of resistance to diseases and environmental factors often gets reduced.

The Angoni, Baila, Tonga and Barotse, are the only known indigenous cattle breeds in Zambia that are fully characterized and are known to be disease tolerant as well do withstand harsh climatic conditions. These breeds are known to thrive over scanty vegetation comprising mainly thorny bushes. These breeds are being multiplied through a careful breeding system at the following breeding Centres: Batoka Livestock Development Trust (cattle, sheep and goats); Mochipapa (Dairy cattle); Mukulayukwa (cattle, sheep and goats); and Mbesuma ranch (cattle). There are a few commercial farmers in the country that are also breeding cattle and goats and are formally registered with the herd Book Society of Zambia. The country's policy is to establish breeding centres at each of the provincial capitals.

Whilst the indigenous cattle breeds of Zambia are well documented, the genetic characteristics and extent of genetic diversity of goats, sheep, pigs, and poultry are not fully documented. Of great concern is the fact that the indigenous livestock genetic resources are being eroded through outcrossing, introgression and over harvesting. This has resulted in dilution or complete replacement of the indigenous goats, sheep, and poultry species by exotic genotypes. There is therefore a need to characterize the indigenous livestock genetic resources in the wake of climate change. Through both phenotypic and genetic characterization it is possible to identify sub-types within breeds of species that might have greater or more of the attributes that make breeds resilient, tolerance and resistant to diseases and other stressful environments and that are more likely to endure more lasting climate change impacts. Where such superior sub-types are found they will constitute the bulk of the animals used for restocking and pass-on schemes in the Projects (LISP and CRLMP) as a way of propagating the superior attributes inherent in them. Based on the performance of targetted indigenous breeds in their original environments/locations, environmental factors (such fodder availability, level and incidence of diseases), and management regimes it is possible to undertake an *ex-ante* assessment on how these breeds might perform in new locations where there are significant differences in the level of environmental stressers and management regimes as comapred with the original locations. Where the levels of stressors and mangement regimes are about the same in the original and new locations, the performance of the targetted breds are not expected to change in any appreciable extent. CRLMP will collaborate with LISP in underaking these assessments.

Livestock Pass-on Scheme

Based on the livestock breeds/breeding systems described above, the CRLMP will implement a pass-on livestock scheme as an incremetal activity to that of LISP, but will be focusing using only adapted local species/breeds acquired from government and private breeding centers or from individual farmers who are known to be multiplying improved brreds from those centers. The scheme will particularly empower women and youths with ownership of small ruminants (sheep and goats). The project will identify and recruit a Livestock Fund Manager who will manage the "pass-on" scheme

following co-financing mechanisms such as those obtaining under the Agribusiness Promotion Programme (APP) and the Small Livestock Improvement Programme (SLIP) implemented under MAL. The APP and SLIP have proven successful in that the beneficiary farmer pays a co-financing of 25% of the value of an animal before receiving it. In the case of goats or sheep, when the animal gives birth to two kids, one female kid is passed on to the next farmer who has already paid his/her 25%. The scheme will revolve and will ensure that no one beneficiary farmer will acquire more than five animals from the pass-on. The pass-on scheme will be augmented with ancillary resources such as grass choppers, feeders, water drinking troughs and salt leaks. Besides setting up the co-financing mechanisms, additional proposed activities are:

- ✓ Identify target villages and beneficiary livestock keeping households per project area (district);
- ✓ Procure & distribute livestock;
- ✓ Conduct livestock breed characterization study in the project provinces and perform *ex-ante* assessments; and
- ✓ Training of extension officers on GIS to evaluate / assess carrying capacities

1.1.2 Livestock farmers set up sustainable livestock pastures, fodder banks, rangeland and water harvesting systems

Setting-up sustainable livestock pastures, fodder banks and rangelands

Rangelands in the project target areas are communally owned, i.e. there are collective and group tenure arrangements to use of grazing resources. More generally, collective tenure facilitates equal access to temporally and spatially variable forage resources. However, due to a range of factors including human population growth and increasing poor governance over natural resources, some of the rangelands are degraded and will continue to degrade, leaving the livestock systems and hence smallholder farmers highly vulnerable to climate change. To enable smallholder farmers to make informed choices about the adaptation and associated mitigation strategies that are at their disposal to resolve the problem of rangelands degradation, the project will adopt a participatory approach to improved rangeland management. The following key activities will be implemented:

- ✓ Establish land use plans at village level using participatory GIS;
- ✓ Planting of fodder & fruit trees (e.g. guava, mulberry) around homesteads, planting of fodder trees along the riverines; and
- ✓ Construction of fire breaks around rangelands.

Sustainable Management of existing water resources and developing alternative water sources for livestock

The effect of climate change has made droughts and floods to become recurrent. It has been observed that Region 3 (AEZ 3 where Muchinga and Northern provinces fall) will generally get less rainfall while possibly the rainfall intensities would increase. Floods result in disaster, death of both human beings and livestock and the general destruction that affects the economy.

In the project area there is limited capacity in rainwater harvesting and harvesting of runoff. In all the seven communities that were visited during the project preparation and formulation, it is evident that existing water sources (rivers, streams and wells) are drying up during the dry season. People have to travel distances ranging from 1 to 10 kilometers to source

portable water and water for watering their livestock. The communities visited hinted that while the quantity of water may have reduced the situation could not be described as critical in some cases. Thus, there is need to accelarate the development of water harvesting and storage infrastructure if the effects of droughts are to be minimised.

To ensure ready and easy access to water for livestock watering (and domestic use), sustainable management of exisiting water sources and developing of alternative water will take a centre stage during the implementation of the CRLMP. Attention will be paid to awareness creation in the areas of adaptation to, and mitigating against droughts by storing water when it is available and use it when it is in short supply, rain water harvesting, recyling of water and the use of water-saving technologies, harnessing water from the roofs for homesteads with iron sheets, and diggging of protected wells that are lined to reduce high water seepage during the dry season. The following key activities will be implemented to improve livestock watering in the project areas:

- ✓ Lining of shallow water wells where necessary;
- ✓ Construct weirs, and small dams/reservoirs as livestock watering points;
- ✓ Construct communal boreholes and wells for watering livestock; and
- ✓ Promote appropriate / sustainable water harvesting at household level (e.g. roof catchment water harvesting and storing in tanks).

1.1.3 Effective practises developed for the community to manage indigenous livestock

Raising awareness of the value of idigenous livestock species and breeds

In general there is inadequate information on the potential of the existing indigenous livestock breeds. The value of indigenous breeds needs to be better understood by extension agents and local communities. Better balancing of the merits of disease and climate resilience against the cost of lower production and marketability is needed. Once the activity of characterizing livestock breeds is completed, the project will embark on a livestock farmers' awareness campaign concerning breeds that are available in the local communities and those that are available from other parts of Zambia. The focus of the awareness raising campaigns will be on highlighting the climate change and management implications of keeping the indigenous livestock breeds. It is expected that through the awareness raising campaigns, farmers will be able to make informed decisions as to which livestock breeds to adopt.

Community management of indigenous livestock breeds

Livestock breeding skills will be developed at the community level, to both conserve and develop locally-adapted breeds, and to introduce new breeds where appropriate. Breed improvement will be based on simple record-keeping and to the extent possible will be built on existing knowledge. Breed improvement will be carried out by local communities in order to be compatible with their production and livelihood objectives and their environmental and socio-cultural demands. To ensure sustainable populations of targeted indigenous livestock breeds in the two provinces and to ensure the conservation of these breeds and their globally unique genetic traits, the following activities will be implemented:

- ✓ Survey of best practices to manage indigenous breeds;

- ✓ Develop breed management manual for farmers and extension workers in local language;
- ✓ Train extension personnel and farmers on breed management; and
- ✓ Exchange visits for livestock farmers (in farmer groups).

1.1.4 Operational index-based livestock insurance (IBLI) scheme

In Zambia, agriculture insurance exist covering a wide range of products such as loss or damage due to fire, lightning, storm, malicious damage, transit and theft of harvested crops whilst stored in the silo or building in the case of crop insurance. Livestock insurance covers risks of mortality and is suitable for various animals. The cover provided by most insurance companies include accident, disease, epidemics and theft. Livestock insurance that compensates for the loss of animals or reduced productivity because of drought or flooding has rarely been offered, especially in the smallholder farmer systems. In the context of climate change and the already highly unpredictable nature of most livestock keeping areas, insurance is a particularly crucial gap to fill. Insurance is often hampered by the lack of trust in local legal institutions or other systems for verifying claims. Traditional systems of insurance are flawed by the fact that all members of a community are likely to be impacted simultaneously by climate events, rendering the traditional insurance systems ineffective.

The need for appropriate livestock insurance products to be developed for and provided to livestock farmers is critical. One such product is the index-based livestock insurance (IBLI) against climatic hazards. With the IBLI, livestock farmers pay a market premium rate for the base insurance product, which pays out to individual herders whenever the livestock mortality rate in a given location exceeds a defined threshold. This threshold is index-based, so it is measured based on weather data (which is related to data on the economic impact of past climate events) rather than the rate of individual losses. This is considered an attractive way to reduce the risk of moral hazard (individuals 'playing the system'), reducing costs and creating an incentive on the part of the herders to adopt effective risk management techniques.The climate change orientation or outlook stems from the fact that the livestock insurance scheme is intended to enable livestock farmers who lose their stock assets due to reasons related to natural (including climate change impacts) or economic conditions to be able to replace them so to better adapt to current and future climate variabilities and cimate change. At a minimum, the project will implement the following activities to develop and implement the IBLI for livestock farmers in the participating provinces:

- ✓ Identify institutions to provide index-based insurance;
- ✓ Create awareness among livestock keepers on the importance of insuring livestock; and
- ✓ Assess models for climate/weather index-based livestock insurance and adapt for Zambia.

1.1.5 Operational Livestock Early Warning Information System

One of the major first steps in raising adaptive capacities at local and national levels will be to improve the assessment of the threat of climate change to enable planners and farmers to react appropriately. The available early warning information

systems mainly focus on crop production, yet both commercial and communal livestock production are often affected by floods, droughts and diseases, which result in the loss of income and product supply. The smallholder livestock sector is therefore likely benefit from some form of livestock early warning information system (LEWIS). The objective of the LEWIS will be to provide forecast information on the signs of emerging hazards which will trigger farmers to find early and appropriate responses to the hazards. As such, a strategy for enhancement of the capabilities of the meteorological department to render better services will be developed and adopted. The main focus will be on improving the quality of service in issuing long-range climate and climate change forecasts to reasonably predict floods and droughts. To that effect, through the CRLMP, the meteorological department will establish at least one automatic weather station in each and every project district in Northern and Muchinga provinces. As part of a sub-programme on weather prediction, there could be value in learning more about how farmers and livestock farmers predict the weather and what sort of additional information they would value.The climate change adaptation orientation or outlook stems from the fact that adaptation practices such as changing crop-mixes to include tolerant crop varieties and rich nitrogen-crops in the face of approaching or on-going drought will benefit from a functional early warning system so farmers go into actions of adaptation in reasonably good time based on information provided by the early warning system. Building capacity to use weather forecasts will be valuable. Forecasting will not aim only at short and mid-term forecasting for the sake of reactive adaptation, but it will also focus on long-term forecasting with a view to influencing proactive adaptation. The forecasting information will be used to inform envisioning exercises linked to understanding the implications of climate change.

To complement this development will be the development of a mechanism to disseminate weather and climate information to livestock farmers. For effective dissemination, a climate reporting mechanism will be developed. Communication of forecasting information will be developed in consultation with the livestock farmers in order to understand the most appropriate means of communication, such as radio and/or mobile telephone. Activitiess are:

- ✓ Establish automatic weather stations in the project area. Have a minimum threshold number of stations by Meteorological Department; and
- ✓ Create awareness to register for weather reports through cell phones.

Outcome 1.2: Resilience of natural resources to climate change enhanced

1.2.1 Restoration of degraded pasture and increased vegetation cover with different drought tolerant perennials

The key natural resources in the project areas that are readily subjected to the vagaries of climate change are land (soils), streams and rivers, natural occuring ponds, rangelands and pastures, wildlife, flora and fauna and ecosystems that provide goods and services. Whereas water-related issues where dealt with under Output 1.1.2, and wildlife is generally outside of the scope of these projects (LISP and CRLMP), the resilience of rangelands achieved through the restoration of degraded pastures and rangelands (including those at water fronts, usually degraded by overgrazing and excessive movements by cattle around these spots) have a direct impact on the functioning of ecosystems that provide services, and on flora and fauna. Activities to be undertaken include:

- ✓ Characterization of the rangelands; and

- ✓ Carry out rangeland improvement interventions/strategies (eg. planting of drought tolerant annual and perennial species).

Outcome 1.3: Increased resilience of infrastructure to climate change threats

1.3.1 Climate resilient infrastructure designs in place

Climate change has significant implications for the LISP infrastructure. The infrastructure investment under LISIP cover crush pens, dip tanks, slaughter houses, milk collection centers, marketing infrastructure and feeder roads. As infrastructure assets have long operational lifetimes, they are sensitive not only to the existing climate at the time of their construction, but also to climate variations over the decades of their use. Achieving more climate resilient infrastructure, requires the impacts of climate change to be a key consideration in the way that significant pieces of are designed, built and maintained.

Recent impacts from flooding and severe weather highlight the risks infrastructure could face and the significant economic damage these types of events bring. Effective, reliable infrastructure underpins economic activity, and failure to adapt, increases the possibility of service disruption and adverse economic impacts. The climate change adaptation orientation or outlook stems from the fact service disruption of and economic losses arising from poor, non-resilient facilities cripples capacity to adapt to current and futue climate climate change impacts. Hence, the LISP infrastructure designs will be modified where appropriate to minimize climate change risks like increased fire incidences, flooding, and droughts. Hence the activity is:

- ✓ Review and modify LISP infrastructure designs.

1.3.2 Climate resilient infrastructure constructed and maintained

Besides taking into consideration other several environmental factors in constructing the LISP infrastructure, the project will construct and maintain project infrastructure as per improved designs for climate change resilience. All new infrastructure will be sited on relatively flat terrain, avoiding flood paths. Standard fire breaks will be prepared around all infrastructure. The activities to be implemented are:

- ✓ Review and realign the locations of LISP infrastructure; and
- ✓ Establishment and construction of climate resilient interventions around infrastructure (eg. Contour ridging and vertiva grass promotion).

1.4 Reduced GHG emissions from LISP infrastructure and processes

1.4.1. LISP infrastructure designs for reduced GHG emissions in place

It is recognized that during the construction, operation, and maintenance of the infrastructure and some of proposed processes under the LISP there will be emission of GHGs and that these are bound to have negative impact on the

environment. For example the introduction of additional livestock into the two provinces through LISP "restocking" and "pass-on" schemes" will over time increase the amount of solid manure dropped in the holding areas. Improper handling of manure stand a good chance to add to greenhouse gas (GHG) emission. Poor quality feeds eaten by ruminant livestock will add greater production of methane into the environment. Similarly, the acquisition of the materials used for building infrastructure such as wooden crushes, human and livestock housing, and animal holding pens should not leave a huge "carbon footprint" in areas where they came from. Furthermore, the process of rehabilitation of feeder roads and access to newly constructed livestock markets should not lead to unwanton cutting of trees and destruction of ecosystems that incease GHG emission.

The aim of this sub-component is to ensure that such emissions will be minimized. Infrastructure designs will take into account and mitigate against the possible sources of GHG emission arising from the LISP infrastructure.

Livestock handling, abattoir and dairy infrastructure

There is relatively little information in the literature that provides significant detail on the GHG footprint of infrastructure in relation to overall GHG emissions. For the LISP, GHG emissions from infrastructure will be predominantly due to the use of materials including: iron/steel, aluminium, plastics, cement/concrete and copper. The project will establish the carbon footprint of the LISP infrastructure. The idea will be to build infrastructure using less emissions-intensive materials.

Road infrastructure

Evidence shows that emissions related to road construction, maintenance, operation and end-of-life may range from just a few per cent to typically 10%-15% of total road lifecycle GHG emissions. There are a number of methods and processes that could be employed in the road transport sector to reduce the GHG emissions at the road construction stage, including the use of alternative materials and low carbon energy. In addition the condition of the road surface can also directly influence traffic safety, noise generation and vehicle fuel consumption. Road surface maintenance can therefore be optimised to fulfil GHG emission reductions and other sustainable transport and safety objectives.

Electricity Supply

As electricity supply is likely to contribute greatly to the GHG emissions related to the operation of the LISP infrastructure like abattoirs, staff houses, and dairy facilities, energy-efficient powering scenarios will be explored to reduce energy supply emissions. Renewable energy sources like use of solar will be adopted in the project. Photovoltaic panels will be installed to produce renewable electricity to replace electricity supply from the grid. The main activity to be implemented is:

- ✓ Review and modify LISP infrastructure designs to reduce GHG emissions.

<u>1.4.2 LISP infrastructure fitted or constructed with GHG emissions reduction technologies</u>

All LISP infrastructure will be constructed, operated, and maintained as per designs that minimize GHG emissions. To the extent feasible and technically possible, solar energy will be utilized to power equipment and cooling systems under the project. LISP infrastructure such as abbatoirs, animal holding pens, milk collection centres and livestock marketing centres in particular have potential to negatively impact the environment through pollution from accumulated manure, spilled milk, and pollution of streams and underground water from effluence from such facilities, and from emissions from accumulated manure. Fitting some technologies to these facilities or close to them could potentially reduce GHG emissions from the facilities/infrastructure. Of the known tecnologies that can render manure less emitting is passing manure through bio-gas digesters. In addition to the products, such as gas for cooking and ligthnening the residual manure from the digesters are still of value and can be used for farming. Thus, the proposed LISP bio-gas digesters to be installed in selected communities will also be supported by the CRLMP through incremental construction, awareness creation on biogas use and dangers associated with its you, and the livelihood diversification potentials from their operations by rural communities. The main activitity to be implemented is:

- ✓ Construct demonstration bio-digesters.

Component 2: Capacity Building on Climate Change Adaptation for Stakeholders

The ability of the livestock farmers to understand the risks they are faced with and how to deal with them is of prime importance. If people do not understand what the risks are, they might not also value the measures put in place to counter such risks. Therefore, the project will train livestock farmers with regard to understanding climate change issues including climate change data and how to use the models that would have been developed to effectively manage their livestock as well as the habitat around them (grazing and pasture management). This will be done with the help of relevant institutions (like the Meteorology Department etc.). In addition, the project will impart livestock feed conservation skills and other business skills so as to increase livestock farmers' livelihood diversity. Biogas technology will be demonstrated and the technical and business capacity of artisans improved to roll out within the framework of the Domestic Biogas Programme in Zambia.

This project component has two outcomes: (i) Increased knowledge and risk preparedness and adaptive capacity to climate variability at country and targeted community levels, and (ii) Diversification and strengthened livelihoods and source of incomes for rural populations. The first outcome will be achieved through two (2) outputs – (i) Country: Technical staff of Government trained in climate risk assessment and adaptation skills for livestock farmers, (ii) - Community level: Training artisans in manufacturing livestock-related material as a source of income diversification.

2.1.1 - Country: Technical staff of Government trained in climate risk assessment and adaptation skills for livestock farmers

Providing forecasting will not be enough to equip either livestock farmers or extension agents to adapt more effectively to climate change. Support will be provided to build the capacity of all stakeholders to make sense and use of climate information. Building understanding of climate information will go hand in hand with understanding what information

is relevant and useable by livestock farmers. Institutionalizing the capacity for interpreting climate information will be explored at different levels: community based organizations (CBOs) including co-operatives, as well as national and local government.

There are a number of options for raising awareness at the community level of the possible outcomes of climate change, but given the uncertainty of predictions, it will be prudent to build consensus initially through participatory learning and action with selected communities to learn how they currently experience climate change, how they perceive future changes impacting on their livelihood, and how they propose to respond to that. To have a meaningful impact, this information will be disseminated further, and a number of communication approaches will be used, including mass media, local government and grassroots organizations.

Through focused training, an effort will be made to ensure that information disseminated to farmers and other stakeholders is transformed into knowledge. At a community level this will require building basic human capabilities on how to use the climate information availed. Attention will be piad to the development of evidence based sensitization materials on climate risks.

Development agencies and local level communities will be trained on the CRiSTAL approach. CRiSTAL is a project planning tool that helps users design activities that support climate adaptation (i.e., adaptation to climate variability and change) at the community level. CRiSTAL stands for "Community-based Risk Screening Tool – Adaptation and Livelihoods". CRiSTAL helps project planners and managers integrate climate change adaptation into community-level projects through participatory planning through identifying and prioritizing climate risks that their projects might address. Without a tool to systematically assess the impacts of a project on some of the local determinants of vulnerability and exposure, it is difficult for project planners and managers to design activities that foster adaptation to climate variability and change.

Strengthened capacity to develop and implement the index-based livestock insurance scheme

Capacity to develop and implement the index-based livestock insurance (IBLI) will be done at two levels. The first level will be to build the capacity of insurance providers and support services like the meteorological department personnel to develop and implement the IBI that is relevant to the Zambian smallholder livestock farmers. The second level will entail creating awareness of the livestock farmers on the existence of an IBI and an elaboration of how it would work, and the implication of adopting the IBI on their livelihoods. The planned activities include:

- ✓ Prepare training materials for government technical staff on climate risk assessment and adapatation skills for livestock farmers;
- ✓ Training of government technical staff on climate risk assessment and adaptation skills for livestock farmers;
- ✓ Facilitate workshop(s) for experts and experts on index-based insurance provision; and
- ✓ Facilitate workshop(s) for experts and stakeholders in early warning systems.

2.1.2 - Community level: Training artisans in manufacturing livestock-related material as a source of income diversification

The major sources of livelihood among rural inhabitants of Muchinga and Northern Provinces are farming, livestock rearing and off-farm income generating activities. The most commonly grown crops are maize, finger millet, groundnuts, common beans, paddy rice, sweet potatoes, pumpkins and sorghum. The two provinces have an estimated 274,000 agricultural households (LCMS, 2010) rearing an estimated 87,000 cattle; 236,000 goats; 72,000 pigs and 5,000 sheep. About 176,000 households keep an estimated 2,805,000 chickens.

Crop production in the two provinces shows variations in production levels in recent years. In Northern Province alone, maize registered a 22 % decrease in 2013, a 34 % increase in 2014 and 3 % decrease in 2015 while finger millet recorded 15 % decrease, 27 % increase and 13 % increase over the same period. The increase in finger millet production may be a serious threat to the environment as it is an indicator of increased deforestation.

In 2010, households in the two provinces were reported to generate an estimated ZMW 1,956,000 per annum from livelihood activities as compared to ZMW 3,233,964 for the whole Zambia (LCMS, 2010). The major sources of income are from sales of crops, small livestock, and charcoal. Minor sources of income included cattle sales, beer brewing, hiring out labour, trading, sale of pan bricks, mushrooms and caterpillars.

The households were also found to spend an average ZMW 1,500,000 per annum, mostly on food and non-food items. Expenditure on food comprised expenses on purchased food items, the value of own produced food items and food items received in-kind for consumption. Expenditure on non-food items comprised expenses on goods and services. A large proportion of the expenditure (50-70%) is on food items.

Livelihoods in the two provinces are affected by deforestation, poor state of roads linking productive areas and markets, late onset of the rain season and early cessation, poor rainfall distribution, high cost of agricultural inputs, low agricultural and livestock productivity. The overall effects arising from these challenges are deepening rural poverty and increased reliance on environmental goods and services.

Forest resources, in the two provinces are howver declining at an alarming rate and little effort is being made to arrest the situation. This poses a very big challenge to livelihoods which depend on forests and other natural resources. This decline limits the range of alternative livelihoods and adaptation strategies.

Taking up of artisan works outside of the farm environment especially by the youth is seen as livelihood opportunities for these groups. In the context of the LISP and CRLMP training of already qualified and new entrants into the artisan workforce in thea areas related to the livestock sector is considered strategic. Thus, carpenters and masons trained on how

to repair and maintain some of the LISP-installed facilities (e.g. crushes and dip tanks) will bring useful services to the project beneficiaries. The planned activities include:

- ✓ Prepare training materials for artisans in manufacturing livestock-related materials as a source of income diversification;
- ✓ Training of artisans in manufacturing livestock-related materials as a source of income diversification;
- ✓ Development of evidence-based sensitization materials on climate risks;
- ✓ Conduct climate change awareness campaigns (community meetings, radio, TV);
- ✓ Exchange visits to affected communities;
- ✓ Create awareness among livestock farmers of existence of index-based livestock insurance providers;
- ✓ Link livestock farmers with index-based livestock insurance providers; and
- ✓ Create awareness among livestock farmers of existence of early warning systems and how to access it.

Outcome 2.2 - Diversification and strengthened livelihoods and source of incomes for rural population (artisan and livestock farmers)

2.2.1 - Livestock farmers equipped with skills of feed conservation for dry season and for other adaptation measures autonomously implemented

The dominant farming system in the project areas identified during field visits as part of the preparation of this project was found to be a range of crops grown at various levels of integration with different species of livestock. Further insights into the prevailing crop and livestock systems and farming methods are described below.

Livestock/ Mixed Crop-Livestock Systems

In terms of spatial distribution of the livestock production systems significant proportions of the Grazing Humid and Mixed Humid Systems are only found in the most northern districts of Kaputa and Mpulungu. Significant portions of the Grazing Temperate system are found in Mbala and Shiwangandu districts but most of the project area fall into the arid agro-ecological zone, with the Grazing Arid and to a much lesser extent the Mixed Arid livestock production systems.

Conservation Agriculture/Farming

The CRLMP will support the process of introducing or maturing the integration of CA and mixed crop-livestock farming in the project area by inclusion of targeted activities in this domain. Collaboration will be sought by CRLMP with nationational and international institutions working on CA in Zambia. The United Nations Food and Agriculture Organization (UN-FAO) is such one institution. Based on the findings on the ground and from studies on livestock and farming in Zambia considerations will be given to the actions listed below.

Existing local level crop–livestock systems will be further developed and promoted through transmission of best practices in terms of agricultural sustainability, labour efficiency, animal husbandry and healthcare (of both animals and humans). Livestock farmers will be sensitized on the importance of diversified production, use of livestock manure, grazing management and conservation farming. Capacity building will be done on fodder production, including forage and cover crops, introduction of legume forages (with appropriate prior environmental evaluation), and distribution of fodder trees.

Good agricultural practices (GAPs) on Conservation Agriculture and its interphace with semi-intensive and extensive livestock farming activities identified by farmers in Southern and Central Provinces reported in Agyemang, K. (2011)--. *Good Agricultural Practices from Conservation Agriculture and Livestock Farming in Southern Africa: Observations from field studies in Zimbabwe, Zambia and Swaziland*) will be promoted through training and field demonstrations to farmers in Muchinga and Northern Provinces. In general the 3-country (Zimbabwe, Zambia, Swaziland) study found that Good Agricultural Practices which resulted in highest crop yields and provided best indicators of farm-household food security were those with high level of integration of CA and livestock farming. Among the GAPs were manure use, use of crop residues for feeds and soil cover, complemented with animal draft power. In Zambia, practicing CA alone and practicing CA with Mixed Crop-livestock farming appears to have similar level of advantages based on the three indicators used in the analysis. From the analysis based on the three indicators and the combined ranking, the best agricultural practices are those that are associated with two Groups (those practicing CA alone and practicing CA with Mixed Crop-livestock farming) typically include minimum tillage and the spreading of crop residues as soil cover.

Issues on conflicts and synergies between conservation-based farming and livestock farming in Zambia as identified in Agyemang, K. and Han, G**.** (2010a)--- *Conflicts and Synergies attendant to Conservation and Livestock Farming.---- A Policy Brief,* will be incorporated in training and capacity building sessions for policy makers, government staff, community leaders and project beneficiaries in the districts where the LISP/CRLMP projects will be implemented. In the study in Zambia the percentage of households in two Groups (those practicing CA alone and practicing CA with Mixed Crop-livestock farming) who saw synergies between CA and livestock farming were slightly less than 70%. On reducing conflicts between CA and LF, over 80% in the two Groups suggested that CA farmers should guard their CA plots or build fences around them.

Fodder production and conservation for dry season feed

Given the value of livestock for the smallholder farmers in the project provinces, an investment will be made in developing fodder crops and more digestible crop residues and in promoting and expanding these technologies. Suitable fodder crops will include those cultivated with almost zero input on marginal land or field boundaries. With growing pressure on water and increasing risk of drought, emphasis will be placed on the development and spread of improved dry-land forage species. Capacity building will focus on the following aspects: the variety of plants that are available that can be used for fodder production; different techniques for forage conservation and identifying solutions that fit with their

production system; security of tenure issues around fodder production and how they can be resolved to ensure that farmers who invest effort in cultivating a crop retain the right to exclude others from harvesting the crop; and Training of technitians and farmers on fodder production, hay production, crop stover management. Increasing feed quality has been shown to significantly reduce methane emission by cattle. As such livestock farmers will be trained on the strategies to reduce the emission of greenhouses gasses include increasing the proportion of consumption of legumes, which yield less methane during digestion than lignified grasses, and increasing the ratio of energy to fibre intake. In addition awareness will be raised on the available feed additives that reduce methanogenesis without reducing the digestive capacity for grass and straw. Among the planned activities are:

- ✓ Prepare training materials for feed and fodder production and conservation; and
- ✓ Farmer training on feed and fodder production;
- ✓ Sensitization of livestock farmers on how to adapt and mitigate for climate change, especially through mixed crop-livestock systems; and
- ✓ Training farmers on the importance of diversified production, use of manure, conservation farming – demonstrations on mixed crop-livestock production technologies, and demonstrations on Conservation Agriculture Farming.

2.2.3 – Strengthened adaptive capacity for sustainable land use management

Improved land use planning is needed to enable livestock farmers to take greater advantage of the range of natural resources at their disposal and to diversify their livelihood portfolio as a hedge against risk. Planning capacities will be improved to reflect the importance of livestock production in mixed farming systems, which may increase if crop farmers are forced to shift steadily from crops to livestock production as climate deteriorates. Similarly, planning capacities will be built on communal rangeland where the scale of landscape management is large and the range of resources is wide.

Participatory planning tools that are highly suitable for land use planning and are consistent with a broader approach to empower livestock farmers will be used. Natural resource maps provide an excellent planning and management tool, and capacities of local government to conduct genuine participatory planning will need to be built. The main activities to be implemented are:

- ✓ Preparation of training materials for sustainable agriculture land use management;
- ✓ Conducting community campaigns to sensitize livestock farmers in sustainable land use management; and
- ✓ Training farmers on sustainable land use management.

2.2.4 – Technical and business capacity developed for construction of biogas plants for livestock farmers

Biogas energy production using livestock waste fermentation will be promoted through the project as a livelihood option in support of LISP activities that involve the installation of biogas digesters around infrasture in communities. Bio-gas production will be promoted at household level, community livestock infrastructure handling level, and at marketing

infrastructure level. This approach has the dual benefit of reducing methane emissions and reducing reliance on wood fuel. The following key activities will be implemented:

- ✓ Training farmers on the construction and maintenance of bio-gas digesters; and
- ✓ Create awareness on how to utilize bio-gas safely.

Component 3: Knowledge, Monitoring and Evaluation

This component deals with the effective planning, management, implementation, monitoring and evaluation of the project activities. This Component will have one key expected Outcome, namely: M&E management and lessons learnt are captured and appropriately disseminated with three expected Outputs: (i) Compile Knowledge adaptation products, (ii) Participate in adaptation practitioners events, and (iii) Produce Monitoring and Evaluation reports.

3.1 Compile Knowledge Adaptation Products

Under this component, the project will compile a number of knowledge adaptation products including climate change adaptation videos, fact sheets, training materials, and studies. These products will be derived from similar projects elsewhere and from the project.

3.2 Participation in Adaptation Practitioners Events

Members of the PIU, the technical steering committee, and the project implementing personnel at the provincial and district levels will participate in adaptation practitioners' events. It is envisaged that at least 24 adaptation practitioners' events will be held as part of the CRLMP implementation. Stakeholders are expected to attend and participate in at least six (6) adaptation practitioners' events elsewhere but relevant to the project.

3.3 Produce Monitoring and Evaluation Reports

The project will produce and submit quarterly progress reports as well as financial reports. It is anticipated that 29 reports will be submitted including the annual work plan and budget (AWPB), progress reports, and financial reports. The evaluation reports by the project will include the baseline survey during Year 1, the mid-term review during Year 3, the beneficiary impact assessment during Year 5, and the project completion review during Year 5.

A.6 Risks, including climate change, potential social and environmental risks that might prevent the project objectives from being achieved, and measures that address these risks:

The project Objective is "To strengthen the adaptive capacity of Zambian livestock farmers to the impacts of climate change". The achievement of this objective is subjected to many risks. If risk is defined as a loss, or as a word synonym with "probability of occurrence of a damaging event", then it can be taken to mean that all factors that can cause the loss or damage to the elements/benefits stated in the project Objective are risks themselves or are risk-related factors.

Climate change, climate variability, environmental factors, and social development patterns are among factors that might pose various degrees of risks and hence prevent the project objective from being achieved. The likelihood of any of these factors causing loss in the project setting, outputs or on beneficiaries over the project duration or few years after completion will depend on the historical trend and future predictions.

In broad terms rainfall in Zambia is strongly influenced by the El Niño Southern Oscillation (ENSO), which causes large inter-annual variability. El Niño brings drier than average conditions in the wet summer months (DJF) in the southern half of the country, whilst the north of the country simultaneously experiences significantly wetter-than average conditions. The Government of Zambia Meteorological Services Department predicts that for the 2015/16 agricultural season, the whole country is expected to experiece the impacts of El Nino phenomenon, already in force. The forecast suggests that most of the country will receive normal to below normal rainfall. The effect is expected to last up to April 2016. The last time the magnitude of the on-going El Nino occurred in Zambia was 50 years ago, according to the Report.

The reverse pattern occurs with La Niña episodes, with dry conditions in the north and wet conditions in the south. Recent studies on Zambia has also shown that the mean annual temperature has increased by 1.3^{O}C since 1960, an average rate of 0.29^{O}C per decade, with the rate of increase most pronounced during winter months (0.34^{O}C per decade); whilst the number of hot days and hot nights per year has increased by 43 days. Therefore, recent trends in floods, droughts and temperatures could provide indications as to how climate change, climate variability and environmental stresses in the project areas can affect the achievement of project objectives. In this connection the recent observations that from 2000 to 2007, the intensity and frequency of droughts and floods and the number of people affected changed, with a net trend towards more floods and, over a longer time-period, droughts, and that the area affected by floods and droughts appears to have expanded as indicated by the fact that the 2006/07 flood affected 41 districts in nine provinces, and the 2004/05 drought left nearly two thirds of Zambia with little or no rainfall. Climate

With the two project provinces, Muchinga and Northern, lying almost completely in the Agro-ecological Region III and receiveing over 1000 mm of rainfall annually, and with highly leached and acidic soils, both severe floods and droughts are major climatic and environmental risks. On one hand, droughts affect agricultural production and plant growth and therefore directly affect livestock production through the availability, quantity and quality of feeds. Bush fires that destroy large hectarages of vegetation also have severe negative impact on animal feed production and livestock losses. On the other hand excessive rainfall contribute to breeding of vectors that carry and spread animal diseases, whilst floods can cause drowning and death of livestock. Climate change impacts, vulnerability and coping measures in general are presented in Table 1 whilst the climate change impacts as perceived by livestock farmers in the target project provinces/districts as well as impediments to adaptation to climate change and variability impacts are presented in Table 2.

Socio-economic factors or conditions that force farmers and other society members to adopt unsustainable farming, livestock and natural resources management practices, such as overgrazing, degradation of soils and setting of bush fires for hunting could negatively affect the sustainability of the project activities and erode the socio-economic benefits envisaged from the project. Available demographic data show that the Zambia's Northern and Muchinga Provinces are particularly vulnerable because of their high dependence on natural resources, and their limited capacity to cope with climate variability and extremes. The capacity to cope with climate variability and extreme weather events is highly dependent on the level of human well-being. In general, livelihood sources of the poor are usually narrower and more climate-sensitive than those of the non-poor. Therefore, any worsening of the socio-economic related vulnerability factors of the communities in the two provinces in the course of implementing the project will negatively affect the prospects of achieving the project objectives. Other risks associated with project implementation and the associated measures of risk mitigation are listed in the Table 3.

Table 1: Climate Change Impacts, Vulnerability and Coping Measures in the Project Area

Impacts	**Vulnerability & Impediments to Adaptation**	**Coping Measures**
Increase in frequency of extreme events at some locations Stress on water resources, human health, and infrastructure, hampering development. Decrease crop yields, livestock productivity or diminishing food security. No changes or substantial increases in crop production projected for the Northern parts of the country including Northern and Muchinga Provinces (Davis, C.L. 2011). Rivers may experience decreases in run-off and water availability affecting agriculture and hydropower systems. Damage or destruction of infrastructure Higher incidence of animal and crop diseases and new strains of diseases Unreliable and insufficient energy Loss of lives due to epidemics Loss of biodiversity Soil erosion	Adaptive capacity is low due to widespread poverty in the area. Social safety nets are not adequate to shield against harvest failures. High dependence on rain-fed agriculture. Low recognition of Climate change as a major threat to food security, water resources, productivity of natural resources, human health and land degradation. Lack of cooperation between farmers and research institutions. Little or no availability of finances to invest in the water sector. Technological and institutional barriers. Lack of information on local climate change characteristics. Low educational levels and risk awareness. Unknown effectiveness of conservation measures; concerns over property rights regarding land acquisition; governance challenges. Higher projected rainfall in the Northern Provinces increases risk of erosion on steeper slopes.	Adopt Watershed Development Approach with Sustainable Land Management practices. Train extension personnel on improved land-use practices and GIS to enhance capacity for sustainable land use management. Adopt water conservation measures and water conservation structures like hillside terracing, bunds and micro-basins, semi-circle terracing and trenches, infiltration pits, ponds and diversion ditches. Supplement water supply from other dams and wells. Improve on efficient water extraction and distribution methods to reduce wastage. Take advantage of the over-supply during flood periods by adopting new water harvesting techniques to accumulate sufficient levels of water to sustain dams through the dry seasons. Construct dykes to control the flow of flood water, and divert water for irrigation. Divert flood water to other uses by installing appropriate infrastructures. E.g. use saved water for irrigation and even hydro-power generation. Introduce drought-tolerant and fast-maturing crop varieties. Change timing of planting. Introduce adaptable local livestock breeds. Diversify livelihood activities, promote agro-forestry and plant trees along rivers. Develop early warning systems. Early warning systems and capacity building for health personnel. Introduce and advance weather index insurance. Use modern infrastructure construction techniques to ensure infrastructure is climate proof. Set up and maintain a strategic fund for the repair and maintenance of infrastructure damages and ensure an uninterrupted water distribution. Promote private sector investment or public-private partnerships for investments in the water sector. Diversify energy resources by developing climate resilient energy sources and introducing drought-tolerant, fast-growing bio-energy crops and high-yielding bio-fuel trees. Mapping and regular census of flora and fauna. Enhancing conservation measures considering the flora and fauna under high risk, e.g. migration corridors; expansion of conservation areas. Enhance capacity for natural adaptation and migration to changing climatic conditions. Reforestation, Cover cropping, Terracing and benching.

Table 2: Impacts of projected climate change on livestock production, adaptation measures and barriers to adaptation

	General Livestock Impacts	**Impacts as identified by local communities in Northern and Muchinga Provinces**	**Adaptation Barriers**
Direct Impacts	Changes in forage quality and quantity (including the availability of fodder crops) Changes in water quality and quantity Reduction in livestock productivity by increasingly exceeding the temperature thresholds above the thermal comfort zone of livestock, which could lead to behavioural and metabolic changes (including altering growth rate, reproduction and ultimately mortality) Increased prevalence of 'new animal diseases' Increases in temperature during the winter months could reduce the cold stress experienced by livestock, and warmer weather could reduce the energy requirements of feeding and the housing of animals in heated facilities	Drought related impacts: Crop damage/loss, leading to food scarcity and hunger. Water shortages. Reduced fish stocks in rivers. Income loss. Reduced charcoal business. Increase in diseases (e.g. diarrhea), affecting humans and animals. Decreased water quality. Increased soil erosion. Floods related impacts: Crop damage/loss, leading to food scarcity and hunger. Loss of crop land and grazing ground. Decline in fish catches. Increase in diseases (malaria, dysentery, cholera, etc.). Destruction of infrastructures (houses, roads). Life loss (humans and livestock). Extreme heat: Increase in diseases affecting animals, crops and humans (especially malaria). Decreased human capacity to do work. Loss of life (animals and humans). Crop damage/loss. Reduced fish stocks. Decreased livestock feed. Reduced water quality. Shorter Rainy Season: Decreased crop yields. Crop damage/loss. Decreased income from crop selling. Crop seeds do not reach maturity (which negatively affects the next crop generation). Reduced charcoal production and business.	Limited or no access to breeds more resilient to climate change. Low Capacity for Income diversification. Limited accessibility to markets. Limited or no accessibility to agricultural extension services. (e.g. to advice on earlier crop planting, crop diversification, conservation agriculture and crop intensification, growing drought resistant crops, using irrigation, using "zero grazing" for some animals). Limited knowledge and skills on mitigation and lack of irrigation opportunities
Indirect Impacts	Increased frequency of disturbances, such as wild fires Changes in biodiversity and vegetation structure	Standing crops and harvested/stored crops destruction by bush fires	Absence or limited community mechanisms to develop, implement and enforce community actions related to bush fires.

SOURCES: Modified after Davis, C.L. (2011)

Table 3: Other Risks Associated with Project Implementation and Measures of Risk Mitigation

Risk	Risk Mitigation Measure
Poor farmer Organization	This will be mitigated by the capacity building initiatives including training on livestock production, community mobilisation and sensitization
Incompetent contractors	Adequate training during the launch of the project will be taken and also use will be made of stringent evaluation methods to enforce quality and also monitoring and evaluation of the contract execution. Government has developed a capacity building programme and suitable legislation for local contractors in Zambia.
Inadequate MAL technical staff	The government has made an assurance that it will recruit and make available qualified and experienced field personnel. The EU supported project of enhancing the institutional capacity of the MAL in sector planning, programme implementation and monitoring and evaluation, will raise the quality of personnel. The project will also provide room for recruitment of key personnel.
Non-workable Institutional arrangements. The close link between the LISP and CRLMP could benefit from rationalized institutional arrangements, in terms of cost and efficiencies of operations. However, oversimplification of unified arrangements may lead to serious reductions in counter balances and checks to the extent that the "climate proofing" of LISP may not be realized to the extent desired.	This probability will be minimized by targeting an appropriate level of mix of personnel from the two projects within a single Project Implementing Unit.

A.7. Coordination with other relevant GEF financed initiatives: There have been a number of GEF financed projects in Zambia. Through the GEF Agency, United Nations Development Programme (UNDP), three projects related to livestock have been identified as, the Preparation of the National Adaptation Programme of Action (NAPA), Strengthening Climate Information and Early Warning Systems in Eastern and Southern Africa for Climate Resilient Development and Adaptation to Climate Change - Zambia and Adaptation to the effects of drought and climate change in Agro-ecological Zone 1 and 2 in Zambia. All these projects are in close coordination with the current project as they all were targeted at understanding the effects of climate change. The deliverables under this project have been derived from the NAPA as it is the reference point for countries to deal with adaptation to climate change. The second component of the project is the cornerstone towards achieving the capacity building objective of the current project by provision of adequate information and early identification of climatic risks and how they are interpreted as well as being understood by the end-users. In addition, the project being championed by one of the

development partners indicates the commitment to provide value-addition to already existing projects like the AU IBAR financed Smallholder Livestock Investment Project (SLIP).

The Livestock Development Programme that Government has embarked on is nationally coordinated with different Cooperating Partners funding different aspects or geographic zones. The government is funding some aspects from its own resources. The Agriculture Cooperating Partners Group (led by AfDB, EU and Finland comprising also of JICA, World Bank, FAO, WFP, IFAD, USAID, Sweden and Norway) has a sub-committee on livestock development to coordinate and dialogue with Government on livestock issues. The World Bank is covering Southern Central and Eastern provinces. IFAD is covering livestock disease control across the country. EU is providing institutional capacity building within the Ministry. AfDB is covering the northern regions of the country. The WB and AfDB projects are quite similar in design though WB has less infrastructure component.

The project will also benefit from the parallel implementation of the:

(i) Special Programme on Climate Resilience in the Kafue and Zambezi river basins (SPCR) where adaption measures will be piloted.

(ii) Strengthening Climate Resilience in the Kafue Sub-Basin (SCRIKA) which strengthens the capacity of communities to cope with floods and droughts thereby contributing to a population that is more resilient to climate change.

(iii) The Lake Tanganyika Regional Integrated Management Program (LTRIMP) which was designed to facilitate the implementation of the Convention on the Sustainable Management of Lake Tanganyika, Strategic Action Program (SAP) and Lake Tanganyika Framework Fisheries Management Plan (FFMP). The objectives of SAP are: (i) to achieve sustainable management of the natural resources of Lake Tanganyika through implementation of activities prioritized in the SAP and (ii) to improve livelihoods through physical and social infrastructure development.

B. Additional information not addressed at PIF stage:

B.1 Describe how the stakeholders will be engaged in project implementation.

The Project preparation Team from its inception has considered the CRLMP and the Baseline project (LISP) as community –based projects and that both beneficiaries and other stakeholders be part of project design, implementation and monitoring and evaluation. This entrenched position informed the large participation of farmers/associations (civil scocieties) to participate in the Inception Workshop were they constituted about 30% of the participants. Similarly, over 150 farmers (males, females, youth) were consulted during the preparation of the Project. The Project design has in-built mechanisms for continued participation of beneficiaries and other stakeholders in the project activities. Additional beneficiaries will be mobilized and engaged through livestock cooperatives. Among Government Ministries or departments to be engaged will be the Zambia Environment Management Authority (ZEMA) to ensure that all the infrastructure development under the CRLMP and LISP are environmental friendly. There is a possibility for ZEMA to

have a representative on the Project Steering Committee. Stakeholder participation in Project Governance will include the following processes:

- LISP/CRLMP Project Steering Committee as the first forum for stakeholders will involve stakeholders from the Provincial Development Coordination Committee (PDCC) and District Development Coordination Committee (DDCC).
- The LISP/CRLMP PIU will integrate a Climate Adaptation Expert hired with CRLMP funding.

The LISP and CRLMP accounts will be managed separately. The Accountants already appointed under the LISP will, in addition to managing LISP account, also manage the CRLMP account. As with the LISP, the MAL Chief Accountant and Procurement Officer will also facilitate implementation of the CRLMP.

The CRLMP monitoring and evaluation activities will be coordinated through the LISP M&E expert. To ensure the smooth implementation of M&E activities at the provincial level, the LISP provincial Focal Points will be assigned M&E duties over and above their provincial coordination duties. The Focal points will prepare and consolidate district quarterly reports to form the provincial quarterly reports for submission to the M&E Specialist. The M&E specialist will consolidate the provincial reports into a national report which will be submitted to the Ministry. At the district level, the Subject Matter Specialists (SMSs) - livestock technicians or livestock production extension officers - will be assigned M&E duties over and above their normal duties. The SMSs will be responsible for data collection and capturing at district level and for the production of district quarterly reports for submission to the provincial Focal Points.

Through the project Steering Committee, the GRZ, the Bank and GEF will review and approve the CRLMP's annual work plan and budget, at least 3 months before the beginning of the fiscal year. It is critical that the CRLMP's annual plan will be synchronized with the LISP's annual plan. As with the LISP, at the Provincial level, the responsibility for delivery rests with the existing institutional structures of MAL under coordination of the Provincial Agriculture Coordinator (PACO). The Provincial and District Offices have technical officers who will spearhead Project implementation. The PDCCs and DDCCs will supervise and monitor the project.

Sustainability: The CRLMP will follow the sustainability principles adopted for the LISP whereby the Bank adopted a participatory approach in identification and preparation of project. This is an important step towards ensuring the relevance of the investments made and the laying of an institutional capacity at the community level for the sustainability of the planned activities. The use of the Provincial and District decentralized implementation system will ensure full community participation guided by District authorities. The Project will put much emphasis on developing the capacity of beneficiaries and strengthening their institutions like interest groups and cooperatives. The beneficiaries will be mobilised, organised into viable self-reliant entities, trained and empowered to view their activities as business rather than subsistence activity. Gender

sensitisation training at the community and local administration levels will ensure that women continue to participate and benefit equally from all rural livestock development activities. Project sustainability will also be ensured by the proactive involvement of the beneficiaries, District/Provincial staff in participatory M&E of activities.

The Project beneficiaries will contribute towards the cost of acquiring livestock through the pass-on scheme which will show their commitment and cultivate sense of ownership. The skills training modules will include rangeland and livestock breeds management.

B.2 Describe the socioeconomic benefits to be delivered by the Project at the national and local levels, including consideration of gender dimensions, and how these will support the achievement of global environment benefits (GEF Trust Fund/NPIF) or adaptation benefits (LDCF/SCCF):

The proposed project together with its baseline project, the LISP, are set in two provinces which have large proportions of the land area falling into the rural areas. As in other rural areas of Zambia, rural poverty is high in the two provinces - as high as 78 percent as of 2010. The poor population in the Muchinga and Northern Provinces are more vulnerable because of their high dependence on natural resources, and their limited capacity to cope with climate variability and extremes.

The implementation of the LISP and the CRLMP in the two provinces is to promote economic activity in the communities through profitable livestock farming and related activities. Due to the fact that some livestock activities are reserved for specific gender/and or age groups in the households, and even at community level, and also by reason of differences in intra-household decission making privileges, men, women and youth may be impacted differently by project activities and outcomes. In order for the Project benefits to equitably reach the various socio-economic, gender and age groups across the communities, a broad knowledge of the demography, agricultural and off-farm livelihood options available to social and gender/age groups and the understanding of the vulnerability of these groups to natural events such as drought and floods must be assured. As part of the preparation of the Project proposal, demographic data for the project areas were sought. Among key data are: From the total projected population of 2,199,493 in 2015, women in Northern and Muchinga Provinces account for 50.6 % of the population while men account for 49.4 %. The two Provinces together accounted for a total number of 296,014 agricultural households in 2010. Women headed households account for a significant 19.8% of the agricultural households whislt male headed households account for 80.2% of the households. According to the Central Statistical Office, 67.85% out of Muchinga's total population of 895,085 in 2015, are under 25 years old. For the Northern Province with a higher total population of 1,304,435 this number stands at a dramatic 68.44% (CSO, 2013).

Thus, given the overall high poverty levels in rural Zambia, it can be deduced that women and youth constitute a vast majority of the poor people in the Northern and Muchinga Provinces. As stated earlier both women and men in rural

areas are especially vulnerable when they are highly dependent on local natural resources for their livelihoods. However, those charged with the responsibility to secure water, food and fuel for cooking and heating (mainly women and youth such as found in the project areas), face greater challenges. When coupled with unequal access to resources and to decision-making processes, and limited mobility, women in rural areas are disproportionately affected by climate change as it affects water availability, agricultural and livestock productivity, and access to forest products such as fire wood. Similarly the youth are considered as a high vulnerable group. As heads or members of young households, youth are disadvantaged in ownership of assets – at their age, they have not accumulated much in liquid or fixed assets. Without much formal education, they also have difficulties finding reliable employment. Since in rural areas, such as where the project activities will take place, agriculture is the main form of employment the youth are at more risk when agricultural production is affected by vagaries of weather.

The LISP (baseline project to CRLMP) interventions cover a range of livestock and livestock-related infrastructure, including feeder roads, crushes and dip tanks, marketing facilities, abattoirs, milk collection facilities. The project is designed to improve livestock production and productivity and to link these activities to markets. The implementation of the CRLMP is to ensure that the infrastructure is durable to impacts of climate change and variability and to build capacities of livestock farmers to adapt to negative impacts of climate change. It is expected that the well being of livestock producers and their families will be improved through increased livestock production/productivity, increased incomes from sales of live animals and products and better nutrition through increased consumption of livestock products.

The implementation of the CRLMP, alongside the baseline project, LISP, is expected to increase the per cent of households owning livestock in the target Districts in the two project Provinces, as a result of the "pass on scheme" and livestock restocking. Furthermore, the mean household per capita livestock incomes from selected species targeted under the project, namely cattle, goats, sheep, pigs and chicken are expected to increase. For example, in the Northern Province the baseline of ZK 264,300 household per capita cattle income (*Zambia 2012 Post-harvest Report*) is expected to improve by at least 40% or to ZK 370,000 by the end of Project (5 years) as a result of improvement in feed resources from pastures, rangelands, and supplementary feeding from improved quality crop residues, and from improved veterinary care and services. These improvements in general livestock husbandry are expected to positively impact on calving rates, milk yields and body weight gains in dams and calves. For the livestock species that are often owned in greater frequency by women, namely, goats and chicken, the gains in household per capita incomes are expected to be even higher due to higher offtake rates in these species. For example, for goats an average of 60% improvement in household per capita is expected on the baseline of ZK 45,238 to ZK 72,380. Improved access to livestock markets made possible by LISP markets and road infrastructure are expected to reduce marketing costs of livestock products, and hence increase profit margins of livestock farmers. These expected increases in the incomes from livestock as a result of projects implementation would be expected to result in improvement in the purchase power of mixed crop-livestock farmers and empower them to invest more in other aspects of agriculture, which should lead to increases in the percentage of food-secure households. Women in reproductive phases (pregnancy, lactation, nursing) and children are particularly expected

to gain more from improved household food and nutrition security, as low caloric intake rates are often present in these groups

It is also expected that the agricultural and livestock production base (farms, rangelands, etc.) will be improved through project activities such as sowing of improved pastures, planting of leguminous multi-purpose trees and better management of communally–owned resources. The potential of improving the socio-economic status of people living in the communities where the project will be implemented was deemed quite high during visits to seven of such communities during the preparation of the project, where a wide range of activities related to livestock were being undertaken by men, women and the youth who expressed interest in capacity building (training and mentoring) as a means to improve productivity, processing and marketing, and ultimately earning of higher farm and off-farm incomes. The challenge is how to design an inclusive CRLMP that will ensure that the interests of women, youth and men are equitably addressed in the project implementation such that project benefits are fairly distributed during and after the project.

At the farm household level, the Livestock restocking and "pass-on" scheme in Component 1 and the Capacity building in Component 2 are particularly placed to benefit women and youth, through skills development, income generation, assured livelihoods, asset building, and improved nutrition. The implementation of CRLMP will assure the sustainability and durability of these benefits.

At the community and District levels, the anticipated benefits are expected to be felt beyond the local and/or district areas as the entire provinces and the nation stand to benefit from quality livestock products, and possible reduction in prices of these commodities arising from increased in production efficiencies. Improved feeder road systems and market access are likely to add increased availability of products to urban dwellers in the target provinces and beyond.

At the national level improved farming practices to be promoted under the project are expected to reduce GHG production through proper feeding of livestock, proper handling and use of manure, planting of perenial crops and pastures and cover crops that protect soil surfaces, and hence reduce emissions. In a recent modelling study by the Livestock Information, Sector Analysis and Policy Branch (AGAL) of the FAO a short list of relevant mitigation options were identified for the livestock production systems in Zambia and three mitigations packages were designed based on their anticipated impacts on emissions and productivity:

- ✓ Improve feeding practices and grassland management: crop residues processing + increased legumes in pastures + improved grazing management,
- ✓ Improve health & reproduction management (fertility and mortality rates), and
- ✓ Improve manure management: recovery of nutrients and energy through anaerobic digestion (biogas).

Results of the modeling confirm that there is a potential for both livestock production growth and mitigation of climate change in Zambia (FAO-AGAL, 2014). The study concludes that with feasible improvements in forage digestibility, animal health and reproduction management, carbon sequestration and manure management, emissions from livestock in

Zambia can potentially be reduced by 32% to 38% of the total annual baseline emissions. Thus, these improved food production and attendant food security, as well improved environment will not be experienced not only at the project districts/provinces but the country as a whole and even adjoining districts in other countries bordering Zambia.

B.3. Explain how cost-effectiveness is reflected in the project design:

Executing and Implementing Agencies: At the Inception Workshop where the design of the Project was further discussed beyond what was in the PIF, three Options for Project management were considered, and the pro and cons (including) costs of implementation were considered. Option 1 was the management of CRLMP independent of LISP (a format in the PIF), Option 2 was to have certain management components be common for CRLMP and LISP, but with two Coordinators , and Option 3, which sought to have only one or two disciplinary specialist recruited to serve the two Projects under one management unit. The projected cost structure was highest for Option 1, then Option 2 , with lowest cost for Option 3. However, It was proposed by the AfDB that based on its experience elsewhere with similar "twined" projects the CRLMP will be implemented under the existing LISP Project Implementation Unit (PIU). This means the project will be implemented using the existing LISP Steering & Technical Committees and MAL structures. A Climate Change Specialist will be an additional member to the PIU. The Climate Change Specialist will be a national expert appointed competitively and will be based in Kasama District with the rest of the PIU. This proposal is based on the following reasoning:

- ✓ Establishing a separate PIU for the CRLMP will be costly in terms of salaries for experts and support staff; establishing a separate project steering committee, and a separate technical committee; establishing separate office space; and procurement of a completely new set of project resources like vehicles, furniture, computers, and the like.
- ✓ Having the two projects run by different management may stifle implementation of both projects especially at community level as this may result in community fatigue as the projects will be talking to similar if not the same issues. Implementation problems might also arise if the Project Managers do not agree on the implementation approach taken by the other. Thus implementation efficiency will be compromised.
- ✓ The requirement that the Climate Change Adaptation Specialist be a national expert would be expected to reduce staff cost to be charged to the M&E component (Component 3) which budget is considered too low, and for which no co-funding amount has been indicated in the PIF.

The above named cost-saving approaches in favour of those initially identified but later on rejected as being either more expensive or impratical or non-workable. Among those initially proposed and rejected are:

- ✓ A full fedged independent project management structure for CRLMP was rejected on the basis of cost and also for the reasons adduced above.
- ✓ The alternative to recruit an international Climate Change Adaptation Specialist was rejected in favour of a national Expert on the consideration of cost.

C. DESCRIBE THE BUDGETED M&E PLAN:

For the CRLMP, a results-based monitoring and evaluation (M&E) will be implemented. Most of the M&E will be done through the MAL system and the experts in the AfDB's country office. Involving the project team will also serve the purpose of raising awareness of the need for vulnerability reduction and adaptation and improve the likelihood of post-project sustainability and follow-up. One outcome of this M&E will be knowledge management to ensure that lessons learned from the project's implementation are available for application to other adaptation projects such as the Special Programme on Climate Resilience in the Kafue Basin that the Bank is developing with the Government.

Monitoring and Evaluation: M&E will be done to improve the programme implementation and impact. M&E will entail monitoring the project activities, outputs, outcomes, and the performance of implementing agencies against the specified targets, reviewing progress and constraints, and using the information for improved project management towards achieving the project goals and objectives. The result based framework will provide the basis for monitoring and evaluation. Monitoring of the Project activities will be done at community (beneficiary), District, Provincial and PIU levels. The M&E milestones are presented in Table 4.

Table 4: M&E Milestones Over the Five Year Implementation Period

Year and Quarter	**Activity**	**Responsible Person(s) and/or Unit(s)**
Year 1, 1st Quarter	M&E Unit in Place	Project Coordinator
Year 1, 1st Quarter	Year 1 AWPB	Project Coordinator, M&E Specialist
Year 1, 1st Quarter	Quarterly review Meeting	PIU
Year 1, 2nd Quarter	Project MIS	M&E Specialist and Short Term Consultant
Year 1, 2nd Quarter	Strategic Review Meeting	PIU
Year 1, 2nd Quarter	AfDB / GEF Mission	PIU
Year 1, 3rd Quarter	Project Baseline Study	M&E Specialist, Communities, Districts, Provinces, Short Term Consultant
Year 1, 3rd Quarter	Quarterly review Meeting	PIU
Year 1, 3rd Quarter	Year 2 AWPB	Project Coordinator, M&E Specialist
Year 1, 3rd Quarter	Steering Committee Meeting	PIU
Year 1, 4th Quarter	Quarterly review Meeting	PIU
Year 1, 4th Quarter	AfDB / GEF Mission	PIU
Year 2, 1st Quarter	Annual Report	M&E Specialist
Year 2, 1st Quarter	Quarterly review Meeting	PIU
Year 2, 2nd Quarter	Strategic Review Meeting	Project Coordinator, M&E Specialist
Year 2, 2nd Quarter	AfDB / GEF Mission	PIU
Year 2, 3rd Quarter	Quarterly review Meeting	PIU
Year 2, 3rd Quarter	Year 3 AWPB	Project Coordinator, M&E Specialist
Year 2, 3rd Quarter	Steering Committee Meeting	PIU
Year 2, 4th Quarter	Quarterly review Meeting	PIU
Year 2, 4th Quarter	AfDB / GEF Mission	PIU
Year 3, 1st Quarter	Annual Report	M&E Specialist
Year 3, 1st Quarter	Quarterly review Meeting	PIU
Year 3, 2nd Quarter	Strategic Review Meeting	PIU
Year 3, 2nd Quarter	AfDB / GEF Mission	PIU

Year and Quarter	Activity	Responsible Person(s) and/or Unit(s)
Year 3, 3rd Quarter	Quarterly review Meeting	PIU
Year 3, 3rd Quarter	Year 4 AWPB	Project Coordinator, M&E Specialist
Year 3, 3rd Quarter	Mid-term review	M&E Specialist, Communities, Districts, Provinces, Short Term Consultant
Year 3, 3rd Quarter	Steering Committee Meeting	PIU
Year 3, 4th Quarter	Quarterly review Meeting	PIU
Year 3, 4th Quarter	AfDB / GEF Mission	PIU
Year 4, 1st Quarter	Annual Report	M&E Specialist
Year 4, 1st Quarter	Quarterly review Meeting	PIU
Year 4, 2nd Quarter	Strategic Review Meeting	PIU
Year 4, 2nd Quarter	AfDB / GEF Mission	PIU
Year 4, 3rd Quarter	Quarterly review Meeting	PIU
Year 4, 3rd Quarter	Year 5 AWPB	Project Coordinator, M&E Specialist
Year 4, 3rd Quarter	Steering Committee Meeting	PIU
Year 4, 4th Quarter	Quarterly review Meeting	PIU
Year 4, 4th Quarter	AfDB / GEF Mission	PIU
Year 5, 1st Quarter	Annual Report	M&E Specialist
Year 5, 1st Quarter	Quarterly review Meeting	PIU
Year 5, 2nd Quarter	Beneficiary Impact Assessment	M&E Specialist, Communities, Districts, Provinces, Short Term Consultant
Year 5, 2nd Quarter	Strategic Review Meeting	PIU
Year 5, 2nd Quarter	AfDB / GEF Mission	PIU
Year 5, 3rd Quarter	Quarterly review Meeting	PIU
Year 5, 3rd Quarter	Project Completion Review	M&E Specialist, Communities, Districts, Provinces, Short Term Consultant
Year 5, 3rd Quarter	Steering Committee Meeting	PIU
Year 5, 4th Quarter	Quarterly review Meeting	PIU
Year 5, 4th Quarter	AfDB / GEF Mission	PIU
Years 2 to 5 1st Quarter	Progress and Financial Audit Reports	PIU, Auditor General / External Audit Firm (Annually)

Monitoring: Monitoring will be an important project management tool for the CRLMP. Monitoring will focus on the two lower levels of the results framework i.e. output and activity levels under each component which are the basis of the work plans and budgeting. The activity and output indicators will form the basis for routine data collection (i.e. monthly or quarterly) for the project. To capture financial progress, the monitoring of financial progress will be done by compiling accurate monthly summary information of management on expenditure per component, category, disbursement/contribution and status of accounts (balances) and review of use of programme facilities, allowances and other services. The project will be reporting on a quarterly basis. The annual reporting calendar for the project is presented in Table 5.

Evaluation: CRLMP evaluation will involve examining the changes brought about by programme interventions and their significance in relation to achieving the programme objective. It will also involve assessing the efficiency (cost effectiveness), relevance (relevance of objective to priority needs and efforts), and programme impact. Based on the various evaluation activities, conclusions will be drawn about implementation progress, capacity, and efficiency in terms of the use of project resources.

Table 5: Annual Reporting Calendar Roles and Responsibilities

Type of report	**Responsibility**	**Deadline for submission**	**Submitted to**
1st district quarterly report	SMS	8th April	PFP
1st consolidated provincial quarterly report	PFP	15th April	M&E Specialist
1st quarterly report	M&E Specialist	30th April	Project Coordinator / National / AfDB
2nd district quarterly report	SMS	8th July	PFP
2nd consolidated provincial quarterly report	PFP	15th July	M&E Specialist
2nd quarterly report	M&E Specialist	30th July	Project Coordinator / National / AfDB
3rd district quarterly report	SMS	8th October	PFP
3rd consolidated provincial quarterly report	PFP	15th October	M&E Specialist
3rd quarterly report	M&E Specialist	30th October	Project Coordinator / National / AfDB
Annual district report	SMS	8th January	PFP
Annual consolidated provincial report	PFP	15th January	M&E Specialist
Annual report	M&E Specialist	30th January	Project Coordinator / National / AfDB

SMS – Subject Matter Specialist **PFP** – Provincial Focal Point

The CRLMP evaluation will mainly focus on the impact and outcome level indicators of the project results based framework. The project evaluation will require carrying out a **baseline survey** in Year 1 to establish the initial project situation, **mid-term evaluation** in Year 3, and an **end of project beneficiary impact assessment** in Year 5. In order to establish the "with" and "without" project scenarios to rigorously estimate the impact of the LISP / CRLMP intervention, evaluation data collection will be extended to include those districts in Muchinga and Northern provinces where the LISP and CRLMP interventions will not occur. A draft questionnaire for baseline, mid-term, and end of project household survey data collection is presented in the attached Appendix 1. In addition to the indicated standard periodic evaluations, the project will conduct annual performance evaluations which will form the basis for annual planning and budgeting.

The M&E Specialist will facilitate the incorporation of the CRLMP M&E data into the established LISP Management Information System (MIS), during PY1. MIS will include the participatory monitoring and evaluation, data collection techniques, analysis and reporting tools. A short term consultancy will provide periodic backstopping to build a computerized web-based MIS that will be operational at district level and will be able to aggregate data from Household

level to the National level. The project MIS will be interfaced with the project financial and procurement systems to ensure ease of reporting on both financial and physical progress.

The Project will provide funds for the development of the project M&E system ($46 656), conducting of the project baseline survey ($98 496), mid-term review ($108 864), beneficiary impact assessment ($120 269), project completion review ($31 622), and annual financial audits ($54 500 over the 5 years). The project will have milestones over the five-year implementation period. The M&E of CRLMP activities, including implementation progress and expenditure will be an integral part of the Executing Agency, as a regular management function through the PIU's M&E Specialist. The PIU will submit to the Bank & GEF, on a quarterly and annual basis, progress reports, annual work plans and budgets, and annual procurement plans using the Bank's & GEF format. The quarterly progress report will be submitted to the Bank & GEF within two months after the end of the reporting period, whilst the annual progress report will be submitted within three months after the end of reporting period.

The Bank & GEF will closely monitor the implementation of the Project through regular follow-up, review and Supervision Missions. The Supervision Missions will be undertaken at least twice a year, and will include, at least once a year, a climate change specialist and an M&E expert knowledgeable in climate change issues. These Missions will verify implementation progress and give guidance to the project to ensure that project results are achieved and reported on.

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

A. RECORD OF ENDORSEMENT OF GEF OPERATIONAL FOCAL POINT(S) ON BEHALF OF THE GOVERNMENT(S):): (Please attach the Operational Focal Point endorsement letter(s) with this form. For SGP, use this OFP endorsement letter).

NAME	POSITION	MINISTRY	DATE *(MM/dd/yyyy)*

B. GEF AGENCY(IES) CERTIFICATION

This request has been prepared in accordance with GEF/LDCF/SCCF/NPIF policies and procedures and meets the GEF/LDCF/SCCF/NPIF criteria for CEO endorsement/approval of project.

Agency Coordinator, Agency Name	**Signature**	**Date *(Month, day, year)***	**Project Contact Person**	**Telephone**	**Email Address**

ANNEX A: PROJECT RESULTS FRAMEWORK (either copy and paste here the framework from the Agency document, or provide reference to the page in the project document where the framework could be found).

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Expected results	**Indicators (indicative)**	**Baseline**	**Targets**	**Data sources and collection methods**	**Frequency**	**Responsibility**	**Assumptions**
IMPACTS (Strategic Level)							
Overall Objective: Strengthen the adaptive capacity of Zambian livestock farmers to the impacts of Climate Change	Percentage of food-secure households Mean household livelihood index (based on HH income (agric. & off-farm), HH assets, HH access to natural assets	45 (*)	80 80	Household survey	Baseline Mid-term End of investment	Independent Service Provider	Economic and political stability in Zambia and neighboring countries to the project area
	Mean household per capita agriculture income (from crop and livestock production) ($)	344	750	Household survey	Baseline Mid-term End of investment	Independent Service Provider	Absence of natural disasters (floods, drought, etc.) and/or climate change with no catastrophic impacts on habitats, livestock
	Mean household per capita livestock income ($)	115	365	Household survey	Baseline Mid-term End of investment	Independent Service Provider	No major pandemic during the project life.
	% household income derived from livestock production	33	50	Household survey	Baseline Mid-term End of investment	Independent Service Provider	Macroeconomic environment remains conducive to investment, private sector development, and trade
	Percentage of households with year-round access to adequate water (quality and quantity for livestock watering) minimum Distance to water source for livestock (Km)	48	90	Household survey	Baseline Mid-term End of investment	Independent Service Provider	
	Livestock disease incidences (% of livestock population) Emerging diseases which were not there before (Diseases appearing in non-endemic areas)	0	0	Vet livestock records Household survey	Quarterly Baseline Mid-term End of investment	Vet Services Independent Service Provider	
	% farmers with access to markets for livestock and livestock products	(*)	90			Independent Service Provider	
	Mean number of livestock by type:						

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Expected results	**Indicators (indicative)**	**Baseline**	**Targets**	**Data sources and collection methods**	**Frequency**	**Responsibility**	**Assumptions**
	Cattle Sheep Goats Chickens	17.2 5.3 8.6 28.5	30 10 20 50				
	% Change in GHG emissions due to livestock activities (estimated)	0	95				
OUTCOMES							
Component 1: Livestock infrastructure development and increasing adaptive capacity of livestock farmers							
Outcome 1.1: Livestock farmers able to cope with climate change through adoption of improved practices that enhance livelihoods	Number (percent) households affected by climate related disasters	(*)	0%	Household survey	Annually[§] Baseline Mid-term End of investment	Independent Service Provider	Direct measure of impact. The results will depend on whether and when extreme climate events occur. An indicator over the long-term
	Number (percentage) of households adopting a wider variety of livelihood strategies	(*)	75	Household survey	Baseline Mid-term End of investment	Independent Service Provider	
	Improved livestock performance: **Cattle** ✓ Calving rate (%) ✓ Calving interval (days) ✓ Calf mortality rate (%) ✓ Adult cattle mortality rate (%) ✓ Lactation milk yield (Litres / year per cow) ✓ Lactation length per cow (days) ✓ Age at first calving (months) ✓ Weaning rate (%) ✓ Cattle off-take (%) **Small stock** ✓ Fertility rate (%) ✓ Kidding rate (%) ✓ Off-take rates (%) ✓ Weaning rate (%)	 56.4 650 16.7 2.95 2122 248 (*) 35 7.5 75 94.0 15 (*)	 77.6 403 5.2 3 4650 301 25 75 15 87.6 105 30 52.3	Household survey	Baseline Mid-term End of investment	Independent Service Provider	Effective participation of livestock breeders and multipliers in the breeding programme Coordination and measures taken to limit natural or artificial crossbreeding between indigenous and exotic breeds

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Expected results	**Indicators (indicative)**	**Baseline**	**Targets**	**Data sources and collection methods**	**Frequency**	**Responsibility**	**Assumptions**
	✓ Dressing percentage	(*)	41.8				
Outcome 1.2: Resilience of natural resources to climate change enhanced	Economic losses through management (establishment, maintenance, etc.) of climate resilient natural assets ($US)	0	0	Household survey	Baseline Mid-term End of investment	Independent Service Provider	Appropriate benefits / loss valuation methodologies are available & adopted
Outcome 1.3: Increased resilience of infrastructure to climate change threats	Percent LISP infrastructure made climate resilient to rapid-onset events (i.e. floods & storm surges, heat-waves)	0%	100%	Replacement cost of infrastructure estimated to have been saved from weather events (weather intensity factored in)	Quarterly	M&E Unit	
Outcome 1.4: Reduced GHG emissions from LISP infrastructure	Percent of LISP infrastructure with GHG emission reduction technology	0%	100%	Quarterly progress reports	Quarterly	M&E Unit	
Component 2: Capacity Building on climate change Adaptation for stakeholders							
Outcome 2.1: - Increased knowledge and risk preparedness and adaptive capacity to climate variability at country and targeted community levels	**P**ercent households who are aware of climate change issues	(*)	90%	Scorecards to measure climate information generation, analysis and communication	Quarterly	M&E Unit	Competence of service providers to provide adequate capacity building Effective participation and adherence of livestock farmers
Outcome 2.2 - Diversification and strengthened livelihoods and source of incomes for rural population (artisan and livestock farmers)	Number (percentage) of households adopting climate change resilient livestock management practices / technologies Number (percentage) of households adopting climate change resilient crop husbandry practices	(*) (*)	90% 90%	Household survey and survey of managers of emergency response agencies with data disaggregated by sex.	Routine Baseline Mid-term End of investment	M&E Unit Independent Service Provider	The policies of local and national extension services in charge of livestock production promote the sustainable preservation indigenous livestock breeds
Component 3:- Knowledge, Monitoring and Evaluation							
Outcome 3.1: - M&E management and lessons learnt are captured and appropriately disseminated	Percent actual/budgeted expenditure achieved No. of unqualified PIU audit reports	0 0	100 5	Supervision missions reports Project MTR reports Project audit reports Project completion report		PIU	Adequate resources provided for M&E activities M & E / MIS set-up and used for decision making
OUTPUTS							
1.1.1 - Livestock farmers acquire breeds resilient to climate change	Number of climate resilient livestock units procured and distributed	0	3 450	Quarterly progress reports	Quarterly	M&E Unit	There are enough budgetary allocations and human resources to

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Expected results	**Indicators (indicative)**	**Baseline**	**Targets**	**Data sources and collection methods**	**Frequency**	**Responsibility**	**Assumptions**
							implement project activities
1.1.2 - Livestock farmers set up sustainable livestock pastures, fodder banks, rangeland and water harvesting systems	Number of village land use plans established Area under sustainable livestock pastures, fodder banks, and rangeland Kilometers of fire breaks constructed around rangelands Number of livestock water sources improved or developed	0 0 0 0	270 2 250 600 292	Quarterly progress reports	Quarterly	M&E Unit	
1.1.3 - Effective practices developed for the community to manage indigenous livestock	Number of best practices identified and documented for the community to manage indigenous livestock	0	-	Quarterly progress reports	Quarterly	M&E Unit	
1.1.4 – Operational livestock index-based insurance scheme	Operational livestock index-based insurance scheme in place	0	1	Quarterly progress reports	Quarterly	M&E Unit	
1.1.5 – Operational Livestock Early Warning Information System	Operational Livestock Early Warning Information System in place	0	1	Quarterly progress reports	Quarterly	M&E Unit	
1.2.1 Restoration of degraded pasture and increased vegetation cover with different drought tolerant perennials	Rangeland area (ha) under improved interventions (e.g. drought tolerant annual and perennial species)	0	4500	Quarterly progress reports	Quarterly	M&E Unit	
1.3.1 – Climate resilient infrastructure designs in place	Number of infrastructure designs improved to be climate resilience	0	11	Quarterly progress reports	Quarterly	M&E Unit	
1.3.2 – Climate resilient infrastructure constructed and maintained	Number of climate resilient infrastructure constructed Number of climate resilient infrastructure maintained	0 0	217 217	Quarterly progress reports	Quarterly	M&E Unit	
1.4.1 – LISP infrastructure designs for reduced GHG emissions in place	Number of LISP infrastructure designs improved to reduce GHG emissions	0	11	Quarterly progress reports	Quarterly	M&E Unit	
1.4.2 - LISP infrastructure fitted or constructed with GHG emissions reduction technologies	Number of LISP infrastructure designs constructed with GHG emissions reduction technologies	0	11	Quarterly progress reports	Quarterly	M&E Unit	
2.1.1 - Country: Technical staff of Government trained in climate risk assessment and adaptation skills for livestock farmers	Number of staff trained on climate risk assessment and adaptation skills for livestock farmers	0	160	Quarterly progress reports	Quarterly	M&E Unit	Competence of service providers to provide adequate capacity building
2.1.2 - Community level: Training artisans in manufacturing livestock-related material as a source of income diversification	Number of beneficiary cooperative members trained on manufacturing livestock-related material as a source of income diversification	0	80	Quarterly progress reports	Quarterly	M&E Unit	
2.2.1 - Livestock farmers (30% F) equipped with skills for livestock feed conservation for dry season and implement other adaptation measures autonomously	Number of livestock farmers equipped with skills of feed conservation for dry season	0	180	Quarterly progress reports	Quarterly	M&E Unit	

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Expected results	**Indicators (indicative)**	**Baseline**	**Targets**	**Data sources and collection methods**	**Frequency**	**Responsibility**	**Assumptions**
2.2.2 – Strengthened adaptive capacity for sustainable land use management	Number of village committee members with capacity developed for sustainable land use management	0	180	Quarterly progress reports	Quarterly	M&E Unit	
2.2.3 – Technical and business capacity developed for construction of biogas plants for livestock farmers	Number of farmers trained on the technical and business capacity for construction of biogas plants	0	180	Quarterly progress reports	Quarterly	M&E Unit	
3.1 – Compile Knowledge adaptation products	Number of knowledge adaptation products compiled (e.g. videos, fact sheets, projects reports, training materials, books, ...)	0	5	Quarterly progress reports	Quarterly	M&E Unit	Efficient and capable PCU staff recruited
3.2 - Participate in adaptation practitioners events	Number of adaptation practitioners events attended	0	30	Quarterly progress reports	Quarterly	PIU	Transparent criteria developed and applied
3.3 – Produce Monitoring and Evaluation reports	No. of AWPB, Progress and Financial Reports submitted timely by PIU	0	29	Quarterly progress reports	Quarterly	M&E Unit	Procurement undertaken in a transparent and competent way
TASKS / ACTIVITIES							
1.1.1.1 Recruit fund manager	Fund manager identified	0	1	Quarterly progress reports	Quarterly	M&E Unit	There are enough budgetary allocations and human resources to implement project activities
1.1.1.2 Identify target villages & beneficiary households per project area (district)	Number of project target villages identified	0	-	Quarterly progress reports	Quarterly	M&E Unit	
1.1.1.3 Procure & distribute livestock	Operational co-financing mechanism in place	-	-	Quarterly progress reports	Quarterly	M&E Unit	
1.1.2.1 Establish land use plans at village level using participatory GIS	Number of reports of community meetings to establish and implement village land use plans	0	16	Quarterly progress reports	Quarterly	M&E Unit	
1.1.2.2 Planting of fodder & fruit trees (e.g. guava, mulberry) around homesteads, planting of fodder trees along the riverines				Quarterly progress reports	Quarterly	M&E Unit	
1.1.2.3 Construction of fire breaks around rangelands				Quarterly progress reports	Quarterly	M&E Unit	
1.1.2.4 Lining of shallow water wells where necessary **1.1.2.5** Construct weirs, and small dams/reservoirs as livestock watering points **1.1.2.6** Construct communal boreholes and wells for watering livestock	Number of reports of community meetings to improve and establish livestock water sources	0	16	Quarterly progress reports	Quarterly	M&E Unit	
1.1.2.7 Promote appropriate / sustainable water harvesting at household level (e.g. roof catchment water harvesting and storing in tanks)	Number of households hosting demo technologies for water harvesting	0	365	Quarterly progress reports	Quarterly	M&E Unit	

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Expected results	**Indicators (indicative)**	**Baseline**	**Targets**	**Data sources and collection methods**	**Frequency**	**Responsibility**	**Assumptions**
1.1.4.1 Identify institutions to provide index-based insurance	**I**nstitutions to provide index-based insurance identified	0	2	Quarterly progress reports	Quarterly	M&E Unit	
1.1.5.1 Establish automatic weather stations in the project area. Have a minimum threshold number of stations by Meteorological Dept.	Number of automatic weather stations established	0	9	Quarterly progress reports	Quarterly	M&E Unit	
1.2.1.2 Carry out rangeland improvement interventions/strategies (eg. Planting of drought tolerant annual and perennial species)	Number of reports of community meetings on rangeland interventions (e.g. planting drought tolerant annual and perennial species)	0	16	Quarterly progress reports	Quarterly	M&E Unit	
1.3.1.1 Review and modify LISP infrastructure designs	LISP infrastructure designs reviewed and modified for climate resilience	-	-	Quarterly progress reports	Quarterly	M&E Unit	
1.3.2.1 Review and realign the locations of LISP infrastructure	**Number of** LISP infrastructure correctly sited / located	-	-	Quarterly progress reports	Quarterly	M&E Unit	
1.3.2.2 Establishment and construction of climate resilient interventions around infrastructure (e.g. Contour ridging and vertiva grass promotion)	Number of LISP infrastructure sites with climate resilient interventions around infrastructure (e.g. Contour ridging and vertiva grass promotion)	0	217	Quarterly progress reports	Quarterly	M&E Unit	
1.4.1.1 Review and modify LISP infrastructure designs to reduce GHG emissions	LISP infrastructure designs reviewed and modified to reduce GHG emissions	-	-	Quarterly progress reports	Quarterly	M&E Unit	
1.4.2.1 Construct demo bio-digesters at slaughter houses and holding centers	**Number of** demo bio-digesters at slaughter houses and holding centers	0	180	Quarterly progress reports	Quarterly	M&E Unit	
2.1.2.7 Link livestock farmers with index-based livestock insurance providers	**Number of** livestock farmers linked with index-based livestock insurance providers	0	10 750	Quarterly progress reports	Quarterly	M&E Unit	
1.1.4.2 Create awareness among livestock keepers on the importance of insuring livestock	Number of awareness campaigns conducted	0	99	Quarterly progress reports	Quarterly	M&E Unit	
1.1.5.2 Create awareness to register for weather reports through cell phones **2.1.2.4** Conduct climate change awareness campaigns (community meetings, radio, TV) **2.1.2.6** Create awareness among livestock farmers of existence of index-based livestock insurance providers **2.1.3.8** Create awareness among livestock farmers of existence of early warning systems and how to access it	Number of beneficiaries reached during awareness campaigns	0	139 750	Quarterly progress reports	Quarterly	M&E Unit	

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Expected results	**Indicators (indicative)**	**Baseline**	**Targets**	**Data sources and collection methods**	**Frequency**	**Responsibility**	**Assumptions**
2.2.1.1 Sensitization of livestock farmers on how to work as cooperatives to adapt and mitigate for climate change **2.2.3.2** Community campaigns to sensitize livestock farmers in sustainable land use management **2.2.4.2** Create awareness on how to utilize bio-gas safely							
1.1.1.5 Training of extension officers on GIS to evaluate / assess carrying capacities	Number of staff training workshops conducted	0	8	Quarterly progress reports	Quarterly	M&E Unit	
1.1.3.3 Train extension personnel and farmers on breed management **2.1.1.2** Training of government technical staff on climate risk assessment and adaptation skills for livestock farmers	Number of staff training reports	0	8	Quarterly progress reports	Quarterly	M&E Unit	
1.1.3.3 Train extension personnel and farmers on breed management	Number of beneficiary training workshops conducted	0	47	Quarterly progress reports	Quarterly	M&E Unit	
2.1.2.2 Training of artisans in manufacturing livestock-related materials as a source of income diversification **2.2.1.2** Training farmers on the importance of diversified production, use of manure, conservation farming **2.2.2.2** Farmer training on feed and fodder production and conservation **2.2.3.3** Training farmers on sustainable land use management **2.2.4.1** Training farmers on the construction and maintenance of bio-gas digesters	Number of beneficiary training reports	0	47	Quarterly progress reports	Quarterly	M&E Unit	
1.1.3.4 Exchange visits for livestock farmers (in farmer groups)	Number of beneficiary exchange visits conducted	0	20	Quarterly progress reports	Quarterly	M&E Unit	
2.1.2.5 Exchange visits to affected communities	Number of beneficiaries participating in exchange visits	0	400	Quarterly progress reports	Quarterly	M&E Unit	
1.1.3.2 Develop breed management manual for farmers and extension workers in local language **2.1.1.1** Prepare training materials for government technical staff on climate risk	Number of training modules prepared	0	6	Quarterly progress reports	Quarterly	M&E Unit	

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Expected results	**Indicators (indicative)**	**Baseline**	**Targets**	**Data sources and collection methods**	**Frequency**	**Responsibility**	**Assumptions**
assessment and adaptation skills for livestock farmers **2.1.2.1** Prepare training materials for artisans in manufacturing livestock-related materials as a source of income diversification **2.2.2.1** Prepare training materials for feed and fodder production and conservation **2.1.2.3** Development of evidence-based sensitization materials on climate risks **2.2.3.1** Prepare training materials for sustainable agriculture land use management							
1.1.1.4 Conduct livestock breed characterization study in the project provinces **1.1.3.1** Survey of best practices to manage indigenous breeds **1.1.4.3** Assess models for climate/weather index-based livestock insurance and adapt for Zambia **1.2.1.1** Characterization of the rangelands	Number of studies conducted (apart from baseline, mid-term, and beneficiary impact assessment studies)	0	5	Quarterly progress reports	Quarterly	M&E Unit	
2.1.1.3 Facilitate workshop(s) for experts and experts on index-based insurance provision	Number of technical meetings conducted	0	6	Quarterly progress reports	Quarterly	M&E Unit	
2.1.1.4 Facilitate workshop(s) for experts and stakeholders in early warning systems	Number of participants attending technical meetings	0	120	Quarterly progress reports	Quarterly	M&E Unit	

§ As and when required

* Not available. To be determine from Baseline survey

ANNEX B: RESPONSES TO PROJECT REVIEWS (from GEF Secretariat and GEF Agencies, and Responses to Comments from Council at work program inclusion and the Convention Secretariat and STAP at PIF).

Responses to GEF/STAP Scientific and Technical screening of the Project Identification Form (PIF)

The STAP recommended two types of Revisions – Minor and Major listed below. These have been addressed in the current CEO Endorsement Form. Pertinent additions have added to fill the gaps identified by the STAP on the PIF

Minor revision required

STAP has identified specific scientific or technical challenges, omissions or opportunities that should be addressed by the project proponents during project development.
Follow up: One or more options are open to STAP and the GEF Agency:
(i) GEF Agency should discuss the issues with STAP to clarify them and possible solutions.
(ii) In its request for CEO endorsement, the GEF Agency will report on actions taken in response to STAP's recommended actions.

Response:

The project preparation team had access to the "updated/revised" PIF made available at the GEF website on link https://www.thegef.org/gef/project_detail?projID=5394. The revised PIF had taken into consideration some of the omissions identified by the STAP and the project preparation Team extensively used the content and comments in preparing the CEO Endorsement Form. Specifically the project preparation Team has addressed the scientific challenges by consulting relevant literature some which were directly related to Zambia. Among those related to farming systems, livestock systems, conservation agriculture, livelihoods and policy were:

- K. Agyemang, J. Mulila-Mitti, G. Han, I. Kadzere, C. Chomba, C. Makunka and H. Munguzwe: Conservation Agriculture and Livestock Farming interactions in Zambia: An assessment of conflicts and synergies
- Mubaya, C. P. *et a*l (2012) Climate variability and change or multiple stressors? Farmers perceptions regarding threats to livelihoods in Zimbabwe and Zambia". *Journal of Environmental Management* 102, pages 9 17. 2012.
- Agyemang, K. (2011). Good Agricultural Practices from Conservation Agriculture and Livestock Farming in Southern Africa: Observations from field studies in Zimbabwe, Zambia and Swaziland. SFS Livestock Programme Working Document No. 4, Harare, Zimbabwe, 30 pp.",
- Dejene, A., Midgley, S., Marake, M. and Ramasamy, S**.** (2011). Strengthening Capacity for Climate Change Adaptation in Agriculture: Experience and Lessons from Lesotho. Environment and Natural Resources Management Series # 18, FAO, Rome, Italy, 66 pp"

- Agyemang, K. and Han, G**.** (2010a). Conflicts and Synergies attendant to Conservation and Livestock Farming.---- A Policy Brief. FAO Sub-Regional Office for Southern Africa, Harare, Zimbabwe, 13 pp
- Agyemang, K. (2011). Looking for "the smell of Livestock" in the SADC First Draft of the Regional Agricultural Policy (RAP): A Contribution to the Livestock Component of the SADC RAP. FAO SFS Working Paper # 5, Harare, Zimbabwe. September 2011.
- Agyemang, K. (2011) Mitigating the impacts of climate change on farming systems, and adaptation to climate variability by smallholder farmers, through livestock-based technologies and mixed crop-livestock integrated farming practices in the Southern Africa region.—A Concept Note/Project Proposal. FAO-SFS Working Document, Harare, Zimbabwe, November, 2011.

Key Information from these technical and policy Papers have been incorporated in various Sections of the CEO Endorsement Form: Specifically:

A 5: Sub-section: Additional detail on Project Activities for Components 1, 2, and 3:- where the possibilities of Climate Change impacts adaptation activities in the study areas may end up contributing to environmental improvement and climate change mitigation and that such possibilities are looked upon favourably by stakeholders. Therefore capacity building in adaptation can legitimately include aspects of mitigation actions.

2.2.1 Strengthened adaptive capacities of beneficiaries with regard to organization, production, processing and marketing of their products: where issues on the following are addressed and clarified

- Livestock/ Mixed Crop-Livestock Systems,
- Conservation Agriculture/Farming
- Issues on conflicts and synergies between conservation-based farming and livestock farming in Zambia
- Good agricultural practices (GAPs) on Conservation Agriculture and its interphase with semi-intensive and extensive livestock farming

A set of key conclusions from one of the Papers (Agyemang *et al.,* 2010 on Group and Household interviews in Southern and Central Zambia but also other study sites in Zimbabwe and Swaziland) that gave impetus to include Activities on Conservation Agriculture and Mixed crop-livestock farming in the CRLMP and to promote synergies and reducing conflicts state: *" Key findings from the Group level of surveys include, 1) the generally unanimity of the Groups' views observed in all three countries, 2) the fact CA is seen in a very good light among a vast majority of the Groups interviewed, as several benefits (increased in crop yields, environmental sustainability, food security, income generation, etc) were attributed to CA, 3) very strong views from most of the Groups that Livestock Farming and Conservation Agriculture are complementary activities, 4) the somewhat emphatic recommendations that Animal Traction should be made part of CA, 5) the broad agreement among the Groups that there are really no major conflicts among CA and CF, and 6) the overwhelming expression from the Groups about the synergies that are currently occurring between CA and CF and*

opportunities that exist for further exploitation. Although some level of conflicts were raised by individuals from various households, when the overall consensus views of the larger pool of households were taken into consideration it emerged that CA as practiced in Zambia is not disturbed on a broad scale by the presence of livestock and production methods. The policy implications of these findings were analyzed and policy recommendations provided".

1.1 Livestock farmers strengthened to effectively cope with climate change and to improve livelihoods through enhanced resilience of natural resources:- where issues on how might introduced livestock breeds from outside of project areas to the project region might perform under climate change and vulnerabilities were addressed by proposing an *ex-ante* impact assessment be undertaking by comparing differences in the level of environmental stressors, management regimes at the two differing locations.

Major revision required

STAP recommends significant improvements to project design.
Follow-up:
(i) The Agency should request that the project undergo a STAP review prior to CEO endorsement, at a point in time when the particular scientific or technical issue is sufficiently developed to be reviewed, or as agreed between the Agency and STAP.
(ii) In its request for CEO endorsement, the Agency will report on actions taken in response to STAP concerns.

Responses

The Project preparation Team improved on the project design at technical, implementation/coordination, timing/duration of Project and monitoring/evaluation levels

Technical:

Efforts were made to put Project and the Baseline Project in the context of farming/livestock systems by documenting the farming practices and off-farm livelihood options of the beneficiaries through community discussions and proposing activities that offer solutions to the problems and challenges communicated to the Team during field visits, augmented by views expressed during the Inception and Validation Workshops.

Activities were developed that would reduce the negative impacts that might affect the environment directly and climate change indirectly, as well as actions and designs that will reduce the impact of climate change and variability on the facilities/infrastructure provided by the Baseline Project (LISP)

Implementation/Coordination:

The Project preparation Team recognized the fact that the CRLMP is meant to support the Baseline project and therefore proposed cost-effective designs that rejected some of the earlier thinking such as independent management structure for CRLMP. For example CRLMP will be implemented under the existing LISP Project Implementation Unit (PIU). This means the project will be implemented using the existing LISP Steering & Technical Committees and MAL structures. A Climate Change Adaptation Specialist (a national expert) recruited under CRLMP funding will be an additional member to the PIU. It was the view of the Project preparation team, and endorsed by a section of stakeholders that: i) establishing a separate PIU for the CRLMP will be costly in terms of salaries for experts and support staff; establishing a separate project steering committee, and a separate technical committee; establishing separate office space; and procurement of a completely new set of project resources like vehicles, furniture, computers, and the like, ii) having the two projects run by different management may stifle implementation of both projects especially at community level as this may result in community fatigue as the projects will be talking to similar if not the same issues.

Timing/Duration of Project:

The Project preparation Team understood the urgency for the CRLMP implementation to overlap with the LISP activities which had started earlier (8-12 months) by proposing CRLMP activities that can be undertaken alongside on-going activities, and by allocating resources to incremental activities that might be able to rectify some of the LISP designs where they are considered to be obvious non-friendly with respect to the environment. For example, newer technologies on feeder road construction that reduce the formation of "pot-holes" by stagnant water on road surfaces were recommended to be undertaken on on-going construction rather than to be rectified after completion.

Monitoring & Evaluation:

The Project preparation Team proposed a " state of the art" M & E framework for the CRLMP which is expected to improve the procedures adopted under the Baseline project (LISP). Among the key features are:

- For the CRLMP, a results-based monitoring and evaluation (M&E) will be implemented.
- Most of the M&E will be done through the MAL system and the experts in the AfDB's country office
- M&E will be done to improve the programme implementation and impact. M&E will entail monitoring the project activities, outputs, outcomes, and the performance of implementing agencies against the specified targets
- Monitoring will focus on the two lower levels of the results framework i.e. output and activity levels under each component which are the basis of the work plans and budgeting.
- Evaluation: CRLMP evaluation will involve examining the changes brought about by programme interventions and their significance in relation to achieving the programme objective.
- The CRLMP evaluation will mainly focus on the impact and outcome level indicators of the project results based framework. The project evaluation will require carrying out a baseline survey in Year 1 to establish the initial project situation, mid-term evaluation in Year 3, and an end of project evaluation in Year 5

Responses to Comments from GEF Agencies—The African Development Bank (AfDB)

The AfDB raised several comments, several of them related to the issues raised earlier by the GEF/STAP during its review of the PIF. The AfDB drew the attention to an updated PIF which had been prepared in response to some of the issues raised by the STAP, two documents (an updated PIF and STAP comments) which were not initially avilable to the Team.

The current CEO Endorsement Form has benefitted from useful comments raised by AfDB. Selected key Comments and Responses are presented below:

Several Comments on TABLE B: PROJECT FRAMEWORK

- This objective is different from the one in the PIF. Need continuity.
- This component was for 4,665,000. Please correct. GEF guidelines doesn't allow big change or we need to provide strong justification
- Many of the outputs in table B are worded more as outcomes. It would be better to quantify outputs where needed, e.g. number of ha of degraded pastures rehabilitated
- Interesting but this is mitigation not adaptation. Why was such an activity added to an LDCF project?
- In the PIF, there was an outcome on livelihood diversification but it seems this has been removed. Why? Livelihood diversification is fully in line with CCA1 of the focal area strategy as an adaptation mechanism
- Why the PMC amount changed from PIF, please justify and correct

The Comments listed above, in the view of the Project preparation Team, arose principally from initial inaccessibility of the Updated PIF to the project preparation Team and the reliance on an earlier version of PIF that had benefitted from earlier comments from the STAP.

With the availability of the Updated PIF to the Team most of the above Comments have been rectified, in most cases addressing the issues raised in the STAP Review directly

Several Comments on SECTION A 5: Incremental /Additional cost reasoning

The Quoted statements below as Comments from AfDB under SECTION A5

"*It is unclear what PIF was consulted to prepare this CEO endorsement but the version available on the GEF website seems to be different. Table B has different outcomes and outputs from the ones described here. See PIF on GEF website: https://www.thegef.org/gef/project_detail?projID=5394*

For e.g. In the above link PIF, one outcome for component 2 is 2.2 Diversification and strengthened livelihoods and source of incomes for rural population (artisan and stock breeders). This outcome on livelihood diversification does not appear in this new document".

"In the original PIF (as found on the GEF website) there were actually two outcomes for component 1. See PIF here https://www.thegef.org/gef/project_detail?projID=5394. This will be the one used for the review of the CEO endorsement document"

This again reinforces the response by the Team on the initial unavailability of the Updated PIF to it (Team). Some of these have been subsequently rectified. Responses to Specific Comments have been provided as below:

COMMENT: The document would benefit from additional information on specific climate change impacts on the livestock sector in particular and in the target districts. This was a STAP comment as well. STAP review stated that the document needs to be further developed by: "describing more explicitly the risks posed by climate change to the livestock sector, the barriers hampering adaptation responses, and how the proposed components intend to address these barriers.".

It would be good to add more on the climate change impacts specific to the target districts. Also, how are households affected? Food security?

RESPONSE: A Table on Impacts of projected climate change on livestock production, direct impacts and indirect impacts has been provided under Section A.6 Risks, including climate change, potential social and environmental risks that might prevent the project objectives from being achieved, and measures that address these risks:

In addition a broader Table - Climate Change Impacts, Vulnerability and Coping Measures in the Project Area on general agriculture and livelihoods has also been added in Section A. 6 where impediments to adaptation are also considered as vulnerability.

COMMENT: Actually, it seems that some major changes in outputs were made, for example, by the inclusion of activities on biogas, reduced GHG emissions, insurance scheme, pass-on scheme, early warning, etc. A number of these are not aligned with the LDCF focal area but are more CC mitigation. There needs to be a better explanation of why these were included in an adaption project

RESPONSE: The Team has established in Section A 5 the need to recognize the "thin" line between Adaptation activities and those that can be classified as mitigation particularly under mixed crop-livestock systems. We understand that some adaptation activities such as planting leguminous plants/crops to enrich crop residue quality for livestock may end up contributing to mitigation. It would be strategic to include mitigation in capacity building and awareness creation on climate change adaptation. Adaptation practices such as changing crop-mixes to include tolerant crop varieties and rich nitrogen-crops in the face of approaching or on-going drought will benefit from a functional early warning system that provide relevant but simple information for farmers. On the issue of "pass-on" scheme, an activity under the Baseline (LISP) could benefit from CRLMP by ensuring that adapted livestock species and breeds are used. Adapted breeds are better able to use rougher feed resulting from drought than exotic breeds if considered for the LISP "pass on". Pass-on and restocking schemes that benefit poor people who have lost their livestock due to climate variabilities provide them opportunity to adapt to current and future climate change and variability. The livestock insurance scheme also works to enable livestock farmers who lose their stock assets to replace them so as to better adapt to future climate variabilities. In sum whereas direct mitigation activities will not be promoted under CRLMP activities that enable farmers and families to adapt under LISP activities will be supported through limited incremental support.

A. 5. Component 1

COMMENT : STAP recommended conservation agriculture as a good option for activities. As STAP noted: "it is not clear from the proposal whether farmers manage mixed crop-livestock systems and if so to what extent conservation agriculture is applied given its potential to improve soil health and long-term crop productivity while serving the demands for livestock feed. STAP believes conservation agriculture can serve these joint purposes if the conditions are appropriate."

As STAP recommends, conservation agriculture for better water, land, crop, livestock use, could be beneficial
Good, but again, some on-the-ground activities on conservation farming are needed, not only training.

RESPONSE: Conservation Agriculture and its interphase with Livestock Farming have been extensively dealt under Comments from GEF/STAP. Good Agricultural practices under both domains will be promoted and demonstrated under CRLMP . Collaboration will be sought with National and International Institutions working on Conservation Agriculture in technology transfer in the domain of Conservation Agriculture.

COMMENT: Considering climate change evolves over time, and means changing conditions in one location different from what has normally occurred in the past, will indigenous breeds be able to cope with changing climate patterns? For

example, if the frequency and severity of droughts increase, will indigenous breeds be able to cope in this new context rather than the conditions they are normally able to resist? This too needs analysis

COMMENT: *Need to do an impact assessment for the new breeds, just to make sure there would be no unintended consequences of introducing new breeds in a given area*

RESPONSE: Both phenotypic and genetic characterization of major livestock in the project areas and outlining areas where livestock will be imported from have been identified as a project activity. An *ex-ante* impact assessment of major livestock species/breeds earmarked for transfer into the projects areas has been identified as a project activity.

ANNEX C: STATUS OF IMPLEMENTATION OF PROJECT PREPARATION ACTIVITIES AND THE USE OF FUNDS[5]

A. PROVIDE DETAILED FUNDING AMOUNT OF THE PPG ACTIVITIES FINANCING STATUS IN THE TABLE BELOW:

PPG Grant Approved at PIF:			
Project Preparation Activities Implemented	***GEF/LDCF/SCCF/NPIF Amount ($)***		
	Budgeted Amount	***Amount Spent To date***	***Amount Committed***
Consulting team mobilization	26 696	26 696	
Inception / Stakeholder Workshop and Beneficiary Consultation Meetings	37 718	37 718	
Production of CRLMP CEO Endorsement Document	95 586	35 845	59 741
Agency Fees	17 355	17 355	
Contingency	22 695		22 695
Total	200 050	117 614	82 436

[5] If at CEO Endorsement, the PPG activities have not been completed and there is a balance of unspent fund, Agencies can continue undertake the activities up to one year of project start. No later than one year from start of project implementation, Agencies should report this table to the GEF Secretariat on the completion of PPG activities and the amount spent for the activities.

ANNEX D: CALENDAR OF EXPECTED REFLOWS (if non-grant instrument is used**)**

Provide a calendar of expected reflows to the GEF/LDCF/SCCF/NPIF Trust Fund or to your Agency (and/or revolving fund that will be set up)