ADAPTATION TO THE EFFECTS OF CLIMATE VARIABILITY AND CHANGE IN AGRO-ECOLOGICAL REGIONS I AND II IN ZAMBIA (CCAP)

Terminal Evaluation Report

09 December 2015

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Project Information Summary Table

Category	Information
Name of the UNDP/GEF project	Adaptation to the effects of climate variability and change in Agro-ecological Regions I and II in Zambia (CCAP)
UNDP and GEF project ID#s	Project ID: 3942 Award/Project Ids: 00058205/ 00072197 (ZMB 10)
Evaluation time frame and date of evaluation report	July-October 2015
Region and countries included in the project	Zambia
GEF Operational Program/Strategic Program	Climate Change, LDCF
Implementing partner	Ministry of Agriculture and Livestock
Evaluation team members	Dr. Eduardo R. Quiroga

Acknowledgements

The Mission wishes to express its gratefulness to the representatives of the Government of Zambia at the national, sub national and local levels for the courtesies extended while executing its mandate. Wherever the Mission went, it was met with utmost hospitality and generosity by beneficiaries, stakeholders and government officials.

The Mission acknowledges its appreciation for the effective support provided by Ms. Janet Rogan, United Nations Development Programme's Resident Representative; Mr Martim Faria e Maya, the Country Director; Ms. Winnie Musonda, Assistant Resident Representative; Mr. Eric Chipeta, Programme Analyst; Mr. Biston Mbewe, Climate Change Adaptation Project Officer; Mr. Owen Ngoma, Climate Change Adaptation Project Administrative Associate. Everyone made available every possible resource to the Mission, including deploying the Mission's field work in a difficult terrain, with the skilful support of Mr Kafula Ng'andu

Gratitude is extended to the managers and staff of the implementing agency the Ministry of Agriculture and Livestock, particularly Mr. Rasford Kalamatila, the Chief Engineer; Mr. Stanislous Chisakuta, Deputy Director; and Mr. Evaristo Nyanoka, National Project Coordinator for the Climate Change Adaptation Project who accompanied the Mission during their fieldwork.

Likewise, gratitude is extended to Mr. John Lungu, Mr. Kaonga Tundu and Dr. Kunda Ndashe who were key members of the implementing teams for the pilot sites of Chongwe, Kazungula and Siavonga, and provided support with the selection of the enumerators in each site to conducting the survey. The Mission is indebted to the management, staff and enumerators of the three sites for their generous support in spending the time needed to collect the information. The Mission has been moved by the openness with which beneficiaries interviewed during field work have shared their enthusiasm and motivation to help achieve the expected outcomes.

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Acronyms and Abbreviations

ADC	Area Development Committee
AER	Agro-Ecological Region
AMAT	Adaptation Monitoring and Assessment Tool
APR	Annual Project Report
ASIP	Agriculture Sector Investment Programme
AWP	Annual Work Plan
AWS	Automatic Weather Station
CA	Conservation Agriculture
CASPP	Conservation Agriculture Scaling up for Increased Productivity and Production
CBD	Convention on Biological Diversity
CC	Climate Change

CCA	Climate Change Adaptation
CCAP	Climate Change Adaptation Project
CCFU	Climate Change Facilitation Unit
CRM	Climate Risk Management
DACO	District Agricultural Coordinator
DDCC	District Development Coordinating Committee
DSSAT	Decision Support System for Agro-Technology Transfer
EEG	Environment and Energy Group
EIA	Environmental Impact Assessment
EWS	Early Warning System
GEF	Global Environmental Facility
GRZ	Government of the Republic of Zambia
HACT	Harmonized Approach to Cash Transfer
HQ	Headquarters
IDRC	International Development and Research Centre
IECN	Integrated Environmental Consultants Namibia
LDC	Least Developed Countries
LDCF	Least Developed Countries Fund
LFA	Logical Framework Analysis
Logframe	Logical Framework Analysis
M&E	Monitoring and Evaluation
MAL	Ministry of Agriculture and Livestock
MDG	Millennium Development Goal
MLNREP	Ministry of Lands, Natural Resources and Environmental Protection
MT	Metric tons
MTR	Midterm Review
MSC	Most Significant Change
NAIS	National Agricultural Information Services
NAP	National Agricultural Policy
NAPA	National Adaptation Programme of Action
NAPSSFZ	National Association for Peasant and Small Scale Farmers of Zambia
NDMP	National Disaster Management Policy
NGO	Non-governmental organisation
NPE	National Policy on Environment
NPP	National Nutrition Planning
PACO	Provincial Agricultural Coordinator
PIF	Project Identification Form
PIR	Project Implementation Report
PPD	Policy and Planning Department
PPG	Project Preparation Grant
Prodoc	Project Document
PS	Permanent Secretary
TOR	Terms of References
UNDP	United Nations Development Programme
UNDG	United Nations Development Group
UNEG	United Nations Evaluation Group
UNFCCC	United Nations Framework Convention on Climate Change
VAC	Vulnerability Assessment Committee
ZMD	Zambia Meteorological Department

EXECUTIVE SUMMARY

Project Description

Most communities in Zambia are vulnerable to the adverse effects of climate change, ranging from floods and droughts to dry spells. By and large, Zambia's farmers lack the capacity, resources and financial assistance needed to adapt to and overcome worsening climatic conditions. The repercussions of this situation are crop failure, food and water insecurity and unsustainable livelihoods. The ability of the agricultural sector to cope with potential global warming and reduction in rainfall is negligible. Under these circumstances, in the ecosystems of Agro-ecological Region [AER] I and II, the Project took a two pronged-approach in order to reduce the vulnerability of communities to climate change impacts:

- 1-mainstream adaptation into agricultural planning at the national, district and community levels to make the case for increased investments in adaptation in the agricultural sector; and
- 2-test and evaluate the adaptation value of interventions that protect and improve agricultural incomes from the effects of climate change.

The Project's goal was to improve food security in Agro ecological Region I and II through enhanced adaptive capacity, in order to respond to the risks posed by the effects of climate variability and global warming . Specifically, the objective was to develop the adaptive capacity of small scale farmers and rural communities to withstand climate change.

Evaluation Rating Table

The rating the performance of a project over time is unavoidably subjective, but it is carried according to GEF guidance and ethics, together with the experience of the evaluator. This Project had two distinct characteristics which required special consideration based on the evaluator's experience.

- First, it was an agricultural project dealing with a technology transfer to subsistence farmers that enabled them to cope with the vagaries of climate variability and global warming. The historical evidence of the transfer from subsistence agriculture towards a science-based farming system suggests that it takes approximately one generation [about 30 years].[1] Explanations for this long maturity rate are manifold and are discussed in Annex 9.[2]
- Second, the Project was under implementation for merely three years due to delays to start implementation though it was a four year project. For an agricultural project, this is an exceedingly short period of time to yield results. Most agricultural projects begin yielding early results only after the fourth or fifth agricultural season as it takes approximately two or three seasons to fully mobilize and become operational.

Therefore, taking GEF standard rates into consideration, [3] a score of Highly Satisfactory is not common (around 4%) since it can only be applied in situations which are exceptional and where no improvement is possible. At the other end of the scale, a score of Highly Unsatisfactory (HU) is also not common (1%). The greater part of projects and project elements are rated in the Satisfactory (S) to Moderately Satisfactory (MU) quartile (76%). Since the Project only operated for three years, we had to approximate whether the trend was either improving, stationary or declining. If the trend was improving

[1] Cf. Waterston, A. Development Planning: Lessons of Experience. Baltimore: The Johns Hopkins Press. 1965. Schultz, T.W. Transforming Traditional Agriculture. New Haven: Yale University Press. 1964. Schultz, T.W. Institutions and the Rising Economic Value of Man. Amer. Jour. Agric. Econ. 50: 1113-1122. 1968. Hirschman, A.O. Development projects observed. Washington, DC: The Brookings Institute. 1967

[2] Fundamentally, agricultural projects are highly complex interventions. This is because it is critical to synchronize the social system [economy and society] with the biological cycle of crops [trees or animals, including fish] with the hydrological and climate conditions (especially precipitation and temperatures), using production techniques. The process of mitigation/adaptation to climate change has compounded this complexity. This fact was clearly acknowledged by the implementation managers of the all pilots sites during the Workshop conducted in Siavonga. Cf Appendix 1 of Annex 7.

[3] GEF Evaluation Office, *Annual Performance Report 2008*. GEF Council Paper GEF/ME/C.35/Inf. 5, May 28, 2009

then it would be rated as Satisfactory, otherwise it would be rated as Moderately Satisfactory.[4]

Table 1: Rating Project Performance

Monitoring and Evaluation		Comments
Overall quality of M&E	□MS	There was a framework in place, and reporting from pilot site level with aggregation of data in APRs took place. Technical assistance to design an agricultural framework was essential.
M&E design at project start up	□MU	M&E framework did no measure agriculture activity and performance including output value. The baseline information was not completed.
M&E Plan Implementation	□MU	Despite the M&E plan in place, and absence the baseline information, the Terminal Report remained incomplete as well. These two benchmarks are fundamental for monitoring results.
IA & EA Execution		
Overall Quality of Project Implementation/Execution	□MS	
Implementing Agency Execution	□MS	Reportedly HACT Assessment modalities played a role in project implementation delays; moreover, project implementation did not take into consideration the necessary planning process required in an agricultural project. Last Audit Report suggests that UNDP needed to provide more guidance in the planning and execution of Project activities. UNDP CO made efforts to maintain a working relationship with the national partners, especially MAL.
Executing Agency Execution	□MS	The members met from project management team at MAL appeared motivated, especially now that the project began producing early results, albeit the project is closed. On the pilot sites visited MAL engagement was robust. Leadership and organization to enable the transfer of technology to cope with climate variability is understood but not yet operational. Subject matter specialist acknowledge working in a silo modality. Greater coordination in delivering technological packages is vital. These packages should be economically viable and environmentally sustainable. .
Outcomes		
Overall Quality of Project Outcomes	□MS	Overall, all outcomes are absolutely essential so that small-holding farmers can cope with climate variability and global warming. Three years was an inadequate timeline
Relevance	□S	Although outcome-two is the Project's cornerstone, and outcomes one, three and four are contingent, they are all very relevant.
Effectiveness	□MS	In the context of outcome-two, the survey conducted in the TE has shown that overall targets are attainable through the technological change proposed by Project which brings about growth in farm revenue. To the extent that outcome-two is realized, the other outcomes will follow suit.
Efficiency	□MS	Free-inputs and technical advise appeared as the drivers of the early results from outcome-two. Considerable efforts should go for ensure repayment schedules to enable a greater number of beneficiaries
Catalytic Role		
Production of a public good	**yes**/no	The technological information directed to enable small-holding farmers, men and women, to cope with climate variability should remain in the community for diffusion. This should be one purpose of the Farmers' Resource Centre
Demonstration	**yes**/no	There is early evidence from the survey undertaken that small-holding farmers, not targeted by the Project, have begun on their own initiative applying the technology proposed by the Project..
Replication	yes/**no**	The process of climate change adaptation learning has begun and it has been shown that overall targets are attainable. However, the Project outcomes are in process.
Scaling up	**yes**/no	The list activities for an exit process that enables a degree of sustainability is essential.

[4] Using absolute rates produced an extreme assessment which was not consistent with the reality on the ground.

		This could be accompanied by 1- consolidating the agronomic and livelihood operations undertaken during the Project; 2- enhancing the commercialization process through value-chain analysis; 3- introducing nutrition planning as an intermediary strategy, given the fact that reforms and/or improvements in the commercialization process are time consuming, and, finally; 4- re-introducing water resources development and management to address water scarcity.
Sustainability		
Overall likelihood of risks to sustainability:	□MS	Based on the preliminary results showing that targets are attainable, there is a potential for sustainability if the trend continues to grow.
Financial resources	□MS	One key step towards a financial sustainability is to reach an agreement between local traditional leaders, project authorities and beneficiaries on the repayment rate of the agricultural inputs and animals distributed during the early phase. Distribution of free goods was not an intended action in either the Prodoc or UNDP policies. The use of resources to stimulate new actions with repayment modalities, so that the resources distributed in the communities are passed on within a sustainable framework, is a key policy principle.
Socio-economic	□S	All farmers interviewed in the Project areas, especially women, testified to consistent motivation and interest in the technologies proposed that benefitted their families and helped them cope with their subsistence needs. The interviewed farmers , in different degrees and within their own cultural milieu and gender, exhibited continuous experimenting and informed decision-making about the new crops and techniques proposed. They are all becoming avid learners and are predisposed to continue with the learning curve.
Institutional framework and governance	□MS	There is promising potential for the organized collective action in response to the leadership of the management organizations currently operating in each pilot site. The MSC data has shown preliminary evidence of managers, male and female, already in the process of organizing the community for the reception and delivery of the Project's outputs. When this potential for organized social action comes to fruition, ongoing efforts to manage natural disasters will be greatly strengthened as well as land tenure systems and associated water rights. If and when, irrigation works and other investments on land and water management are outlaid. Also the consolidation of outcome-two will reverberate in enhancing the institutional framework and governance in climate change adaptation.
Environmental	□MS	As there were no baseline measurements and ensuing monitoring of the ecological systems under review, it is not possible to gauge either contributing or enabling progress to reduce environmental stress. However, there is an incipient trend towards agricultural intensification led by the Project. As mentioned, the Project has distributed packages of fertilizers and herbicides. Although the effect on the environment appears either minor or negligible, it would be environmentally diligent and responsible to promote IPM and other environmentally sustainable techniques for agricultural intensification. The prevailing small units of production can facilitate this process.
Overall Project Results	**□MS**	

Summary of Conclusions, Recommendations and Lessons

Conclusions

All evidence points in the direction of an embryonic trend of technology transfer from subsistence agriculture towards a farming system based on resilient productivity. This trend has created an early positive impact on the food security conditions among the Project beneficiaries interviewed, especially among women farmers. In addition, there is inconclusive evidence to support an early impact due to the demonstration-effect. The data reveals that non-

targeted segments of the rural communities have already begun adapting climate proofed technologies promoted by the Project to their specific conditions, on their own initiative.[5]

The farmers interviewed from the three pilot sites, both male and female, have adopted three agronomic techniques: 1- crop diversification, 2- crop rotation and 3- conservation agriculture. The cropping patterns remain traditional, even though new proposed varieties [high-yielding& drought-resistant] have been partially adopted. The key drivers in this process are free extension advice and inputs, together with accessibility to markets where produce can be sold, as evinced by the data. [6]

Relative changes in crop yields and cropping patters from the current conditions and those without the Project are minor as shown in Graph 7.3 of Annex 7. The cropping patterns of 2010 and 2015 are practically similar. Maize continues to predominate not only because it is the staple crop used nationally for daily consumption but also because some new high-yielding varieties have been taken up by some farmers, as sporadically reported in the Mission's survey. Although there are no yearly cropland estimates available, it is not clear if the significant increase [62%] in cropland from 2010 to 2015 is due to a greater use of drought-resistant varieties. In the 2015 cropping pattern, as result of Project activities there is an increase in the use of a drought-resistant crop, i.e. sorghum and cowpeas .

Concerning farm revenue, the Project targeted a 10% increase in farm income across the outputs associated with outcome-two. Based on the Mission's estimates [proxy information elaborated in section 3 of Annex 7], in 2015 the expected, targeted farm income should be K 2310.[7] The crop returns per ha are probably the best proxy for farm revenue, since both nationally and in the project areas small landholders operate farms of about 1 ha.[8] Using the target income of K 2310, several farmers have already reached this target [Table 7.10 of Annex 7]. The "winning" crops are rice [K12300/ha] and cowpeas [average K4610/ha] in Kazungula; sorghum [K3384/ha] in Siavonga; and high-yielding maize [K3530/ha] in Chongwe. If a honey bee producer reaches a production of 60 liters/year, he/she can also reach the targeted income of K2400 [cf Table 7.6 of Annex7].

There is no data, however, to determine what percentage of the total number of the Project's beneficiaries have adopted the technologies proposed by the Project.[9] It is evident that drought resistant crops [supported by the agronomic techniques introduced] are the winning crops as they command a high market- price and are not water-demanding or labor intensive.

In sum, all evidence indicates that the farmers, especially female farmers, adopted the technology transfer in the form of skill development, facilitated by the fact that soil improvement, land levelling, and other skills do not require either assets or liquidity. Past agricultural experience shows that this is the most effective method of poverty alleviation in rural areas. This was the Project's silver lining.

Farmers interviewed exhibited, in different degrees and within their own cultural milieu, continuous experimenting and informed decision making about the new crops and techniques proposed; this was especially evident among female farmers. These farmers are all becoming avid learners and are predisposed to continue with the learning

[5] In the sample from the three sites reviewed, Group D were small holders operating outside the Project's interventions but showing initiative to replicate the Project's know-how. More details are in section 2 and 4 of Annex 7

[6] These findings are consistent with the survey of farmers in eleven different African countries on perception and adaptation to climate change. Cf. World Bank. The Perception of and Adaptation to Climate Change in Africa. Policy Research Working Paper 4308, Washington, DC, 2007. Summary

[7] The baseline was not established at the beginning of the Project. The proxy farm income without the project was estimated at USD 300 or K 2100 [see section 3.2 of Annex 7]

[8] See Table 7.2 showing mean farm areas planted by crops and farm size for 2010; also MAL/UNDP Participating household status report for CCAP. 2015, table 23.

[9] This information should be available in the Terminal Report [in process] which is the responsibility of agencies involved in implementation.

curve. By implementing this Project in less-than-ideal conditions, the UNDP and the GRZ have opened up a rich vein of information on the issues and problems related to subsistence farming and climate change adaptation.

The data shows that institutional barriers have emerged which can delay and even send the process stray. Both female and male farmers show apprehension to adopting the agronomic technologies because of the uncertain commercialization of surplus production from high-yield crops.[10] When the commercialization conditions are unproblematic, as in the Chongwe site, the technology uptake and expected economic results are unfettered. Thus, the evidence reveals that the economic results of this early uptake of know-how related to resilient productivity is heavily influenced by the commercialization conditions in a given site and time context. To this extent, the level of farm income is also shaped. Similarly, the full extent of the economic potential of the proposed technologies is now underutilized. Thus, introducing improved marketing arrangements which should allow small-holding farmers to take advantage of the market opportunities available either for staple or non-staple crops is critical. This is the lynchpin to unleashing the full economic potential of resilient productivity so that communities can effectively cope with the long term effects of climate variability and global warming.

Recommendations[11]

Rec #	Recommendation	Entity Responsible
A	**Category 1:** Carry out outstanding actions so that the Project exits implementation mode and enters into a scale up mode. To this end, within the legal and administrative procedures of the relevant GRZ ministries, three prerequisites are essential Cf. *Exit/Sustainability Strategy*	
A1	**Key recommendation** - Critical technical and legal actions include: · developing technical manuals for district staff related to the technology transfer process; · guidelines for inputting revolving funds; · registration of cooperatives, associations and business enterprises in the current operation; · developing business plans, and financial and business systems for the cooperatives, associations and business enterprises; · establishing business plans, and financial and business systems for the cooperatives, associations and communities by project staff; and · wider use of ICT applied to the pilot sites, i.e. utilization of iPads, smart phones, etc	MAL
A2	A framework for continuous institution building is needed and includes: · arranging district planning of climate change activities; · arranging district reporting and coordination meetings; · beginning the capacity building of district staff; · aligning partnerships with district stakeholders; · organizing on-going training and monitoring of farmer groups and sub-committees by district staff; · arranging management procedures for revolving funds by the sub-committee; · arranging the implementation of business plans by the boards and management of the established cooperatives, associations , business enterprises and trusts.	MAL
A3	Embedding the Project technology transfer process in the operational plans of ministries. To this end, the following Project guidelines and manuals must be published and disseminated: · entrepreneurship manual; · technical production manuals; · iPad/ video on different climate change topics; · inputting a revolving fund manual; · goat pass-on system [& other inputs] manual; · community nurseries and seed bank manual; · honey and rice marketing and market analysis; · business plans for honey, rice, and cooking oil;	MAL

[10] In a typical situation subsistence farmers have little or no assets to take risks in uncertain commercialization conditions.

[11] The data used to draft this recommendations comes from the Consultant's report on an exit/sustainability strategy. It is likely that some specific activities have being undertaken. Other recommendations are based on the Annexes attached, like the value-chain related recommendations. It is the concept of the recommendation that matters more than the letter

	· eight [8] district sustainability plans; and others as required	
B	**Category 2:** Consolidating the Agronomic and Livelihood Operations, which aims to lay the foundations to attain the outcomes throughout the process and end-results of the Project.	MAL
B1	**Key recommendation:** Conduct a stocktaking of what has been achieved in terms of: · the amount of ha incorporated by the Project in each pilot site, separated by gender; · the composition of cropping patterns with special reference to yields achieved with the Project; · the number of participants in livelihood operations proposed by the Project, including performance rates of number of animals received, sales, home consumption, etc.	MAL
B2	· reaching an agreement between local traditional leaders, project authorities and beneficiaries on the repayment rate of agricultural inputs and animals distributed during the early phase; · those individuals from each of the eight sites who agree to the repayment terms, and reveal their preference to continue with the learning curve with the Project's agronomic interventions and/or livelihoods in operation on a repayment basis [pass-on system] constitute the indicative list of potential participants for scaling up	MAL
C	**Category 3:** Value-Chain Analysis to the Service of Small Landholding Farmers The goal is to make solutions to commercialization accessible to small holding farmers. Each crop has specific production and marketplace dynamics which must be understood and managed to enhance the overall performance of markets and marketing to the service of small landholding farmers. This is more thoroughly discussed in Annex 10.	
C1	**Key recommendation:** Under the conditions pervasive in the pilot sites selected, · Identify the set of crops for value-chain analysis; · set up an integrated bundle of interventions targeting the whole value chain from final consumer to producer and all the required supporting services.	MAL & UNDP
C2	· Organize a value-chain analysis carried out by national agencies, parastatals, NGOs and donors; · to avoid duplication of activities, articulate a division of labor round specific comparative advantages as schematically outlined in Table 10.1 of Annex 10.	MAL& UNDP
C3	· Identify actions to ensure that production and marketing processes is environmentally-friendly. To the extent possible production intensification should I use IPM and ecological agriculture so that the use of agro-chemicals will be minimized in the marketing process.	MAL & UNDP
D	**Category 4:** Nutrition Planning as an Intermediate Strategy. As time consuming commercialization arrangements need to be sorted out so that small-holding farmers can benefit from market opportunities, growing nutritious crops can provide additional business opportunities in addition to improving the nutrition levels of family units. This is analyzed in Annex 11.	MAL & UNDP
D1	**Key recommendation:** · Identify the farm family unit's consumption preference as a starting point for enhancing nutrition. To this end, as the strategic entry point is to incorporate nutritious crops into current cropping patterns, review cropping patterns in each pilot site.	MAL & UNDP
D2	· In relevant pilot sites, enable the programming of community-based initiatives designed to promote the production of a variety of vegetables and fruits for home consumption. The participating families should have incentives to enhance their quality of living conditions by learning about new varieties of vegetable crops	MAL & UNDP
D3	· Through the Community Based programming induce a demand-pull of staple crops, vegetables, and fruits across all smallholding farmers. This would be generated by [1] virtue of farm families improving their own diets with different varieties of vegetables and fruits, and [2] farm families getting involved in livelihood opportunities as restaurant owners and/or suppliers to restaurants.	MAL & UNDP
E	**Category 5:** Water Resources Development and Management. The goal is to address water scarcity in a least-cost approach supported by sustainable environmental management and acceptable socio-economic modality. To this end, the overarching goals are to organize: [1] the dataset needs identification with respect to the irrigation potential in the sites under consideration, and [2] the administrative requirements for implementing irrigation projects among subsistence farmers should be determined. These are analyzed in Annex 8.	MAL & UNDP
E1	**Key recommendation:** Within the watershed[s] where the sites are situated, · Conduct the collection of the dataset needed for the design of an irrigation system including climate data, water resources, water drainage, soil conditions and topography, as well as adaptation methods and crops to deal with climate change. · Subsequently, assess the technical/socio-economic/environmental feasibility of a potential project [s] within the context of the small-holders' management level currently operating in a given site. · This process should be focused on solving water scarcity in a way that is socio-economically acceptable and	MAL & UNDP

	environmentally sustainable. To this end, and from the standpoint of the sustainable management of natural resources, the use of geological structures for water bodies such as the regeneration of *dambos* must be emphasized throughout this process.	
E2	· Enable so that the planning process focuses on [1] how the farmers enhance their skills to adapt to the proposed operation, and [2] how the servicing institutions reduce the risks involved in the process to enable the small farmers to successfully uptake the technology. The services should enable irrigated agriculture to be economically worthwhile for the producer, the consumers, and for the overall process to be sustainable. The produce must be marketed to ensure the economic return necessary to cover operation and maintenance costs so that the irrigation scheme is financially sustainable. One planning process is schematically illustrated in Graph 8.2 of Annex 8. Communities should be approached to consider their participation in the development only after the conclusion of the feasibility results.	MAL & UNDP
E3	Ultimately, the relevant issues to be addressed are: · What are the consequences of a dam construction [or a weir] on water resource users? · Whose land will be used to build the reservoir? · Furthermore, women should not be left out of this process due to land tenure considerations and/or water rights. Adequate gender-neutral land tenure and water rights must be arranged by the traditional authorities in close coordination with local and central authorities before the implementation of the irrigation system.	MAL & UNDP

Lessons Learned

Often lessons learned focus on new knowledge gained from particular initiatives, context outcomes and even methods. This Project focused on technology transfer from subsistence agriculture towards a farming system based on resilient productivity. Consequently the lessons highlight strengths and weaknesses in the preparation, design and implementation, including M&E that have affected performance, outcome and impact.[12]

Unadvised Planning-Implementing Procedure.

The Project's implementing modality [simultaneous execution of planning and implementation procedures] was defective for the adaptation/mitigation to climate change of the agricultural sector of Zambia, with special reference to small landholders. The evidence indicates that this modality was ineffective for activity implementation and, in particular, for complex activities requiring the completion of one activity before the second activity could occur and be completed. Specifically, in the context of outcome- two, the most significant shortfall was the ineffective planning and preparation for the execution of complex water infrastructure works. Another consequence of this faulty modality was that the Project's farmers were deprived of the anticipated improvement of access to the market, either to sell their produce or to purchase inputs. As the evidence shows [sec 5, Annex 7], the adoption of high-yielding and drought resistant crops introduced by the Project, which have a greater return than maize, is hindered by uncertain commercialization.

Appraisal Review of Agricultural Development Projects.

Often one useful and standard procedure for complex projects used by IFAD, WB and others, especially agricultural projects where irrigation development is a component, has been to have an independent organization appraise the total project design. The appraisal process seeks to ensure that all technological, economic, environmental, marketing, and other relevant issues are properly addressed to warrant successful implementation. Using the benefit of hindsight, the Project could have used an appraisal review conducted by an independent team composed of an agro-economist, an agronomist and an irrigation engineer. The overall purpose would be to establish the feasibility of the project design at the technical, economic, social and environmental levels. The recommendations would focus on an implementation schedule based on sequencing the agricultural innovations to build up the absorption capacity of the farmers who are targeted to participate. Secondly, the implementation of the water works would be ranked, by

[12] "Lessons learned from an evaluation comprise the new knowledge gained from the particular circumstances (initiative, context outcomes and even evaluation methods) that is applicable to and useful in other similar contexts. Frequently, lessons highlight strengths or weaknesses in preparation, design and implementation that affect performance, outcome and impact." UNDP. Handbook on planning, monitoring and evaluating for development results. New York, page 180

identifying which of the water works could be implemented after minor additional works, which would require detailed technical analysis and which are not feasible either for technical, environmental, economic or other reasons. It noteworthy that an appraisal exercise costs no more than approximately 3 to 5% of a project's total cost. The potential losses that occur when projects run into implementation difficulties are costlier.

The M&E Process of Agricultural Projects in Less-than-Ideal Conditions

In a typical country in Africa South of the Sahara, South Asia, or Central America, the conditions to generate data is weak, especially for rural and agricultural projects because the budgets [national and from donors'] are grim. In this less-than-ideal situation the stock and flow of timely information are irregular and unreliable. In this context, the following lessons have been drawn.

M&E Framework for Agricultural Outcomes Based on Existing Framework.

The basic principle is that climate change is global and adaptation is local, especially in regards to agriculture, and consequently there is no "one-size-fits-all" approach. Therefore, the M&E plan and implementation has to reflect the realities on the ground. The standard approach within the framework of UNDP M&E procedures, in addition to dealing adequately with administrative issues, focuses on capacity development for institutional transformation. Although agricultural development does require institutional reform and alignment, the technical elements of output production [crops, trees, and animals including fish] are paramount in the agricultural transformation process. Effective technological transfer requires institutional leadership and support and adequate technology that is economically and socially viable as well as environmentally sustainable. There are several works on M&E for agriculture projects designed between 1980-2000 when investment in agricultural development by all donors was of consequence.[13]

In-Depth Mid Term Review.

When agricultural/livestock production is partially or entirely an ingredient of a climate change outcome, an in-depth MTR can be productive, especially in reference to baseline information and indicators. The key purpose of the MTR would be to identify corrective actions either at the level of final targets or baseline measurements. The upshot from this Project is that, unsurprisingly, it is not possible to measure any change without a baseline. And the goal of a climate change project is nearly confounded without adequate measures with and without the project conditions.

Sharing Climate Change Data Across Ministries, Donor Agencies and NGOs.

Climate-related data can be collected through primary methods, however this is a resource-intensive effort. It could also duplicate ongoing efforts, as many donors and agencies often work in the same regions, sometimes simultaneously. One option is for all stakeholders concerned to jointly gather baseline information and monitoring data. This initiative would be similar to the one being led by the General Global Donor Platform Rural Development [GDPRD], FAO and the World Bank concerning tracking results in agriculture and rural development in less-than-ideal conditions .[14] The idea is to select a core set of standard climate change indicators, with the recommendation that they should be regularly compiled by all agencies, both national and international, in Zambia. These "priority indicators" should be the same as in all climate change programs to allow for comparisons, and to facilitate the monitoring of climate change programs and goals at the national level.

A-INTRODUCTION

[13] For example, Dennis J. Casley & Lury, D.A. Monitoring and evaluation of agricultural and rural development projects. World Bank Publication. John Hopkins University Press, 1984, pp 30-45; IFAD. A guide for project M&E. Rome 2003; IFAD Evaluation Manual Methodology and Processes. Office of Evaluation, Rome, 2009; FAO/WB/GDPRD. Tracking Results in Agriculture and Rural Development in Less-Than-Ideal Conditions: A Sourcebook of Indicators for Monitoring and Evaluation. 2008 Extracted from on 10/10/15 from www.fao.org

[14] FAO/WB/GDPRD. Tracking Results in Agriculture and Rural Development in Less-Than-Ideal Conditions: A Sourcebook of Indicators for Monitoring and Evaluation. 2008 Extracted from on 10/10/15 from www.fao.org

1 Purpose of the Evaluation

In conformity with UNDP and GEF M&E policies and procedures, all full and medium-sized UNDP support GEF financed projects are required to undergo a terminal evaluation upon completion of implementation. The terms of reference (TOR) found in Annex 1 set out the expectations for a Terminal Evaluation (TE) of the Adaptation to Climate Variability and Change in Agro Ecological Regions I and II (PIMS # 3942).

The project was designed for the Government of the Republic of Zambia through the Ministry of Agriculture and Livestock (MAL) who implemented the Project under the title "Adaptation to Climate Variability and Change in Agro Ecological Regions I and II" to adapt to the negative effects of climate change, with financial and technical assistance from the Global Environmental Facility (GEF) and the United Nations Development Programme (UNDP). This four - year project was implemented on 1 August 2012 and had a total budget of USD 3,795,000.

1.1 Scope and Method

It is clear that the knowledge about climate change characteristics and their effects in the short- and long-term in nearly all economic sectors, especially agriculture, is imperfect.[15] This why the overall approach in climate change adaptation is inferential, i.e. from the bottom up. Likewise, the mounting information on climate change adaptation applicable to agriculture is embryonic, in particular the measurement of indicators across the board. Under these circumstances, the harsh reality is that many countries in the region and around the world lack the capacity to produce and report the data necessary to inform the international development debate on climate change adaptation of agriculture, with special reference to subsistence farming.

- By implementing this Project in less-than-ideal conditions, the UNDP and the GRZ has opened up a rich vein of information on the issues and problems related to subsistence farming and climate change adaptation.

In conformity with the TOR [page 2] and with the UNDP GEF guidelines for Terminal Evaluations,[16] Annex 7 contains an in-depth exposition of the methodology. To synthesize, the main guiding evaluation principle was that agricultural transformation is location-specific, and that the adaptation of technology is influenced not only by the local ecology, but also by social norms and economic conditions particular to the social structure of the given site. Therefore, the task of assessing technological change in agriculture is to determine what kinds of factors impede or incentivize the technology transfer process while taking into consideration the fact that successful agricultural innovations are grafted onto traditional agricultural modes.

The methodology therefore had to assess how the conditions in the pilot sites have changed as a consequence of the Project's implementation. Consequently, it was necessary to understand the conditions in the pilot sites without the Project. To this end, reconstruction techniques were used based on ethnographic evidence, rapid surveys, and a range of indicators, including those monitoring the changes in the agricultural sector, were used in addition to the project components. More concretely, the results obtained in each of the pilot sites visited were assessed to determine the extent to which a tangible adaptation in skills has taken place to cope with climate variability and global warming, and the ensuing consequences in crop yields, cropping patterns and farm income.

From the eight pilot sites, a representative set of pilot sites was jointly selected, i.e. Chongwe, Siavonga and Kazungula, after taking into consideration the limited time allocated to the Terminal Evaluation, site proximity and

[15] UNDP. Institutional capacity development plan for climate change in Burkina Faso. New York, 2011 ; Government of Japan/ United Nations Development Programme. Africa Adaptation Programme - Capacity Assessment. Capacity Development Response for Climate Change Adaptation. A Methodological Guide Draft 4 Eduardo Quiroga, Consultant, Dakar, 2011, pp 3-6.

[16] UNDP. Project-Level Evaluation Guidance for Conducting Terminal Evaluations of UNDP-Supported, GEF-Financed Projects. Evaluation Office, New York, 2012.

ease of site access. Given the time and resources available, the survey's intent was exploratory and problem-learning rather than predictive. A purposive sample of farmers appeared to be a sufficient representation to examine the effect of Project actions on the varied agro-ecological zones and socioeconomic conditions of the pilot sites reviewed. Thus, the sample selected in each site was purposive and stratified. In each site, five groups were selected with the participation of the project and implementation teams. For each group, five male and five female farmers were selected.

The goal of these five groups was to learn the behavioral response to the technology transfer. Groups A,B, and C were early-adopters of the know-how proposed, but had different degrees of economic success. Groups D and E were test groups. Both groups had not been targeted by the Project actions, but Group D was already in the uptake of the know-how imparted by the Project while Group E behaved in a "business as usual" manner. Group F was made up of the members from the management committee; it proved useful to learn their response to the technology transfer.

1.1.1 The Limitations of the Evaluation

The following issues imposed constraints on the Terminal Evaluation [TE].

Resource limitations were paramount. The agricultural project under review is ambitious, complex and spread out geographically in eight pilot sites. Limited resources no doubt led to the assignment of only one international consultant using the standard time of approximately 30 working days.[17] Consequently, two proposals were submitted for management's consideration, both of which summarized pared down the assignment. The first was a bidding proposal and the second was the Inception Report. The criteria used to pare them down is discussed below.

Secondly, the project design contained a complex set of interventions. As illustrated in Table 1, there were interventions on four subject matters: 1- agronomy; 2- water resources management and development; 3- livelihood opportunities based on agriculture and forest exploitation; and 4- community-based actions to expand knowledge on meteorological information for farmers. The skills requirements to conduct these four sets of interventions are specialized and not necessarily interchangeable, except in a few interventions.

Table 2 Summary of Project Interventions by Subject Matter

Agronomy	Water resources development and management	Livelihood opportunities based on agriculture and forest exploitation	Community-based Actions for Knowledge Enhancement
1-Soil conservation techniques 2-Crop diversification 3-Rice farming in flood-prone areas 4-Expansion of area under irrigation	1-Earth dam construction 2-Construction of storm water dams 3-Construction of reservoirs 4-Construction of Weirs 5-Rehabilitation of Irrigation systems	1-Beekeeping 2-Fish Farming 3-Integrated fish and rice farming 4- Non-Timber Forest Products 5-Livestock pass-on modality 6-Rice Processing Equipment	1-Construction of Farmer Centres 2-Construction of Early Warning Systems and Operation

Source: own elaboration

If only individual interventions are considered, each was conducted either in Zambia or nearby. However effectively implementing all 19 interventions [including irrigation works] simultaneously throughout 8 geographically different pilot sites, in just four years, can be an unwieldy implementation task. Establishing yearly and aggregate targets in each site was also necessary, and needed the support of technical personnel. A master plan was required to guide

[17] Amendments to the Contract took place as the work load increased

the project's implementation in all eight sites and to ensure the completion of all activities anticipated. The water resources development and management component required a complete feasibility analysis before reaching the farmers. This feasibility study requires specific and varied sets of data identified in Annex 8; this data set is not readily available at this time, especially the financial resources..

The Prodoc does not deal with this complexity, as evidenced by the Prodoc, which proposes joint implementation and execution. This approach delivers inputs on the ground; it does not lead to development results. Ultimately, the Prodoc outlines the implementation procedures normally used for capacity development projects. The consequences of this approach are being reviewed by this TE.

Thus, the approach throughout this TE has been a case of an evaluation being conducted in less-than-ideal conditions.[18] One specific condition was the inadequate dataset produced. Despite the Prodoc's assessment that GZR needed strengthening in M&E, this advice was not heeded. Instead, the Prodoc proposed a M&E approach ordinarily used for capacity development projects. Therefore, the data set produced was not consistent with the requirements of an agricultural project. There was no baseline produced and furthermore, a comprehensive Terminal Report is in-process by the Project Team or the GRZ, as was recommended by the Prodoc.

Given this less-than-ideal condition, the Inception Report proposed a comprehensive proposal to learn primarily what happened in outcome-two, because it was the cornerstone of the Project. Outcomes one, three, and four are contingent on what was realized in outcome-two. Because of the limited resources, the TE assessment had to be skewed to outcome-two. However, there were not enough resources to continue doing survey-like efforts in the other three outcomes. We had to rely on the information available and systematic triangulation throughout the evaluation. Therefore, the focus has been on gathering a minimum set of priority core indicators, associated with outcome-two [the Project's cornerstone], rather than a desired set.

Thirdly, using a rapid survey, outcome-two was assessed primarily with the aim of learning about the response of the early-adopters among male and female small-landholders, and was biased towards early-adopters. It was jointly agreed with management to conduct the survey, with the participation of the Project Team and National Project Coordinator. This was due to limited resources. The TE timeline meant that one consultant could not conduct the survey alone, and the survey was carried out by enumerators trained by the Consultant. On each site, the Consultant conducted as many interviews as possible to ensure data reliability, sometimes with the help of translator. The NPC was not directly or indirectly involved with the data collection and analysis; instead he facilitated the flow of activities since the enumerators were MAL personnel and not involved with the Project.

As the survey was conducted in a less-than-ideal situation, little or no effort was spent reviewing the shortfalls in the water resources development component. The Steering Committee requested directives on irrigation development planning, including nutrition planning based on previous experiences in this area, which is further discussed in Annex 8, however, it regrettably lacks specific recommendations due to a lack of field work on the subject matter.

It was possible to triangulate a proxy-baseline against which the results of the survey conducted could be assessed. The findings relate to the early-adopters of the technologies proposed by the Project, both men and women, including the emerging constraints to the full economic fruition of the expected project results.

However, in the absence of a complete Terminal Report from either the Project Team or the GRZ, it is not yet possible to determine to what extent the outcomes have been achieved. No analyses has been undertaken on the

[18] FAO/WB/GDPRD. Tracking Results in Agriculture and Rural Development in Less-Than-Ideal Conditions: A Sourcebook of Indicators for Monitoring and Evaluation. 2008 Extracted from on 10/10/15 from www.fao.org

completion of outcomes. As is known, the Terminal Report is an opportunity for the implementing entity to present the project's outcomes, particularly with regard to meeting the expected accomplishments. Given this context, there is a measure of accountability as the implementing agency has the obligation to (i) demonstrate that work has been conducted in accordance with agreed rules and standards and (ii) report fairly and accurately on performance results vis-à-vis mandated roles and/or plans.[19]

1.2 Structure of the Evaluation Report

The Mission has been meticulously following the procedures to conduct terminal evaluations proposed by the UNDP for GEF-financed projects;[20] we have been doing so every step of the way, from preparing and conducting the evaluation to drafting the present report. Unsurprisingly, this Project evaluation brought about rewarding technical challenges in the process. To this end, based on the review of the literature available from UN specialized organizations and other research organizations, the consultant opted to follow the guidelines proposed by OECD, [21] placing special emphasis on customizing these procedures to the conditions of the project areas. Any error or omission is solely the author's responsibility.

Further, the evaluation criteria matrix was submitted and discussed in the Inception Report.[22] In the same report, the evaluation questions that need to be answered so as to determine the project's results were jointly reviewed and discussed with key stakeholders, including the sources of information and methodology. The contemplated narrative is found in section 5 of Part B of the present report.

Lastly, in conformity with the Guidance for conducting project evaluations[23] [page 15], the bulk of the information for the background sections has been accessed from the Project Document (Prodoc); In particular, the project description and development context, the project design/formulation, and the basic parameters for implementation. Therefore, no effort has been assigned for scholarly referencing. The outline of the terminal evaluation report [TER] tracks Annex F of TOR [pp 26-27].

2 Project Description and Development Context

Most communities in Zambia are vulnerable to the adverse effects of climate change, ranging from floods and droughts to dry spells. By and large, Zambia's farmers lack the capacity, resources and financial assistance to adapt to and overcome worsening climatic conditions. The repercussions of this situation is crop failure, food and water insecurity and unsustainable livelihoods. The ability of the agricultural sector to cope with potential global warming and reduction in rainfall is negligible. This is due to: 1- low levels of investment, 2- land degradation, 3- limited access to agricultural inputs and output markets, and 4- a reduced labour force due to HIV/AIDS pandemic.

Under these circumstances, in the ecosystems of AER I and II, the Project took a two pronged-approach in order to reduce the vulnerability of communities to climate change impacts:

- 1-to mainstream adaptation into agricultural planning at the national, district and community levels to make the case for increased investment in adaptation in the agricultural sector; and

[19] Executive Board of the United Nations Development Programme and of the United Nations Population Fund. The UNDP accountability system Accountability framework and oversight policy. New York, 2008

[20] UNDP.Project-Level Evaluation Guidance for Conducting Terminal Evaluations of UNDP-Supported, GEF-Financed Projects. Op cit 2012.

[21] Dinshaw, A. et al. (2014), "Monitoring and Evaluation of Climate Change Adaptation: Methodological Approaches", OECD Environment Working Papers, No. 74, OECD Publishing. pp 16-22 Extracted 25-8-15. http://dx.doi.org/10.1787/5jxrclr0ntjd-en

[22] UNDP /GEF/ GOZ/ MAL Adaptation to Climate Variability and Change in Agro Ecological Regions I and II (PIMS # 3942) TERMINAL EVALUATION Inception Report Eduardo Quiroga UNDP Consultant. Draft: July 14, 2015 Final Version, Part II, p 12

[23] UNDP.- Project-Level Evaluation Guidance for Conducting Terminal Evaluations of UNDP-Supported, GEF-Financed Projects. Op cit 2012.

- 2-to test and evaluate the adaptation value of interventions that protect and improve agricultural incomes from the effects of climate change.

Therefore, the Project's goal was to improve food security through enhanced adaptive capacity to respond to the risks posed by the effects of climate variability and global warming in AER I and II. Specifically, the objective was to develop the adaptive capacity of small scale farmers and rural communities to withstand climate change. This involves the integration of adaptation considerations into agricultural planning at the national, district and community levels in order to protect and improve agricultural incomes from the adverse effects of climate change.

More concretely, the following four outcomes had potential to contribute to the attainment of the Project's goal:

- First, to have climate change risks integrated into critical decision making processes for agricultural management at the local, sub-national and national levels.
- Second, to have agricultural productivity in the pilot sites made resilient to the anticipated impacts of climate change.
- Third, to have national fiscal, regulatory and development policy revised to promote adaptation responses in the agricultural sector.
- Fourth, to have knowledge and lessons learned to support the implementation of adaptation measures compiled and disseminated.

However, the Project was expected to address anticipated barriers that could prevent the scaling up of successful interventions and the adoption of profitable activities by local farmers, such as:

- limited access to markets;
- limited climate risk information used in agricultural planning;
- limited institutional capacity to adequately address climate change; and
- limited public awareness of climate change and the need to adapt.

2.1 Project Start and Duration

The Project's original starting date was 1 January 2010. The effective commencement date was 1 August 2012, approximately 2 years after the initial project signature. The Project was expected to conclude on 31 December 2013. As this would only provide one year of implementation, the closing date was extended to 30 June 2015. Thus, the Project was under implementation for 35 months, that is, it was one month short of reaching three years.

2.2 Problems that the Project Sought to Address

Zambia's agricultural sector is characterized by subsistence farming, i.e. farm-operators eking out a living in farms of less than two hectares with little or no infrastructure for water management. Despite the considerable potential for irrigated development, only commercial farms use irrigation.[24] Thus, rain-fed agriculture is mainstream. Production therefore is precarious due to the variations in climatic conditions and the onset of global warming and climate variability. Given the limited access to resources, extension information, and markets, small-landholding farmers depend on maize and staple crops accompanied by small amounts of tubers and vegetables. Under these dire conditions, small-scale farmers have fallen into poverty at a rate of 84%[25].

[24] Of the country's irrigation potential, conservatively estimated at 2 750 000 hectares, only about 100 000 hectares is currently under irrigation mostly by commercial farmers who account for about 52 000 hectares (Ministry of Agriculture and Cooperatives. 2004. Irrigation Policy and Strategy).

[25] Jorgensen, S.L. & Loudjeva, Z. . A Poverty and Social Impact Analysis of Three Reforms in Zambia: Land, Fertilizer and Infrastructure. The World Bank. Social Analysis Paper No. 49. 2005

The Project interventions, situated within AER I and II, are areas highly prone to climate hazards, i.e. drought, shortening of the rainy season, flooding, and dry spells associated with crop failure, all of which have negative repercussions on food and water security, soil quality, wildlife and, ultimately, the sustainability of livelihoods including the displacement of human populations[26]. Furthermore, drought and flooding episodes across Zambia have become more frequent and of increasing intensity. This is assumed to be a manifestation of long-term climate change[27]. For these reasons, this LDCF project (hereafter referred to as "the Project") has chosen to focus on AER I and II and the implementation of initiatives leading to the adaptation to global warming and climate variability in the context of the agricultural sector.

2.3 Immediate and Development Objectives of the Project

- The overarching goal of this project is "to improve food security through the enhanced adaptive capacity to respond to the risks posed by the effects of climate change (including variability) in AER I and II of Zambia".
- The objective of the project is "to develop the adaptive capacity of subsistence farmers and rural communities to withstand climate change in Zambia". The objective was anticipated to be accomplished through the implementation of the four expected Project outcomes, as identified above [sec 2.2]

2.4 Baseline Indicators Established

As discussed in detail in section 3 of Annex 7, a baseline framework is the basis for the assessment of change over time. Without baseline data to establish conditions "without" the project for outcome indicators, it is difficult to gauge the kinds of changes that have in fact occurred "with the project" at the end of the project's implementation. Carefully designed baselines and targets are necessary to measure the performance of adaptation actions within the planned timeframe, especially during the process of climate change adaptation.

Logically, baseline indicators are established at the beginning of the project through surveys [special studies] conducted for this purpose.[28] The fundamental notion is that these indicators will be compared with the condition of the same indicators at specific points during implementation [mid-term and / or terminal evaluations]. However, experience indicates that several structural factors militate against constructing baselines and targets to measure change over time. This is due in part to the uncertain nature of climate change, making it difficult for project designers to sketch outcomes with special reference to the metrics of baselines linked to global warming and climate variability. In addition, significant gaps arise from the quality of national statistics and information available for sustainable development, posing considerable difficulties to the evaluation.

Presumably, the above factors led to the Prodoc's focus on a national institutional framework, rather than setting up project indicators through surveys or special studies. In fact, the framework is a response to the country's vulnerability to face climatic hazards, which significantly affect food security and poverty. Specifically:

- The Poverty Reduction Strategy Paper (PRSP, 2002-2004), which was succeeded by the Fifth National Development Plan (FNDP, 2006-2010). Both strategies intend to foster the agricultural sector, especially through improving input supply, investment opportunities and disease control.
- The National Disaster Management Policy (NDMP, 2005), the National Agricultural Policy (NAP, 2004-2015) and the National Irrigation Plan (NIP, 2006-2011). These policies aim to enhance agricultural productivity and

[26] Zambia National Adaptation Programme of Action, September 2007.

[27] Jain, S. An Empirical Economic Assessment of Impacts of Climate Change on Agriculture in Zambia. The World Bank Development Research Group. Sustainable Rural and Urban Development Team. 2007

[28] :World Food Programme. How to plan a baseline study. Office of Evaluation and Monitoring, Rome [no date]

thereby reduce poverty through capacity building, sustainable agricultural practices, soil conservation measures and increasing the extent of irrigated agriculture.

- The National Environment Policy (NPE, 2004) identifies 11 government ministries involved in environmental affairs. The draft NPE also highlights current shortfalls in these nineteen policies including ineffectual mechanisms for community-based natural resource management, lack of informal inter-sectoral links, limited up-to date baseline data and limited national guidelines for effective integration of international environmental conventions.
- Gender Policy, which recognizes the gender disparity that exists between men and women, where women remain a disadvantaged and vulnerable group. The policy advocates for gender equality and women's empowerment in all sectors. Furthermore, the strategic plan for the implementation of the gender policy has prioritized five sectors and agriculture is one of these sectors.

The key facts arising from this policy review are:

- climate change has not been integrated into any of the above-mentioned policies, apart from the FNDP;
- policies do acknowledge that present climatic variability is, to a large degree, responsible for crop failure and associated food, water and health insecurity;
- policies advocate for an improved early warning system [EWS] that is effective at a local level;
- climate change is not adequately taken into account, and the policies' mitigation and development strategies are likely to be less effective and potentially maladaptive in the future; and
- NAP and the NIP promote an increase in irrigation to reduce the reliance on rain-fed agriculture.

It is possible to surmise that the above framework would be helpful in reviewing the Project's development objectives, however, as will be seen below, the Project's core focus was on on-the-ground issues to enhance the skills of small landholders such that they would be able to cope with climate change issues.

2.5 Main Stakeholders

The Prodoc was formulated with the help of stakeholders' consultations from the outset. Further, as is discussed below in section 2.6, the Project interventions were comprehensive: they comprised, from the outset, the implementation of eight water resource infrastructure works, the extension and diffusion of four agricultural techniques to cope with climate variability and global warming, and four lines of livelihood alternatives. Logically, this broad range of interventions included the participation of 12 government agencies, primarily from MAL, and local NGOs other than the UNDP. Table 2 below contains the list of key Ministries/Departments and their role in the Project, as anticipated in the Prodoc. It was expected that the participation of national organization at the national, sub national and local levels would foster ownership.

2.6 Expected Results

As discussed in section 2.2, Zambia is vulnerable to climate change repercussions from expected shifts in temperature and rainfall variability. These are plausible factors that can negatively impact agricultural productivity associated with the prevailing farming system, which in turn, will adversely affect food availability and farm incomes. Therefore, investments addressing the barriers of 1- the predominance of rain-fed agriculture; 2- deficiencies in the early warning systems; and 3- environmental degradation due to unsustainable agricultural practices, should be a contribution to the sustainable growth of agriculture.

More concretely, the Project anticipated focusing "on the ground" interventions to strengthen the adaptive capacity of vulnerable small-scale farmers within the eight pilot sites in AER I and II. At the national level, capacity was to be strengthened to integrate climate change risk reduction strategies into development policies and programmes of national institutions. Specifically, the Project intended to:

- benefit local communities by equipping them with the tools to improve crop yields and income streams;
- reduce the dependence of vulnerable communities on rain-fed agriculture by ensuring year-round provision of water following the implementation and rehabilitation of irrigation systems as well as water capturing and storage facilities;
- promote alternative livelihoods to boost the income streams of vulnerable groups;
- institute accountability and transparency in local government and management institutions in order to modify long-term development strategies and polices to foster adaptation through the reduction of risks posed by climatic hazards; and
- document lessons learned from the implementation of "on the ground" interventions in order to disseminate knowledge to other regions and countries embarking on similar adaptation projects in order to refine project strategies and ensure the early achievement of project results.

Although globally a better understanding of adaptation mechanisms was to be achieved, the Project had additional national benefits to contribute:

- 1-increased food security, thereby positively affecting MDG One;
- 2-enhancing health outcomes (as a result of better nutritional status), thereby positively affecting MDGs Four and Six; and
- 3-anticipated improved farming practices that could enhance environmental sustainability, which could positively affect MDG Seven.

B-Findings

3. Project Design / Formulation

Framework

Because agricultural interventions are complex, especially under climate change adaptation/mitigation conditions, it is useful to specify the scope and the framework used in this assessment. It is worth noting that the analysis was carried out primarily in light of the results obtained from the three pilot sites visited. It was intended to assess to what extent a tangible adaptation in skills has taken place to cope with climate variability and global warming, in addition to the ensuing consequences on crop yields, cropping patterns and farm income, as examined in detail in section 4 of Annex 7.

The agricultural project analysis framework has been used to surmise the findings about project design/formulation.[29] The scope used in examining the planning/formulation process has taken into account the fact that agricultural interventions are complex, especially under climate change adaptation/mitigation conditions.[30] In this light, project design/formulation has direct implications on implementation, which in turn, influences the production of outputs and the generation of expected outcomes. Annex 9 contains a detailed analysis of the scope considerations to evaluate an agricultural project.

3.1-Analysis of LFA/Results Framework (Project logic /Strategy, Indicators)

[29] In this assignment we have used the comprehensive framework of : Dennis J. Casley & Lury, D.A. Monitoring and evaluation of agricultural and rural development projects. World Bank publication. John Hopkins University Press, 1984. This framework is consistent with the economic assumptions related to the project analysis of agricultural projects which are being used in this exercise. See: section 2.2.1, Annex 7

[30] The literature on project design/implementation is vast. We are focusing design/implementation issues arising from conditions similar to those found in Zambia. Rondinelli's early work is the most relevant : D.A. Rondinelli. Why development projects fail? Problems of project management in developing countries. Project management quarterly, vol 8, No 1, March 1976. Likewise, the World Bank Economic Institute did produce relevant work: World Bank. Problems of implementation. EDI training materials. November 1980. As noted earlier, there will not be attempt of scholarly referencing of these works.

The assessment began by examining the latest operational statement of the LFA, which was used by the Mid Term Review. The summary of the LFA, which reflects the Project's results framework, depicts that the Project was configured with four outcomes, eleven outputs and another eleven sub outputs.

Table 3: Summary of LFA/ Project's Results Framework

Outcome 1: Climate change risks integrated into critical decision making processes for agricultural management at the local, sub-national and national levels	Output 1.1: Institutional capacity to support climate risk management in the agriculture sector at the national, district, and village level was developed
	Output 1.2: Effective EWS(s) developed to enhance preparedness and reduce climate related risks
	Output 1.3: Economic impact assessment of the value of climate risk information for farmers
Outcome 2: Agricultural productivity in the pilot sites made resilient to the anticipated impacts of climate change	Output 2.1: Techniques for soil and water conservation as well as soil improvement were tested for their ability to improve the productivity of small-scale agriculture
	Output 2.2: Crop diversification practices tested for their ability to improve the resilience of farmers to drought
	Output 2.3: Alternative livelihoods tested for their ability to diversify incomes away from maize production **+ Five [5] Sub Outputs***
	Output 2.4: Community-based water capacity and irrigation systems improved or developed to test their ability to raise agricultural productivity **+ Six [6] Sub Outputs***
Outcome 3: National fiscal, regulatory and development policies revised to promote adaptation responses in the agricultural sector	Output 3.1: Awareness of climate change risks and the economic value of adaptation responses raised among policy- and decision-makers
	Output 3.2: National policy dialogues conducted to discuss project findings in relation to the cost-effectiveness of piloted adaptation options
	Output 3.3: Policies that require adjustments to promote adaptation were identified and reviewed
Outcome 4: Lessons-learned and a knowledge management component developed	Output 4.1: Knowledge and lessons learned to support the implementation of adaptation measures were compiled and disseminated

Source: Adapted from Mid Term Evaluation, 2013, Table 1
[*] Added by the Terminal Mission

The Project's backbone is outcome two, which had four outputs and eleven sub outputs. From the subject-matter standpoint, there were sixteen major interventions, eight of which dealt with the construction/rehabilitation of water resource development for agricultural use. There were four climate-proofed agricultural techniques set for extension, as well as four additional alternative livelihood techniques also set for extension. The implementation timeline was three years. In sum, by any standard, it was a complex project with a short implementation timeline.[31]

The pathway to the Project's objective [i.e. to develop the adaptive capacity of the small scale farmers and rural communities to withstand climate change] is outcome- two. This is the Project's cornerstone—not only because

[31] Four or five years of implementation are standard. However, donors are considering longer implementation timelines in function of project design.

the cardinal activities "on the ground" were implemented under outcome-two (and had clear repercussions on yields, cropping patterns and ensuing farm revenue) but because it also used more than half of the total estimated cost. The Prodoc described the interventions "on the ground" [Annex G of Prodoc] and the accomplished results on the ground were anticipated to be reflected in outcomes 1,3, and 4.

The Participating Household Report [page 12][32] validates that outcome-two comprised interventions dealing with agricultural infrastructure development, i.e. water resource development and some social investments. The remainder of the interventions dealt with the extension and diffusion of agricultural techniques to cope with climate variability and global warming.

Despite the fact that outcome-two was designed as the Project's lynchpin, it lacked specific tracking procedures to measure agricultural performance over time; consequently no indicators were identified at any of the different levels required in standard agricultural monitoring. Thus, a gap emerged in terms of the effectiveness of the instruments and indicators used to measure progress and performance of the agricultural interventions. This gap made the measurement of progress and achievement of expected results difficult, This gap, as well as a proposed set of proxy tools used to measure the results obtained during the execution of the terminal evaluation, have been discussed extensively (both conceptually and operationally) in sections 2 and 3 of Annex 7.

3.2-Assumptions and Risks

The key assumptions underlying the Project design comprised [1] commitments from different stakeholders, i.e. GRZ, NGOs, and CBOs to finalize the implementation of the baseline requirements and [2] commitment to the Project until it's completion by extension and lead farmers on the ground. While the extension and lead farmers remained until the end of the Project, baselines were not completed. As discussed in sec 3 of Annex 7, this Terminal Evaluation had to develop proxy baselines to measure change over time, with and without the Project, in terms of the performance of outcome indicators. Consequently, it is evident that the assumptions were not robust. Moreover, they did not help to determine activities and planned outputs.

However, it was correctly assumed that pilot sites are best placed to demonstrate the benefits of the measures used to adapt to climate change. In the Mission's opinion, they are under-utilized as centres of diffusion of information. Concretely, the Resource Centre should be used as a community foci and as a repository of the community's technological information on new crops adapted to the conditions of the pilot site; farm management techniques directed to enhance the productivity of the farm unit; and others.[33]

Risks that could potentially affect the success of the Project were identified with recommended mitigation measures and were ranked as low, medium and high. In the low risk category were agricultural and water management interventions that were not cost effective, with special emphasis placed on the configuration of cost recovery procedures. The evidence, however, indicated that the risk was high. In fact, practically all of the interventions related to water management and agriculture had to be cancelled.

Under the medium risk category were primarily operational issues such as poor co-ordination among implementing institutions leading to delays in deliverables and inadequate staffing in the MAL extension system, which could limit the Project's up-scaling potential. These factors played a role in implementation and their risk was correctly ranked

[32] UNDP/MAL Participating household report for the Climate Change Adaptation Project. Table 2, 2015

[33] The mission requested the opinion of a few farmers, male and female, on these ideas. The response was overwhelmingly positive. They also were interested in learning about exchange rates, especially those farmers who trade with surrounding communities of neighboring countries. Seemingly the current method of trade is barter but farmers wondered if there would be additional benefits using money, hence, their interest in exchange rates.

as medium. However, shortcomings in the baseline implementation by national stakeholders had an adverse impact on the project's outcomes and in reality, they carried a high risk as opposed to a medium one.
It was remarkable that the high risks associated with project implementation were primarily policy issues. For instance, a change in donor interest resulted in the GRZ also changing their priorities, which slowed the momentum of the implementation. Similarly, the slow pace of policy modification was considered to be a high risk. It can be inferred that the planner's assumption was that this Project was policy-driven. The facts indicate that the ground realities of the farmer's communities are the drivers of adaptation to climate change. In conclusion, on the whole, the analysis of assumptions and risks was not robust or logical. Overall, the analysis did not help to generate sound outputs with the potential to contribute to outcomes. It is possible that the economic logic of climate change adaptation/mitigation was not well understood. This is discussed in detail in section 6.1.2. Lastly, as the Project was addressing the mitigation/adaptation of climate change in the context of small holding agriculture, the present assessment was a case of dealing with externalities.

3.3-Lessons from other Relevant Projects Incorporated Into Project Design

The present Project deals with a looming phenomena that is bound to affect human societies to a scale as yet unknown in recent history, especially in sub-Saharan Africa. There are no lessons learned from other projects as of yet, with the exception of the scientific literature.[34] Put it differently, the Project design contained a complex set of 19 interventions in four different subject matters, illustrated in Table 1, if one considers individual interventions, each has been done either in Zambia or nearby. But effectively implementing all 19 interventions simultaneously throughout 8 geographically different pilot sites, in just four years, can be an unwieldy implementation task—which has not been successfully undertaken. A discussion of these operational complexities are found in section 1.1.1.

3.4-Planned Stakeholder Participation

The Project was jointly formulated with the participation of stakeholders from the outset. This was essential, as the Project's interventions were comprehensive and comprised the implementation of eight water resource infrastructure works, the extension and diffusion of four agricultural techniques to cope with climate variability and global warming, and four lines of livelihood alternatives. The intervention, on the one hand, included twelve government agencies, primarily from MAL and local NGOs other than the UNDP . The specific roles of each are listed in Table 3. This all-embracing approach was simplified when the water resources development works were cancelled. It is relevant to underline that the Project promoted the participation of national organizations at the national, sub national and local levels and ensured ownership. The Project interventions were all- inclusive and ranged from the national government to the village farmer, with an emphasis on women from small holding farmers.

3.5-Replication Approach

The replication approach was discussed with the implementing team of seven pilot sites and a national consultant retained for this purpose on the 10 of July 2015 in Siavonga.[35] It became clear that in order to scope out a replication approach, an exit strategy was necessary to ensure the sustainability of the Project's results. To this end, in a one thing at a time approach a strategic exit was examined.[36] Three prerequisites are considered essential to conducting the replication approach, to be carried out under the legal and administrative procedures of the relevant ministries of the GRZ.

- The first deals with transitional actions that need to be taken to ensure the sustainability of an exit process.
- The second relates to a framework for continuous institution building which needs to be established; and,

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[34] Intergovernmental Panel on Climate Change. The Physical Science Basis. Contribution from Working Group I, Cambridge University Press, 2007,

[35] It must be remembered that this meeting on exit strategy was a recommendation of the MTR. Thus, the material used in this section comes from this meeting. The TE took advantage of the meeting to interact with the implementing cadre of the seven pilot sites on agricultural results. See Appendix 1 of Annex 7.

[36] UNDP/MAL Adaptation to the effects of Climate Change and Variability in Agro-ecological Regions I and II in Zambia Exit Strategy. ppp. Siavonga, July 2015

- Finally, the Project's technology transfer process needs to be embedded in the operational plans of ministries for the purpose of mainstreaming.

The specific elements of these three prerequisites are expanded in section 6.1 below. The fulfillment of these prerequisites would lead the way to a sustainable exit. To this end, line ministries would ensure the allocation of adequate resources where relevant to ensure not only sustainability but also replication and expansion. It is understood that many of these specific requisites need further elaboration in the context of national and local legal procedures and customary law.

Without the effective realization of these pending actions, the Project's scaling up would be compromised due to risks arising from possible duplications of already-existing outputs, and results in already-known unadvised practices, among other risks. Similarly, national authorities would also run the risk of not knowing with certainty the cost of incorporating initiatives in processes, including the deployment of a subject matter specialist, how these initiatives conjugate with already ongoing operations, and the technical expertise needed to carry out these initiatives. The specifics are clearly delineated above in the exit/sustainability strategy.

Given this context, the following actionable agenda composed of four pillars should be considered to scale up the Project:

- Pillar 1. Consolidating the agronomic and livelihood operations undertaken during the Project;
- Pillar 2. Enhancing the commercialization process through value-chain analysis;.
- Pillar 3. Introducing nutrition planning as an intermediary strategy, given the fact that the reforms and/or improvements in the commercialization process are time consuming, and, finally;
- Pillar 4. Re-introducing water resources development and management to address water scarcity.

Since no field work was conducted for the preparation of project profiles enabling activity identification, the agenda is composed of directives based on programmatic experience. Likewise, capacity building actions identified to strengthen the embryonic trend in technology transfer, discussed in detail in section 6.3.1, are essential to scaling up the Project, i.e. continuous strengthening of skills for farmers and their families, the development of each site's Farmers' Centre as a depository of the community's technological information and diffusion, among other factors. Last but not least, once a timeline for the scaling up has been set up, yearly and aggregate agricultural planning must be scheduled such that outputs lead to outcomes. The simple distribution of inputs must be avoided. Section 6.2 contains a detailed discussion on scaling up the project.

3.6-UNDP Comparative Advantage

UNDPs comparative advantage is capacity building and development. There is ample programmatic evidence demonstrating the UNDP's meaningful contribution to Zambian development results in the pivotal areas of governance, gender, the MDGs, environment and climate change.[37] The evidence indicates that the Project's overall focus was relevant and closely linked to national priorities. In this context, the UNDP has displayed sound operational efficiency in mobilizing, disbursing and accounting for the use of funds. Within the UNDP framework, the systems in place for the planning, monitoring and evaluation processes are sound, including the reporting of results. The planning and review processes both internally between various UNDP units, and externally with programme partners and stakeholders, are structured and systematic and are undergoing continuous improvements. The bulk of the stakeholders operating in Zambia appreciate the UNDP's responsiveness to local needs and flexibility in their programming approach that allows their partnership with the UNDP to readily accommodate their emerging needs.

[37] GRZ & UNDP Final Report of the Midterm Evaluation of the Country Programme Action Plan (CPAP) 2011-2015, Lusaka, 2013 pp 66-69

In the area of capacity development for climate change adaptation, the UNDP is a leader in global and regional efforts. The task is nothing less than daunting, however.[38] There are unparalleled odds against the viability of designing tools and procedures for climate change adaptation. The upshot is that the nature of the evidence arising from CCA initiatives in Africa, led by the UNDP, are enlightening for the present Project.

- Foremost, it was only in 2007 that the IPCC [4th Assessment Report] disclosed evidence of human-induced global warming. On-going results from initiatives that began around 2008 are still inconclusive. Climate change adaptation initiatives are often pilot-studies, or demonstration projects with the purpose of determining potential skills or procedures for climate change. Thus, the data generated often did not benefit from a baseline measurement against which to measure a given performance. Therefore, the data allows only logical inferences, not cause-effect linkages.
- The knowledge about climate change characteristics and effects in the short- and long-term in nearly all economic sectors, especially agriculture, is imperfect. Therefore, the overall approach in climate change adaptation is inferential, i.e. from the bottom up. Thus, mounting information on climate change adaptation applicable to agriculture is embryonic, in particular the measurement of indicators across the board.
- Inaction is not an option. Ongoing UNDP initiatives, such as the present Project, are critical because they afford the opportunity to learn about capacity development issues in the context of subsistence farmers' efforts in climate change adaptation.
- The harsh reality is that many countries in the region and around the world lack the capacity to produce and report the data necessary to inform the international development debate on climate change adaptation of agriculture, with special reference to subsistence farming. The UNDP, by implementing this Project in less-than-ideal conditions, has opened up a rich vein of information on the issues and problems related to subsistence farming and climate change adaptation.
- Last but not least, some of the world's powerful nations, on the premise of free market enterprise, militate against the leadership of the UNDP and others in the uphill battle of climate change adaptation. The lack of unanimous action among all nations deprives those who stand to suffer the most from climate change of precious resources and unified political will to cope with climate change. The compelling evidence is now clear. Both developed and developing nations need their national governments to be champions for successful climate change adaptation.[39]

3.7-Linkages between Project and Other Interventions within the Sector

The Project had linkages with the projects below, which aimed to address environmental and climate change concerns.

- Climate Change Facilitation Unit (CCFU). This is an initiative of the MTENR. The major objectives of the CCFU include assisting the MTENR to develop a comprehensive strategy for addressing climate change concerns and to develop the necessary policy and legal framework.
- Building Adaptive Capacity to Cope with Increasing Vulnerability due to Climate Change Project. This is a three year international project being undertaken by ZARI and is funded by the International Development Research Centre (IDRC). The general objective of the project is "to develop education, research and extension

[38] Government of Japan/ United Nations Development Programme. Africa Adaptation Programme - Capacity Assessment. Capacity Development Response for Climate Change Adaptation. A Methodological Guide Draft 4 Eduardo Quiroga, Consultant, Dakar, 2011, pp 3-6; UNDP "Institutional Capacity Development Plan for Climate Change for Burkina Faso" New York, March 2011

[39] Cf. The Global Mechanism. TerrAfrica. UNCCF. Guidance for action. 3 vols. UNCCF/IFAD, no date, vol I, pp 9-13

competencies to be able to create strategies that facilitate rural communities to increase their adaptive capacity to cope with risks and opportunities associated with climate change and variability".

- Conservation Agriculture Scaling Up for Increased Productivity and Production (CASPP). This is a two year project being implemented by MACO and managed by the Food and Agriculture Organization (FAO). The project aims to upscale the Conservation Agriculture Programme (CAP) funded through the Royal Norwegian Embassy's Climate Change Facility. As part of upscaling CAP, CASPP intends to rapidly upscale proven technologies (through MACO extension systems) to beneficiary farmers.
- Capacity Development for Effective Early Warning Services to Support Climate Change Adaptation in Zambia. This project is being implemented by the ZMD and is supported by the UNDP. They have made funds available to support the GRZ to upgrade the current EWS's to accommodate the adaptation concerns of different sectors of the economy adversely impacted by climate change.

With the exception of the CASPP, with whom the Project trained extension workers and farmers on conservation farming, the Project did not co-produce any of the outputs of the other projects. Did the Project actively learn from these other projects and to what extent did this Project use the linkages to the other projects in its design and implementation? The answer on both accounts can only be an estimate for several reasons. As can be confirmed reviewing the Mission's itinerary [Annex 2] and the list of persons met [Annex 3], the time devoted to these issues was almost nil due to the limited resources assigned to this TE, as discussed in section 1.1.1

Therefore, the prima facie evidence suggests limited or no conditions to exchange information on climate change at the project level, or at the management level among donors and government officials. This was corroborated with discussions with UNDP management.

There appears to be a misplaced expectation that by linking with other projects, the design and implementation of UNDP/GEF CCA projects for agriculture will be strengthened. It was only in 2007 that the IPCC [4th Assessment Report] disclosed evidence of human-induced global warming and on-going results from initiatives that began in 2008 are still inconclusive, especially in agriculture. Moreover, agricultural investments in infrastructure and capacity development [national statistics, applied research among others] have been languishing for decades.[40] This is the reason, as mentioned earlier, that this Project is generating vital information about what to expect in investments to enhance the productivity of subsistence agriculture under the regime of climate variability.

The current GEF/UNDP evaluation format is geared towards straightforward projects directed to capacity development, where complex biological processes interacting with the social systems are not essential. Agricultural projects have long maturity rate. Explanations for this long maturity rate are manifold and are discussed in Annex 9.[41] The Project was under implementation for merely three years. For an agricultural project, this is an exceedingly short period of time to yield results. Most agricultural projects begin yielding early results only after the fourth or fifth agricultural season as it takes approximately two or three seasons to fully mobilize and become operational. It should therefore be reiterated the need to reconsider an M&E framework for agricultural projects.

3.8-Management Arrangements

As reviewed at the outset, the Project was expected to be implemented over a period of four years, however the actual implementation time was three years. The MACO (now MAL) was the government cooperating agency

[40] WB. Agriculture for Development World Development Report 2008, Washington, DC 2007

[41] Fundamentally, agricultural projects are highly complex interventions. This is because it is critical to synchronize the social system [economy and society] with the biological cycle of crops [trees or animals, including fish] with the hydrological and climate conditions (especially precipitation and temperatures), using production techniques. The process of mitigation/adaptation to climate change has compounded this complexity. This fact was clearly acknowledged by the implementation managers of the all pilots sites during the Workshop conducted in Siavonga. Cf Appendix 1 of Annex 7.

directly responsible for the government's participation in the project. All of the key responsibilities of the implementing agencies are listed in Table 2. The implementation strategy contemplated bridging coordination between 1- national authorities responsible for formulating and integrating climate change policies; 2- the national, regional and local authorities responsible for project implementation; and 3- on-the-ground practitioners of agricultural resource management. This management arrangement was predicated on continuous monitoring of project progress at all levels and will ensure that the project's activities are always aligned with project goals.

The MAL anticipated managing the project through the use of a Project Secretariat (PS) and by delegating specific project activities to appropriate ministries and departments, such as the ZMD, Zambia Agricultural Research Institute (ZARI), Department of Agriculture, Department of Forestry, Department of Fisheries, Department of Veterinary and Livestock Development and the DMMU. The responsibilities of each department are detailed in Table 2.

Project National Steering Committee (Project Board): The PNSC was expected to meet at least once a year. It was the highest oversight body and was created to ensure that the project is consistently aligned with the GRZ's broader climate change, environmental and development objectives as well and remains complementary to the implementation of the FNDP and the MDGs.

Project Technical Committee (PTC): The PTC was expected to meet once per quarter, or more frequently as needed by the project Secretariat and the UNDP CO. They were the main decision-making body of the project and were also responsible for making management decisions, including approval of project revisions.

Project Secretariat (PS): The role of the PS was to conduct a set of administrative tasks related to budget management and M&E; above all, they were responsible for co-ordinating the day-to-day operations of the project. This comprised 1- Principal Land Husbandry Specialist responsible for land management and conservation farming. 2- Monitoring and Evaluation Unit in the Agriculture, Policy and Planning Department (PPD). 3- Financial Management Unit (FMU) responsible for the project's finances.

Programme Implementation Technical Support Team: The Programme Implementation Technical Support Team will consist of short-term and medium-term experts from different fields, who will be engaged in assisting in the delivery of different project outputs and outcomes. These include experts on:

- climate modelling responsible for developing a communication channel that will ensure climate data is properly packaged and delivered in a timely manner to end users, such as policy makers and farmers.
- climate change adaptation, responsible for undertaking the economic impact assessments that investigate the value of using climate risk information to inform agricultural planning.
- policy analysts to review and revise the current policies in the relevant ministries, to be include in climate change considerations.
- economic analyses, knowledge management, communications and M&E to develop the overall progress monitoring system.

Provincial Level Staff: At the provincial level, the Agricultural and Natural Resources sub-committee of the Provincial Development Coordinating Committee (PDCC) was the main project decision-making body at the provincial level. The Provincial Agricultural Coordination Officer (PACO) was assigned an officer from the provincial office to coordinate the involvement of other departments at the provincial level and was responsible for incorporating climate change in provincial development plans.

District Level Staff: At the district level, the Agricultural and Natural Resources sub-committee of the District Development Coordination Committee (DDCC) was the main project decision-making body at the district level. The District Agricultural Coordination Officer (DACO) appointed an officer from the district office to coordinate the

involvement of other departments at the district level, and was responsible for incorporating climate change in district development plans.

Table 4. Roles and Functions of Ministries and Departments in Project Implementation

Ministry/Department	Specific Role
Ministry of Agriculture and Cooperatives (MACO)	· Government Cooperating Agency. · responsible for the government's participation in the project.
Department of Agriculture	· implementing Department and responsible for executing the project. · chairs the Project Technical Committee (PTC). · National Project Coordinator appointed from within the Department. · house the Project Secretariat (PS). · implements project activities through its extension network.
Department of Policy and Planning	· member of the PTC. · responsible for reviewing existing policies to ensure the incorporation of climate change considerations. · facilitate the sharing of lessons and experiences at a national level. · responsible for the M&E.
Department of Veterinary and Livestock Development	· member of the PTC. · provide the PS with technical assistance on livestock related matters during project implementation.
Department of Fisheries (DOF)	· member of the PTC. · provide the PS with technical assistance regarding fishery related matters.
Zambia Agricultural Research Institute	· member of the PTC. · provide field-level technical support to farmers in the project areas, where necessary. · conduct field-level adaptation research on crop diversification options. · responsible for adaptive technology demonstrations in AER I and II.
National Agricultural Information Services	· member of the PTC. · disseminate climate change information. · channel for disseminating weather data from the Zambia Meteorological Department (ZMD) to local farmers. · channel for disseminating information concerning improved climate resilient practices through radio and television programmes.
Ministry of Energy and Water Development (MEWD) (Department of Water Affairs, DWA)	· member of the PTC. · provide technical assistance concerning water-related activities such as dam building. · assist with the revision of water-related policies to ensure that they incorporate climate change considerations.

Ministry of Communication and Transport (Zambia Meteorological Department)	· member of the PTC. · responsible for the coordination and implementation of activities related to meteorological information production and dissemination.
Office of the Vice President [Disaster Management and Mitigation Unit (DMMU)]	· member of the PTC. · recipient of project information and input from the project to incorporate climate change projections into disaster management plans, policies and projects.
Ministry of Tourism, Environment and Natural Resources	· member of the PTC. · Departmental staff (Forestry Department) will be engaged at the local level to implement certain environment-related interventions.
United Nations Development Programme (UNDP) Country Office	· Serve in a technical advisory role during the PIF and PPG processes. · Provide technical support to the Project Manager during the site selection workshops and project preparation phase. · provide support to the National Project Coordinator and the PS concerning the implementation of project components. · responsible for reporting project progress to GEF. · participate in the PTC. · responsible for monitoring (technically and financially) the use of project funds. · mobilize and coordinate support from international partners through a global network. · facilitate the international dissemination of project knowledge and lessons.
Local Communities/ CBOs/ NGOs	· consulted during the PPG process. · Participated in site selection at the National, Provincial, District and Community levels. · participate in the planning and implementation of the project interventions at the community-level.
Agricultural and Natural Resources Subcommittee of the PDCC and DDCC	· Participate in site selection at the provincial, district and community levels. · facilitate the effective coordination of the project at the provincial, district and community levels. · responsible for supporting and monitoring the project at the provincial, district and community levels. · responsible for community mobilization.
Gender in Development Division	· member of the PTC. · resource institution for promoting gender equality and female empowerment. · serve as resource institution for gender-related issues during the project implementation.

Source: Adapted from Prodoc Table 1, page 20

Field Staff: In the project areas, the Department of Agriculture was to provide space to accommodate field-based staff. The field-based staff were to facilitate activities at the local site level and report to the PS. This staff included Block and Camp Extension Officers (BEO and CEOs), Community Development Officer and Forestry/ Fisheries Officers where available. These officers were expected to work closely with the Area Development Committees (ADCs) and the Camp Agricultural Committees (CACs). The BEOs and CEOs were to interact with the interest/user groups through the management committees that were formed at the community level to oversee the management and operations of the investments that will be piloted at the sites. Traditional leaders will also be represented.

4.Project Implementation

Given the comprehensive technical scope of the Project, as outlined [section 3.1], the implementing strategy unwittingly promoted a silo approach among all of the participating agencies. This was confirmed during the working sessions with DACO in Siavonga [Appendix 1 of Annex 7]. In hindsight, what was lacking was an implementation schedule that would sequence a converging participation of these large number of participants. The Project planners underestimated a challenging and key task. It was critical to technically configure the sequencing sub-outputs within outputs such that the outputs could induce the synergy essential to generating agriculture outcomes. Concretely, the task was considerable: it was essential to configure four outcomes, eleven outputs and another eleven sub outputs. These activities had to be conducted within sixteen major interventions, eight of which dealt with the construction/rehabilitation of water resource development for agricultural use. There were four climate-proofed agricultural techniques set for extension, as well as four additional alternative livelihood techniques also set for extension.

Last but not least, the project design identified the national M&E capacity as being limited, yet the Project relies heavily on a monitoring process for adaptive management from the start without immediate strengthening. There was the need to determine the procedures and techniques needed to track down the agricultural results of outcome-two from the beginning, as is done in most agriculture development projects.

In sum, the implementation timeline was three years and, by any standard, it was a complex project with an exceedingly short implementation timeline. If the above real-world planning had been conducted during the inception time, it might have highlighted the actual number of years needed to execute the Project

4.1-Adaptive Management

The Prodoc's approach is typified by the Adaptation Alternatives concept [Box 1]. It combines, wittingly or unwittingly, project implementation with design without sequencing information feedback to enable learning to take place. This turns adaptation without sequencing learning into a moot question. As will be discussed below, decisions in agricultural processes are complex by nature. In the case of infrastructure development, for example, before a decision can be made there needs to be a feasibility analysis of the available alternatives.[42] Consequently, the following findings arise from examining this modality in light of results on the ground, as portrayed in Annex 7.

First, this modality, wittingly or unwittingly, intended to jointly execute both planning and implementation without sequencing a hierarchy of objectives. The evidence indicates that this modality was ineffective for activity implementation and, in particular, for complex activities requiring the completion of one activity before the second activity could occur and be completed. Specifically, in the context of outcome- two, the most significant shortfall was the ineffective planning and preparation for the execution of complex water infrastructure works:

- four multipurpose dams for four different communities;
- one earth-dam for one community;
- six store dams around one community;
    - two reservoirs around one community;
    - three weirs in another community; and
    - the rehabilitation of two irrigation schemes.

Clearly it was unwieldy to conduct the planning of these complex interventions on water resource development while simultaneously executing the four climate-proofed agricultural techniques set for extension, as well as four additional alternative livelihood techniques also set for extension, all within an implementation timeline of three

[42] Adaptive management. Extracted from Wikipedia 2015-10-10

years.[43] After the Mid Term Review, the water works interventions were cancelled. Annex 8 outlines preliminary directives for the planning of irrigation among subsistence farmers. Sometimes the complexities of designing and implementing an irrigation scheme in order to address water scarcity are seriously underestimated. An overview of the key factors and potential options available that are involved in the design of irrigation are outlined as follows:

- First, chart the fundamental data requirements for irrigation development in the context of subsistence farming.
- Subsequently, sketch out a planning process customized to the needs of subsistence farming with special reference to the project areas.
- Lastly, framework to review the economic logic of adaptation/mitigation is outlined. The overarching principle is the intent to allocate resources efficiently between different adaptation/mitigation options to generate agricultural outcomes, specially in the context of important investments that irrigation requires.

From the visit to the field sites, it was apparent that the communities involved were visibly disappointed. It is evident that these interventions were proposed prematurely, i.e. without the results of feasibility or even pre-feasibility studies, as there were no feasibility studies available. Only one environmental impact assessment was available.[44]

Box 1 Adaptation Alternatives [Prodoc pp 31-32]

The project will implement high priority interventions within the pilot sites, the effective implementation of which will contribute towards boosting agricultural productivity under changing climatic conditions and improving the income streams of vulnerable farmers.

For example, crop diversification is an important response to the impacts of climate changes on maize (80% loss of suitable croplands, see paragraph 14). Fish farming and rice growing are both important potential adaptation options, as they could become more viable with climate change (i.e. using harnessed floodwater).

Other interventions (such as soil and water conservation and soil improvement techniques) will rehabilitate degraded lands, allowing the expansion of agricultural activity, and alternative livelihoods will be investigated, tried and tested.

To effectively mitigate the effects of drought in the pilot sites, water storage and irrigation facilities will be developed (and rehabilitated where necessary). This will also serve to improve agricultural productivity under changing climatic conditions by providing water to humans, livestock and crops.

These interventions will be tested at the pilot sites to identify the interventions that can be upscaled catalytically to other areas of AER I and II, based on their demonstrated cost-effectiveness. Furthermore, the interventions will aim to build local capacity to ensure that the adaptation measures are sustainable beyond the project's lifespan.

The approach taken to identify the interventions that can be catalytically up scaled to other areas of AER I and II is as follows:

- Undertaking "economic experiments" i.e. implementing the priority adaptation interventions identified by pilot sites in a scientifically controlled manner.
- Assessing the profitability of interventions (cost-benefit analyses) and using this information to revise policy and catalyze entrepreneurship. This will be done after the first year of operations (likely in Year 2 of the project).
- Determining which interventions are most successful in terms of profitability and feasibility.
- Determining which interventions will be spontaneously adopted by entrepreneurs within the communities, given the right economic and regulatory environment (policies will be amended to facilitate this). Barriers to this and to the upscaling of interventions will be determined and documented. This information will be used to catalyze policy revision. In addition, during the analyses, incentives for interventions will be identified and provided should the intervention fail.
- Training management committees in order to equip them with the ability to train neighbouring communities in the adoption of profitable interventions. Training management committees consisting of community members to oversee the implementation of successful interventions will ensure ownership and the longevity of the interventions at the local level. Training will not only involve the actual intervention but will also include financial, administrative and business management training in order to facilitate entrepreneurship involving interventions. A strong focus of the project will be to sufficiently capacitate members of the management committees in order to promote the idea that the committees become permanent features within each pilot site. Each pilot site will establish one management committee and sub-committees where necessary for managing specific interventions. For example, Kataba requires two management committees, one for fish farming and one for rice farming. Therefore, the project will establish one management committee with two sub-committees for these two interventions.

Additionally, in order to ensure that the pilot interventions are successful and sustainable after the project's lifetime, the following activities will be undertaken at all of the pilot sites for all of the interventions under Outcome 2:

[43] It appeared a moot issue to attempt to determine the quantity of quality of manpower needed to conduct joint planning and implementation in an agricultural setting.

[44] MAL / UNDP Environmental Impact Assessment. Final Report. District Level Corrective Action Plans for Water Infrastructure Projects in Chirundu and Chongwe *ZENITH CONSULTING COMPANY LTD [no date]*

Market access will be improved for the products produced on the pilot sites and farmers' access to input markets will also be improved. A consultant will be hired to review the existing agricultural marketing arrangements at the pilot sites to identify gaps. In addition, he/she will review existing interventions more broadly to extract lessons learned and promote partnership linkages. Based on these gaps, an improved marketing system will be developed, which will assist in boosting the income streams and introduce farmers to sources of high yielding inputs (such as fertilizers). This will shift the focus of existing agricultural production from subsistence activities and maximize benefits from the pilot interventions, promoting their sustainability.

- Access to weather forecasts will be improved to allow farmers and input suppliers to make informed pre-production decisions (i.e. to ensure that the appropriate seed will be planted depending on anticipated seasonal weather). This will minimize losses and protect investments.
- Continuous monitoring of the i) progress; ii) productivity; iii) feasibility and profitability (using cost-benefit analyses); and iv) acceptability by the farmers.
- Capacity will be built (through training) within the management committees to ensure continuous monitoring and improved management above and beyond assistance received from extension officers.
- Lessons learned will be continually captured during the process by knowledge management experts. These will be documented in the form of technical reports as well as in a feasibility analysis, which will be used for lobbying for policy change and catalyzing upscaling.
- Public awareness on the benefits of adaptation will be increased through the continuous capturing of lessons learned and their dissemination to the general public by the NAIS. This will be achieved using newsletters, television programmes, radio programmes, brochures and newspaper articles. This increased awareness will assist all stakeholders when lobbying for policy changes.

Sometimes is unclear to development agencies that an irrigation system is an expensive and complex input for agricultural production. Therefore, in a typical situation, proposing an irrigation system to the communities should be done based on sound evidence of technical, economic, social and environmental feasibility. Concretely, the areas under consideration need to establish basic parameters, i.e. the presence of suitable lands and available water supplies for irrigation purposes. These require detailed surveys, i.e.: topographic surveys; water surveys covering the entire drainage area; soil surveys used to select land suitable for irrigation; legal surveys used to ascertain the national and local laws [especially customary laws] associated with the future use and management of land, water and people for the administration of the irrigation scheme; and finally, ancillary support.[45] Ultimately, there is the need to address the issue of the consequences of building water works on other users of the water resources, commonly refer as the losers and winners from the development. Irrigation water increases the demand for land with irrigation, and often women loose access to this land, unless necessary arrangements are made with traditional authorities. Annex 8 sets out a preliminary planning process for irrigation development with particular reference to small scale agriculture.

Another consequence of this faulty modality was that the Project's farmers were deprived of the anticipated improvement of access to the market, either to sell their produce or to purchase inputs. As the evidence testifies [sec 5, Annex 7], the adoption of high-yielding and drought resistant crops introduced by the Project, which have greater return than maize, is hindered by uncertain commercialization. The market and marketing studies and associated arrangements had to be sequenced at the very beginning so that the results could be incorporated by farmers as they began considering the adoption of crops and techniques proposed by the Project. To this extent, the intended benefits to be accrued by small farmers was compromised.[46]

However, if truth be told, the UNDP and other donors have used the approach of jointly conducting both planning and implementation in crisis countries moving from humanitarian assistance to economic reconstruction, such as Afghanistan, Iraq and others. The Recovery and Employment Afghanistan Program (REAP) in early 2003 conducted works in Kabul, Kandahar and Jalalabad.[47] More than 260 works were carried out, creating short- term employment

[45] This latter element includes, credit facilities, access to prices information on markets and marketing channels, continuous technical assistance including plant health, transportation, domestic water supply, schooling, and actual land tenure conditions. More often than not, these ancillary factors have a decisive influence on the performance of irrigation schemes, especially in terms of markets, transportation and marketing channels, and land tenure system which provides security and equal access to women. Cf: FAO Successful irrigation: planning, development and management. 2nd printing, Rome, 1975

[46] It must be noted that simple activities, without any prerequisite, were executed. Regrettably there are no measurements on activity implementation.

[47] UNDP/Afghanistan. Country Programme Review. Mission Report. E.R. Quiroga, team leader, A. Mojaddidi, consultant. Kabul, February 2005

for more than 40,000 people. Approximately 285 km of roads were rehabilitated; 330 culverts constructed; 150 km of irrigation canals cleared; 12 parks rehabilitated; 12,000 trees planted; 660 km of drainage canals reconstructed; 85 buildings rehabilitated or constructed; and more than 200,000 cubic meters of rubble and rubbish cleared away from urban areas. Thus, in total more than 1.66 million man-days of labor were created. However, there was no evidence that aggregation of these realized outputs brought about development outcomes to improve peoples' lives. For example, from the irrigation and drainage canals repaired, there were no records of the number of hectares under irrigation, nor who benefitted from these hectares under irrigation. Clearly, the principal intention of this project was to avoid famine or uncontrollable displacement of the population, as is currently taking place in Syria.[48] In sum, this planning modality [simultaneous execution of planning and implementation procedures] is inadequate for the adaptation/mitigation to climate change of the agricultural sector of Zambia, with special reference to small landholders.

In conclusion, the project's implementation was defective. There was a set of activities normally conducted during preparation [the marketing arrangements needed, the irrigation works] that were expected to be conducted during implementation. In hindsight, what was needed was an implementation schedule that considered sequencing such that the implementation of sub-outputs within outputs would induce the synergy needed in agriculture outcomes. If the resulting synergy was sufficient, outputs could generate outcomes. [49] This type of real-world planning might have highlighted at the start the actual number of years needed to execute the Project. In addition, the monitoring process would have identified procedures and techniques needed to track down agricultural results, in addition to the administrative monitoring of the UNDP. Lastly, there was the need for contingency planning to redirect implementation, if required, during the mid term review.

4.2-Partnership Arrangements

The linkages between project and other interventions within the sector outlined in section 3.8 were the most relevant.

The following issues were identified as requiring analysis by GEF's M&E specialist :

- the overall effectiveness of project arrangements and management (as outlined in the Project Document), as well as actual implementation
- ensuring responsibilities and reporting lines are clear;
- decision-making is transparent and undertaken in a timely manner; and
- the quality of the execution of the executing agency

As already indicated, the limited resources assigned to this TE militated against a comprehensive analysis of project management, as TOR [page 2] underscores the assessment of goals, objectives and results to draw lessons that can improve the sustainability of benefits and enhance UNDP programming. This can be corroborated by reviewing the Mission's itinerary [Annex 2] and the list of persons met [Annex 3]. The time devoted to these issues was almost nil due to the limited resources assigned to this TE. However, in the interest of advancing UNDP programming, , there was the need to schedule agricultural targets yearly and aggregate targets in each site. A master plan was required to schedule and guide the project's global implementation in all eight sites, ensure the completion of all anticipated activities, and facilitate additional efforts to ensure that outputs produced generate outcomes. In this context, the water resources development and management component required a complete feasibility analysis before reaching the farmers. This feasibility study required specific and varied datasets identified in Annex 8, which are seemingly unavailable at this time.

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[48] Similarly the Iraq Reconstruction and Employment Programmes (IREP I,II,III) a nation-wide programme created short term employment on projects to rehabilitate village or town infrastructure to the tune of 5.3 million man-days. The material impact might not have been considerable but it was a bold initiative to provide relief to the civil population and avoid faminine and uncontrollable displacement of civil population. Cf. UNDP/ Iraq. Outcome Evaluation of UNDP Governance, Crisis Prevention and Recovery, and Poverty Reduction Initiatives in Iraq. Mission Report. Dr. Jim Freedman, Team Leader, Dr. Eduardo Quiroga, Dr. Amal Shlash, Dr. John Weeks. Amman, June 2009

[49] The UNDP's Workplan that links activity execution with disbursement. It is a sound administrative tool, but is not an implementing mechanism for the physical execution of activities leading to the realization of potential synergies.

The Prodoc does not deal with this complexity and instead proposes joint implementation and execution. This approach delivers inputs on the ground; it does not lead to development results. Ultimately, the Prodoc outlines the implementation procedures normally used for capacity development projects. The consequences of this approach are being reviewed by this TE. The conclusion is inescapable. The Project, as presented by the Prodoc, is not implementable as a standard agricultural project.[50] A second opinion, in the form of an Appraisal Report before implementation, would have been useful as a way of reconsidering the interventions, the sequencing of interventions, implementation time and other issues that come along with complex agricultural projects. I

Moreover, if it is hypothetically assumed that the overall effectiveness and implementation of project arrangements and management (as outlined in the Project Document) were highly satisfactory, including clear reporting responsibilities, transparent decision-making, responsibilities and reporting clear lines, transparent decision-making and undertaken in a timely manner, it is not necessarily evident that the overall results would have been significantly different, unless the MTR would have recommended the re-design of the project.

The executing agency [MAL], particularly PACO and DACO appeared to have the expertise needed to meet the technical requirements of nearly all of the 19 initiatives, based on the discussions at the Siavonga meeting about Project Results. On the surface, the number of experts seemed insufficient to meet the demand in eight sites spread out in southern Zambia. The extension-information system, essential in agricultural projects, was not up to the requirements.

The comparative advantage of UNDP is well established and has been discussed in section 3.6. This Project was an agricultural project from A to Z with emphasis on agronomic techniques and infrastructure to cope with climate variability and global warming. In terms of the agricultural expertise needed to address climate variability , while the specific components are available, the complete configuration is in the making.[51] When agriculture was in the development agenda, UNDP worked out effective agreements to design and implement agricultural projects.

4.3-Feedback from M&E Activities Used For Adaptive Management

The key feature of adaptive management applicable to the Project under evaluation is that decision-making is iterative. Put simply, decision-making is based on assessing results and adjusting actions on the basis of what has been learned. This implies a continuous process of feedback between monitoring and decisions based on learning. However, information feedback, if inadequate, can prevent the effective adaptive management of decision making. Evidence shows that far too often data collection for M&E , in particular baseline information, is not implemented or the data analyzed show inconclusive results. Sometimes in many occasions the data is analyzed and presented but is not used for decision-making because of internal or external factors.[52]

In a few cases, like the Yap people of Micronesia, people have been using adaptive management techniques to sustain high population densities in the face of resource scarcity for thousands of years.[53] The Yap people have altered their environment and created, for example, coastal mangrove depressions and seagrass meadows to support fishing and termite resistant wood.

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[50] It must be noted that the outcome-two is the cornerstone, and outcomes one, three and four are contingent on outcome-two

[51] Although there are a series of skills available, the precise set of skills to address climate variability in the agriculture of developing countries is in process. McGill Institute for Food Security. Current and Future Challenges for Sustainable Food Security. 2015 Conference. McGill University, October 2015

[52] Elzinga, C.L., D. W. Salzer, J. W. Willoughby (1998). Measuring and Monitoring Plant Populations (PDF). Denver, CO: Bureau of Land Management. BLM Technical Reference 1730-1.

[53] Falanrue, M. People pressure and management of limited resources on Yap (in McNeely, J.A.; Miller, and K.R (eds)). Washington DC: The Smithsonian Institution Press. 1984

In the present situation, M&E data was collected following the framework of UNDP procedures. However, baseline information was not completed for the present evaluation. This TE designed proxy-baseline framework [Annex 7]. . More concretely, the monitoring and evaluation procedures of the Project's lynchpin [outcome-two] were not identified at any of the different levels required. Therefore, a gap emerged in terms of the effectiveness of instruments and the indicators used to measure the progress and performance of the agricultural interventions. This gap made the measurement of progress and the achievement of expected results difficult. Proxy tools to deal with this gap were designed and used during the execution of the terminal evaluation. These issues are discussed, both conceptually and operationally, in detail in sections 2 and 3 of Annex 7.

In sum, the available evidence indicates that the monitoring results, to the extent that the monitoring was not focused on the performance of agricultural outputs and outcomes, had little or no potential to be used for adaptive management.

4.4-Project Finance

Synthesis

It is clear that the Project carried out its administrative and financial operations in accordance with the Project Document, financial rules, regulations, practices, and procedures of the Government of Zambia, and in accordance with UNDP rules and regulations. The Project's assets and equipment were also properly managed; it maintained an appropriate financial management structure, internal control and record-keeping system. The subtext of the finance/co-finance picture conveys that the Project, as it was designed and implemented, did not need additional funds. Specifically, cancelling the water resource development works after the MTR contributed to the 20% unspent resources. It is, therefore, logical to infer that efforts to acquire additional funds were not a priority. Discussions with UNDP and MAL confirm this statement. However, this situation does not imply that financial resources are available to cope with adaptations needed in the agricultural sector as a whole.

The following factum on the Project's financing and co-financing has been submitted by the UNDP CO to the Mission.

UNDP Expenses

In line with the Project Steering Committee's request, UNDP's own financing increased to finance the incorporation of additional beneficiaries in the Project. UNDP contribution rose from USD 175 000 to USD 770 857, that is, an increase of 22%. This was reflected in the Annual Work plans. These additional UNPD funds also covered supplementary transportation needs that were identified during Project implementation, as well as a saddle dam to avoid flooding in downstream communities.[54]

Government of the Republic of Zambia

The Government contribution in-kind was mostly dedicated to office spaces and their maintenance, and officers' emoluments who were supporting the Project in regional, provincial, and national levels.

GEF

There is an approximate 20% difference [USD 1,126,638.10] between the projected and actual expenses. The UNDP CO indicates that this GEF funding discrepancy was due to the fact that the final disbursement to the TE consultant, along with other expenses, have not yet been paid out. Furthermore, there are pending payments for the project support costs to be paid to UNDP. Once these are paid, the balance is expected to be nil. These figures are shown in Table 5.1 of Annex 5.

4.5-Monitoring and Evaluation: Design at Entry (*), Implementation (*) and Overall Assessment (*)

[54] The specific site where the saddle was constructed was not identified, neither were the characteristics and cost of saddle pinpointed.

Monitoring and Evaluation	Comments	
Overall quality of M&E	MS	There was a framework in place, and reporting from pilot site level with aggregation of data in APRs took place. Technical assistance to design an agricultural framework was essential.
M&E design at project start up	MU	M&E framework did no measure agriculture activity and performance including output value. The baseline information was not completed.
M&E Plan Implementation	MU	Despite the M&E plan in place, and absence the baseline information, the Terminal Report was submitted but was incomplete as well. These two benchmarks are fundamental for monitoring results.

Framework

Prior to the assessment of the M&E plan and implementation, as designed in the Prodoc [62-67], it is important to understand that this evaluation was conducted under less-than-ideal conditions, particularly with respect to the availability of relevant information.[55] Therefore, the focus has been on gathering a minimum set of priority core indicators, associated with outcome-two [the Project's cornerstone], rather than a desired set. [56] The Inception Report proposed a simple methodology and procedures for collecting data, data collection instruments (e.g., crop budgets, MSC stories, LFA questionnaires), the selection of representative pilot sites and associated sampling procedures to ensure reliability and validity.[57] In line with the UNDP GEF guidelines for Terminal Evaluations,[58] Annex 7 validated the procedures used in the field data collection, i.e. clarifying any differences from the planned procedures set out in the Inception report; exposing how the baseline was triangulated and used to assess how the conditions have changed with the Project in the three sites reviewed; and, lastly summing up the results obtained in each of the pilot sites visited in order to assess to what extent a tangible adaptation in skills has taken place to cope with climate variability and global warming and the ensuing consequences in crop yields, cropping patterns and farm income.

What follows is a brief scoping review of the ramifications of the M&E in the context of climate change adaptation issues among subsistence farmers. This is followed by a brief assessment of the design and implementation of the M&E as reported in the Prodoc [pp 63-68]. Subsequently, a review of the actual datasets needed based on the implementation of the terminal evaluation is described as a lesson learned.

Scope

[55] It is noted that there was at least 80% of the information available [according to the Project team]

[56] FAO/WB/GDPRD. Tracking Results in Agriculture and Rural Development in Less-Than-Ideal Conditions: A Sourcebook of Indicators for Monitoring and Evaluation. 2008 Extracted from on 10/10/15 from www.fao.org

[57] UNDP /GEF/ GOZ/ MAL Adaptation to Climate Variability and Change in Agro Ecological Regions I and II (PIMS # 3942) TERMINAL EVALUATION Inception Report Eduardo Quiroga UNDP Consultant. Draft: July 14, 2015 Final Version, pp 5-19

[58] UNDP.Project-Level Evaluation Guidance for Conducting Terminal Evaluations of UNDP-Supported, GEF-Financed Projects. Evaluation Office, New York, 2012.

As in many other countries of Sub-Saharan Africa, the bulk of Zambia's farming communities are composed of small holding farmers. Although there are many ways of classifying the subsistence farming system,[59] the core elements are : 1- the level of production is geared towards meeting the subsistence needs of the family unit, 2- a partial portion of the production is destined for the market so that the proceeds cover supplementary family needs, and 3- the technology is traditional without necessarily implying that farmers are reticent to learning and using new techniques. Indeed, there is evidence that new techniques are accepted if it is clear that it is in their economic interest to take the risk of adopting the technology.[60]

It is clear that our knowledge is imperfect to configure resilient agricultural productivity as well as the methods to measure the process of technological transformation.[61] It follows that the metrics used to measure the agricultural performance of subsistence farming systems is not established. It is difficult to disentangle the socio-cultural factors intimately intertwined with production and investment decisions under a subsistence farming system.[62] However, subsistence farmers in the pilot sites and elsewhere now face the challenge of adopting new techniques to cope with climate variability and global warming.

To this end, the use of monitoring systems has been productive in achieving the best outcome based knowledge drawn from monitoring. The overall purpose of a monitoring system is to reduce uncertainty overtime by assessing results and adjusting actions on the basis of what has been learned. This implies a continuous feedback process between monitoring and decisions based on learning. Evidence indicates, however, that effective monitoring is data-sensitive.[63] Breakdowns in information feedback can prevent the effective contribution of the monitoring system to the process of learning and changing a system, when needed.[64] Specifically:

- data collection is never completely implemented;
- data is collected but not analyzed;
- data is analyzed but results are inconclusive;
- data is analyzed and is interesting, but is not presented to decision makers;
- data is analyzed and presented, but is not used for decision-making because of internal or external factors.

Given the scope outlined, the assessment of the M&E plan and its implementation has focused on two principles. First, climate change is global and adaptation is local, in particular agriculture with special reference to subsistence farming; consequently there is no "one-size-fits-all" approach. A subsidiary principle is that the M&E plan is reviewed with a focus on the realities of agricultural development for subsistence farming in the project area. It follows that the procedures and activities used to gauge the progress of resilient agricultural productivity must be capable of flexible responses.

M&E Design at Entry/Implementation and /Overall Assessment

[59] One report classifies Zambian small holding farmers into sub subsistence, marginal subsistence and viable small holding farmers. Cf. World Bank Zambia Smallholder Agricultural Commercialization Strategy. Washington, DC, 2007 pp iii-vii

[60] Cf: Box 7.1 of Annex 7 brings forth historical and ethnographical evidence about small holding farmers incorporating agricultural innovations that is consistent with their economic interest as they perceive benefits.

[61] Krystyna Swiderska, et. al. The Governance of Nature and the Nature of Governance: Policy that works for biodiversity and livelihoods, IIIED, no-date, pp 18-25

[62] The key work is : Tax, S. Penny capitalism. Smithsonian Institution. Publication 16. Washington, DC, 1953. Also, see: Schultz, T. W. Transforming traditional agriculture. Yale University, 1964.

[63] Elzinga, C.L., D. W. Salzer, J. W. Willoughby (1998). Measuring and Monitoring Plant Populations (PDF). Denver, CO: Bureau of Land Management. BLM Technical Reference 1730-1.

[64] As the present case highlights M&E must bring forth relevant data to meet its objectives. However there are structural barriers as discussed in: FAO/WB/GDPRD. Tracking Results in Agriculture and Rural Development in Less-Than-Ideal Conditions: A Sourcebook of Indicators for Monitoring and Evaluation. 2008. Extracted on 01/10/15 from www.fao.org

The monitoring and evaluation plan outlines a standard approach within the framework of UNDP administrative procedures. In principle, the roles and responsibilities for tracking progress towards achieving objectives are well articulated, including the standard type of monitoring and evaluation activities that are normally conducted in UNDP projects. It is essential to consider that UNDP project- design focuses primarily on capacity development for institutional transformation. Although technological transformation is necessary to transform or enhance agricultural output [crops, trees, animals including fish], institutional reform and alignment can induce technological transformation by enabling conditions to incentivize production. There is a close interaction between technological change and institutional transformation in agricultural development, as discussed in section 2 of Annex 7 and the development literature in general.[65]

In terms of technological transformation on the ground among subsistence farmers, outcome-two is the Project's cornerstone. Its repercussions were anticipated to be reflected in outcomes one, three and four. Indeed, the Prodoc [pp 22-23] establishes outcome-two as the cornerstone of resilient productivity in crops as well as animal production [goats rearing, bee keeping, and aquaculture] and activities were identified for baseline work. Ultimately, there was no M&E plan to track the adaptation of small holding farmers in the context of the Project's objectives.

Unsurprisingly, a gap emerged in terms of the effectiveness of instruments and the indicators used to measure progress and performance of the agricultural interventions. Baselines were not collected as anticipated. With the use of logframes, the Project collected anecdotal evidence from focused interviews with selected farmers about the results of introducing the anticipated technological changes. However, there were no instruments to collect basic data on yields, cropping patterns, and output per production unit to determine economic return. Similarly, due to the absence of a baseline it was not possible to measure targets of yields, outputs, and farm revenue. Overall, as will be analyzed below, this gap made the measurement of progress and the achievement of expected results difficult. For the execution of the terminal evaluation, a set of proxy tools were designed, including a baseline. These issues are discussed, both conceptually and operationally, in detail in sections 2 and 3 of Annex 7.

Moreover, Annex 9 reviews in detail the datasets needed based on the implementation of the terminal evaluation. These datasets are the type of information normally required during the M&E of agricultural projects. The intent of this section is to summarize how these datasets were obtained during the terminal evaluation. The purpose of the narrative is to draw lessons learned.

Lessons Learned:[66] The Different Datasets for the M&E of Agricultural Outcomes

As discussed before, agricultural projects are complex undertakings. It is essential to synchronize the biological cycle of crops [trees or animals, including fish] with hydrological and climate conditions, especially precipitation and temperatures, using production techniques. This complexity has increased with the mitigation/adaptation process to climate change.[67] This is because the process of synchronization with the social system, with particular reference to climate change parameters, requires additional efforts from the standpoint of capacity building and skills enhancement resource accessibility where the target-populations are located, in order to induce an agricultural system based on resilient productivity. Therefore, according to the framework used, [68] the datasets essential for monitoring and evaluating agricultural initiatives embrace several levels.

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[65] Hayami, Y & V Ruttan. Agricultural development: An international perspective. 2nd ed. John Hopkins University, 1985

66 "Lessons learned from an evaluation comprise the new knowledge gained from the particular circumstances (initiative, context outcomes and even evaluation methods) that is applicable to and useful in other similar contexts. Frequently, lessons highlight strengths or weaknesses in preparation, design and implementation that affect performance, outcome and impact." UNDP. Handbook on planning, monitoring and evaluating for development results. New York, page 180

[67] This fact was clearly agreed upon during the Workshop conducted in Siavonga with implementing cadre of the seven pilot sites. Cf Appendix 1 of Annex 7

[68] In this assignment we have used the comprehensive framework of : Dennis J. Casley & Lury, D.A. Monitoring and evaluation of agricultural and rural development projects. World Bank publication. John Hopkins University Press, 1984. This framework is consistent with the economic assumptions related to the project analysis of agricultural projects which are being used in this exercise. See: section 2.2.1, Annex 7

The Fist Dataset Level

This level covers monitoring indicators within the administrative framework of UNDP procedures as discussed above. The available evidence indicates that this set of administrative monitoring activities is necessary in the various stages of project implementation. However, it is now clear that this set of monitoring activities alone are insufficient to track changes in the technological transformation process in agriculture.
Concretely, during the project's start-up phase the baseline situation was not measured, despite the fact that the associated methodology and respective roles and responsibilities were articulated. Consequently, during the implementation of the TE there was no option other than to use proxy baseline measures to gauge possible changes in crop yields, cropping patterns and ensuing economic results at the farm level, as discussed and designed in sections 2 and 3 of Annex 7.

More concretely, the Project's monitoring activities were characterized by an absence of systematic interactions with beneficiaries to measure how they were using the inputs provided; determine what the output in terms of crop yields was; measure the size of the area under production; determine the destination of the output as well as how much was consumed by the family unit and what portion of the total output was directed to the market; and lastly, what the commercialization procedures were at the farm-gate level. The Project interviewed farmers about their experiences with the new proposed technologies. This anecdotal testimony is useful as indicative evidence for further in-depth work either through surveys or case studies. There was no in-depth follow up, possibly due to a lack of a conceptual framework to monitor agricultural projects.

The Second Dataset Level

This level consists of an array of information often formatted as national, regional or standard indicators. This information is available among the different national ministries, civil organizations, NGOs (both national and international), and donors' representatives.[69] This dataset is related to: 1- technical parameters associated with factors that can contribute to the project's physical performance, i.e. hydrological and environmental parameters linked with watershed management, precipitation and others; and 2- economic parameters reflected in local and regional prices of staple and cash crops, especially those linked to project activities. It is clear that any fluctuation in prices can disturb the performance of projects. Price information from local and national markets make for simple indicators, however this information was not available under the Project's monitoring procedures.

In fact, additional information linked to the performance of an agricultural project and that affects the performance of farmers, both male and female, relates to: 1- the prices and fluctuations of direct farm supplies, i.e. seeds, fertilizers, equipment, etc. ; 2- educational, health and social facilities that are of particular concern to women, as mothers, as well as wives and members of extended family networks;[70] and 3- as agricultural production intensifies the need for sources of additional resources, such as credit, arises. This requirement is linked to customized advice on technical issues related to crop production and commercialization that can have vital repercussions on the project's performance. This was not considered under the Project's monitoring procedures.

Lastly, the Project distributed inputs to farmers. This information, if systematically registered, can provide an opportunity to configure performance indicators related to 1- rates of usage of inputs, i.e. seeds, fertilizers, and goats provided by the Project ; and 2- the usage rate, which can yield information on adoption rates, which in turn can also

[69] It is worth emphasizing that project M&E of any sector is second-tier effort. In other words, project M&E does not generate information. It uses information for national, regional providers. This is a difficult issue to deal with in countries with limited statistical capacity.

[70] There is compelling evidence showing that when these social facilities are not available and accessible to women, the repercussions on their performance are negative. One must keep in mind that more than half of the food produced in the regions is carried out by women farmers.

yield the repayment rate, also known within the project as the "pass on" modality. However, the Project has not produced this kind of monitoring information. The Terminal Evaluation conducted a survey in the three selected pilot sites based on farm budgets to capture some qualitative elements of the inputs distributed by the Project. The structure of the survey is described in detail in sections 4 and 5 of Annex 7.

The Third Dataset Level

This level is critical to conducting evaluations and relates to output indicators, including the disposal of outputs, i.e. the commercialization of outputs. More concretely, output indicators are related to the farmer's stated estimate of production of a given crop or livestock operation in a given production season. Direct measurements include areas and yields of crops under production per unit areas, both with and without the project. In the case of livestock [animals and fish], direct measurement includes the number of live animals, milk production, and the off take of animals including fish [volumes and weight]. The associated economic indicators reflected in prices at farm-gate, wholesale, and retail are essential to estimating the gross and net revenue of farm income. In the absence of this information, it was not possible to measure farm income. This, despite the fact that the Prodoc [page 22] indicated that changes in farm income was the key metric to appraising the performance of this Project. Therefore, the Terminal Evaluation used proxy farm income indicators and conducted a survey in the three pilots sites selected to gauge the gross and net farm revenue among farmers that participated in the Project. This is discussed in detailed in sections 3, 4 and 5 of Annex 7.

Besides meeting their subsistence needs, farmers have demands to meet in terms of health and education requirements for their families. The presence of these services near the project areas contributes to a better overall performance in terms of project outcomes. For example, evidence reveals that the level of health and education services available was directly linked to better levels of economic performance in production and vice versa. Regrettably, these indicators were unavailable and it was not possible to gauge the effect of health and education on the overall Project performance, especially for the small holding farmers.

4.6-Implementing Agency (UNDP) execution (*) and Executing Agency execution (*), overall project implementation/ execution (*), coordination, and operational issues

IA & EA Execution		
Overall Quality of Project Implementation/Execution	□MS	
Implementing Agency Execution	□MS	Reportedly HACT Assessment modalities played a role in project implementation delays; moreover, project implementation did not take into consideration the necessary planning process required in an agricultural project. Last Audit Report suggests that UNDP needed to provide more guidance in the planning and execution of Project activities. UNDP CO made efforts to maintain a working relationship with the national partners, especially MAL.
Executing Agency Execution	□MS	The few members met from project management team at MAL appeared motivated, especially now that the project began producing early results, albeit the project is closed. On the pilot sites visited MAL engagement was robust. Leadership and organization to enable the transfer of technology to cope with climate variability is understood but not yet operational. Subject matter specialist acknowledge working in a silo modality. Greater coordination in delivering technological packages is vital. These packages should be economically viable and environmentally sustainable.

As discussed in section 1.1.1, the limited resources available to this TE militated against a comprehensive analysis of project management. The TOR [page 2] underscores the assessment of goals, objectives, and results so that we may draw lessons on how to improve the sustainability of benefits and enhance UNDP programming. Furthermore, the Mission's itinerary [Annex 2] and the list of persons met [Annex 3] shows that the amount of time scheduled to review the Project's management performance was almost non-existent.

Available evidence suggests that the effective implementation of such an ambitious project [19 interventions simultaneously throughout 8 different pilot sites, in just four years] was an unwieldy implementation task [cf Table 1]. The last Audit report [71] identified a few instances of of inadequate planning with limited risk to delay project execution. Despite these planning shortfalls, the rate of Project delivery was found as per work plans; and all Project disbursements were made in accordance with Prodoc, financial rules, practices and procedures of the Government of Zambia and with the UNDP. As the Terminal Report is in progress, it is difficult to measure overall performance of delivery as we lack the final global targets and achieved figures.

UNDP's comparative advantage in capacity development is evident. Section 3.6 outlines the fact that the UNDP has been doing path-breaking work about the effects and characteristics of climate change in the short- and long-term in various economic sectors, including agriculture. Although climate change research and evidence has increased in recent years, concrete knowledge on how to adapt to climate change is embryonic, especially when it comes to the performance of institutions in the process of technology transfer among subsistence farmers.

Despite these constraints, the UNDP's ongoing initiatives, such as the current Project, are critical because they create the opportunity to learn about subsistence farming's response to technology transfer in the context of climate change adaptation. By implementing this Project in less-than-ideal conditions, the UNDP and GRZ have opened up a rich vein of information on the issues and problems related to subsistence farming and climate change adaptation. The current agricultural Project laid emphasis on agronomic techniques and infrastructure to cope with climate variability and global warming.

The teachable moment is that the UNDP's armamentarium for implementation, execution, and coordination needs to be customized to the requirements of each agricultural project, especially if the agricultural component is linked to additional actions. A management specialist should configure UNDP's new management armamentarium for climate change adaptation in agriculture. In terms of the agricultural expertise needed to address climate variability, while the specific components are available, the customized configuration is still under development.[72] When agriculture was in the development agenda, the UNDP worked out effective agreements to design and implement agricultural projects with partners like FAO and IFAD.

5.PROJECT RESULTS

5.1-Overall Results (*)

[71] : MKM Solutions. Audit Report on the Statements of Expenses (CDR), Assets and Cash Position. For the year Ended 31 December 2014. pp 21-32

[72] Although there are a varied sets of skills available within the field of agriculture, the precise set of skills to address climate variability in the agriculture of developing countries is in process. Cf. Current and Future Challenges for Sustainable Food Security. 2015 Conference. McGill Institute for Food Security. McGill University, October 2015

Outcomes		
Overall Quality of Project Outcomes	□MS	Overall, all outcomes are absolutely essential so that small-holding farmers can cope with climate variability and global warming. Three years was an inadequate timeline
Relevance	□S	Although outcome-two is the Project's cornerstone, and outcomes one, three and four are contingent, they are all very relevant.
Effectiveness	□MS	In the context of outcome-two, the survey conducted in the TE has shown that overall targets are attainable through the technological change proposed by Project which brings about growth in farm revenue. To the extent that outcome-two is realized, the other outcomes will follow suit.
Efficiency	□MS	Free-inputs and technical advise appeared as the drivers of the early results from outcome-two. Considerable efforts should go for repayment schedules to enable a greater number of beneficiaries

All evidence points in the direction of an initial spurt of technological uptake that has made an early positive impact on the food security conditions among the Project beneficiaries interviewed, and especially among female farmers who expressed enthusiasm as they felt empowered by the Project outputs.

At a minimum the farmers interviewed, both female and male, are aware that there are technological options to cope with climate variability and global warming. Thus, an embryonic trend of technology transfer from subsistence agriculture towards a farming system based on resilient productivity has begun. This trend is consistent with the historical pattern of the area peoples engaging in continuous experimenting, appraising, and making informed decisions, as illustrated in the portrait of the Kayuni village [Box 7.1 of Annex 7]. The specific results concerning the evolution of yields, cropping patterns and ensuing farm revenue are as follows.

Regarding the evolution of crop yields and cropping patterns raised in the project areas, the data [Graph 7.2 of Annex 7] illustrates minor upward and downward changes from 2010 to 2015. The overall fluctuation pattern follows the national averages, indicating that the national trend leads the production conditions in the project areas. Although national crop yields are slightly higher than in the project areas, this can be accounted for by the fact that the Project intended to target farmers in the project areas that had limited assets and resources.

Perhaps it is not surprising that if changes in crop yields from the conditions both with and without the Project are minor, so are the changes in cropping patterns shown in Graph 7.3 of Annex 7; the cropping patterns of 2010 and 2015 are practically similar. Maize continues to predominate not only because it is the staple crop used nationally for daily consumption but also because some new high-yielding varieties have been taken up by some farmers, as sporadically reported in the Mission's survey.[73]

Although there is no yearly cropland estimates available, it is not clear if the significant increase [62%] of cropland from 2010 to 2015 is due to a greater use of drought-resistant varieties. It is remarkable, however, that in the 2015 cropping pattern, there is an increase in the use of a drought-resistant crop, groundnuts. It is evident from the prevailing cropping patterns that the farmers from the sample reviewed in this Mission were the main technology-adopters.

[73] It must be noted that the Mission worked with the information available which has been cited every time including table number.

Concerning farm revenue, the Project targeted a 10% increase in farm income across the outputs associated with outcome-two. Based on the mission's estimates [proxy information elaborated in section 3 of Annex 7], in 2015 the targeted farm income expected should be K 2310.[74] The crop returns per ha are probably the best proxy for farm revenue, since both nationally and in the project areas small landholders operate farms of about 1 ha.[75] The Household Survey conducted in 2015 estimated that small landholding farms producing mixed beans [K2333/ha] reached the income target.[76]

The farm income derived from the Mission's sample is consistent with the previous pattern. Using the target income of K 2310, several farmers have reached this target [Table 7.10 of Annex 7]. The "winning" crops are rice [K12300/ha] and cowpeas [average K4610/ha] in Kazungula; sorghum [K3384/ha] in Siavonga; and high-yielding maize [K3530/ha] in Chongwe. If a bee honey producer reaches a production of 60 liters/year, he/she can also reach the targeted income of K2400 [cf Table 7.6].

There is no data, however, to determine what percentage of the total number of the Project's beneficiaries have adopted the technologies proposed by the Project. It is logical to infer that drought resistant crops [supported by the techniques introduced] are the winning crops as they command a high market- price and are not water-demanding or labor intensive. However, these potential advantages are not exploited, which is unusual for a market oriented society [cf Box 7.1 of Annex 7]. As will be discussed in section 6.2, the uncertain commercialization of surplus production from high-yielding crops appears to hinder efforts to exploit the economic potential of the technology introduced. In addition, there is inconclusive evidence to support an early impact due to the demonstration-effect. The data reveals that non-targeted segments of the rural communities have already begun adapting climate proofed technologies promoted by the Project to their specific conditions, on their own initiative.

To sum up, the fact that a few farmers have reached the targeted income of $2,310, indicates that this objective was in fact attainable. However, there is no data to determine what percentage of the Project's beneficiaries have reached this targeted income. Therefore, the objective was partially achieved.

5.2-Relevance (*)

How does the project relate to the main objectives of the GEF focal area, and to the environment and development priorities at the local, regional and national levels?

The factors driving Zambia's poor agricultural performance among subsistence farmers include: 1- low levels of investment, 2- land degradation; 3- limited access to markets of agricultural inputs and outputs; and 4- a reduced agricultural labor force due to HIV/AIDS pandemic. This has introduced a measure of vulnerability among the communities in AER I and II.

To reduce the vulnerabilities exacerbated by adverse effects from climate variability and global warming, the Project has taken a two pronged-approach: 1- mainstreaming of adaptation into agricultural planning and national, district and community levels to make the case for investment in adaptation in the agricultural sector; and 2--- test and

[74] The baseline was not established at the beginning of the Project. The proxy farm income without the project was estimated at USD 300 or K 2100 [see section 3.2 of Annex 7]

[75] See Table 7.2 showing mean farm areas planted by crops and farm size for 2010; also MAL/UNDP Participating household status report for CCAP. 2015, table 23.

[76] The rest of the farmers producing other crops did not reach the target. It is important to note that mixed beans command a unitary price almost five times higher than maize and their cultivation is not demanding in labor and water. This is also the case with cowpeas, ground nuts and sunflowers, all of which command higher prices than maize without undue requirements of labor and water; this is with the exception of sunflowers, which require a pressing oil machine to market their oil.

evaluate the adaptation value interventions that protect and improve agricultural incomes from the effects of climate change. This comprises fostering capacity and systems to anticipate, assess and prepare for climate change risks. These risks were anticipated at community, regional and national levels. Ultimately, adaptation learning generated from the pilot projects was expected to guide the mainstreaming of adaptation in national fiscal, regulatory and development policy, to support adaptive practices on a wider scale.

=*Was the project appropriate solution to the problem?*

The Project was an appropriate solution to the project area, which is highly prone to climate hazards. It proposed that subsistence farmers use alternative production techniques to cope with climate variability and global warming. There has been an initial surge of technology uptake [primarily crop diversification, crop rotation and conservation agriculture] as reflected in the interviews conducted with all of the farmers in the sample.

How does the project support the GEF [Env & Sust Dev] area and strategic priorities?
=How does the project support the environment and sustainable development objectives of Zambia ?

A central concern of the institutional framework is Zambia's vulnerability to current climate hazards which significantly affect food security and poverty. In this context, the sustainable management of land and associated resources are vital. Therefore, improving farming practices that are characteristic of subsistence agriculture is an essential goal. The dissemination of agricultural techniques to enhance crop yields can reduce the dependence on monoculture. This process can, in turn, enhance environmental sustainability. The specific environmental and sustainable development objectives of Zambia are not elaborated in the Prodoc. The current evaluation deals primarily with improving the farming practices of subsistence farmers.

Were local beneficiaries and stakeholders adequately involved in project design and implementation?

There is documentary evidence reflected in public documents, indicating that local beneficiaries and stakeholders participated from the start in the project-design and implementation.

Is the project country-driven?

The Project is country driven to an important degree, as national organizations, sub national organizations and those involved in the implementation all identified with the project's objectives and overall goal. Women in particular showed great identification with the project outputs , as they were particularly empowered by the training received.

=Is the length of the project sufficient to achieve project outcomes?

The evidence unequivocally suggests that the anticipated length of the Project was insufficient to achieve the project's outcomes. Concretely, it has been established that physical infrastructure projects, i.e. transportation networks of different types, reach fruition within 2 to 4 years depending on the physical magnitude. In contrast, project designs where the institutional framework plays a key role, i.e. natural resource management, environmental, and capacity development projects reach fruition slowly. Natural resources management and environmental projects reach fruition in 10 years. Education projects reach fruition in one generation [approximately 30 years]. The reason for the different timeframes is that these latter types of project aim, in one way or another, to transform the value system, institutional arrangements, etc. of a given social structure. Measuring the evolution of these kinds of projects for monitoring purposes is complex. Therefore, it is not surprising that the climate change adaptation initiatives that have begun 3 years ago have not reached conclusive results.[77]

[77] See: Theodore W. Schultz. The economic value of education. Columbia University Press, New York, 1963. Also, Albert O. Hirschman Development projects observed. The Brookings Institution, Washington, DC 1967

How do GEF-funds help to fill gaps (or give additional stimulus) that are necessary but are not covered by other donors?

According to the information made available in Annex 5, in line with the Project Steering Committee's request, UNDP's own financing increased to finance the incorporation of additional beneficiaries in the Project. These additional UNDP funds also covered supplementary transportation needs that were identified during Project implementation, as well as a saddle dam to avoid flooding in downstream communities.

The subtext of the finance/co-finance picture conveys that the Project, as it was designed and implemented, did not need additional funds. Specifically, cancelling the water resource development works after the MTR contributed to the 20% unspent resources. It is, therefore, logical to infer that efforts to acquire additional funds were not a priority. Discussions with UNDP and MAL confirm this statement. However, this situation does not imply that financial resources are available to cope with adaptations needed in the agricultural sector as a whole.

5.3-Effectiveness (*)

To what extent have the expected outcomes and objectives of the project been achieved?

The available evidence suggest that the Project objectives have been partially achieved and outcomes have not been achieved. As shown in Annex 6, an outcome review has not been conducted.[78] The outcome indicators have been selected. There is a list of outputs achieved for each outcome in the preliminary draft of the Terminal Report.

=*To what extent were the appropriateness, evaluability and measurability of the results framework and its associated indicators and the M&E system that was put in place?*

The available evidence indicates that the project-design process was faulty. Consequently, the results framework did not take into consideration the complexity of agricultural development projects. Therefore, the bulk of standard agricultural performance indicators were neither taken into account, nor collected. The Project did not have in place a monitoring system for agriculture transformation. Under these circumstances, the terminal evaluation developed a set of tools to design proxy indicators so as to partially measure the most important results obtained from the technology transfer process. This is elaborated in sections 2 and 3 of Annex 7. However, through existing monitoring procedures, anecdotal evidence was collected on agricultural transformation through focused interviews from selected farmers, mainly adopters of technology. There were no attempts for an in-depth analysis or measurement.

=*What were the factors beyond the control of executing and implementing agencies that may have affected the attainment of results and how the risks have been managed during pcal beneficiaries and stakeholders adequately involved in project design and implementation?*

The combined evidence indicates that the attainment of results was significantly weakened by the project-design more than any other external factor. Although the evidence is inconclusive, the project- planners misunderstood the risks. It was estimated that the weak participation of donors would be highest risk and the possible failure of infrastructure works would be a low risk; this despite the fact that during the planning process there was no basic information available on water budgets, no soil survey, and no information about land tenure systems about the sites

[78] Outcome review refers here to the evaluation method of assessing outcome achievements Cf. UNDP Outcome level evaluation. A companion guide to the handbook on planning monitoring and evaluating for development results for programme units and evaluators. New York,December 2011

pre-selected, to mention only key elements. This is indicative that project- planners underestimated the complexity of agricultural development, especially water development works for agricultural use. [79]

If there was one factor beyond the control of the executing and implementing agencies, it was that there was no way to ascertain how robust the project design was when implementation began. Given the complexity of the project, what was needed was an appraisal process. Put simply, the project-design needed an appraisal process conducted by an independent organization. An appraisal process seeks to ensure that all technological, economic, environmental, marketing, and other relevant issues are properly addressed to ensure successful implementation. This is the standard procedure for complex projects including agricultural projects where irrigation development is a component.

In terms of the beneficiaries, the evidence indicates that the farmers, especially female farmers, adopted the technology transfer in the form of skill development. This transfer was facilitated by the fact that know-how does not require on-farm investments, i.e. soil improvement, land levelling, and other skills that require either assets or liquidity. Agricultural experience shows that this is the most effective method of poverty alleviation in rural areas. This was the Project's silver lining. The area farmers, especially women, testified to consistent motivation and interest in the technologies proposed that benefitted their families and helped them cope with their subsistence needs a little better. Farmers interviewed exhibited, in different degrees and within their own cultural milieu, continuous experimenting and making informed decisions about the new crops and techniques proposed. They are all becoming avid learners and are predisposed to continue with the learning curve.

The upshot is that an ambitious project can be better managed by scaling down the magnitude of the objectives. However, a faulty agricultural project design, especially when there is anticipated infrastructure development, can lead to irreversible shortcomings. The additional cost of an appraisal exercise is no more than 3% of a project's total cost in most cases. However, the losses in time and opportunities can be higher than 3%.

Has project been effective in achieving expected outcomes with respect to the following:
+Institutional capacity in place to assess, plan and implement mechanisms for the management of irrigated agriculture?

The theoretical irrigation potential appears considerable i.e. it is conservatively estimated to be 2 750 000 hectares. Only about 100 000 hectares are currently under irrigation, mostly by commercial farmers who account for about 52 000 hectares [Prodoc, page 9]. There is no national institutional capacity in place to assess, plan and implement irrigated agricultural schemes.

+Was there farmers' capacity and incentives for their participation in irrigated agriculture and alternative livelihoods?

Ethnographic evidence indicates that rain-fed crops were introduced and adopted more than 50 years ago [Box 7.1 of Annex 7]. Consequently, there is a growing tradition of raising crops to meet the subsistence needs of the family unit and selling portions of the farm production to cover the supplemental consumption needs of the family unit. Therefore, agricultural communities have become acutely aware of water shortages for their rain-fed crops.
As experience testifies, rain-fed farmers need to upgrade their skills related to farm management techniques in order to use irrigation water effectively in their fields, and to avoid water logging by over irrigation. This requires considerable efforts from national irrigation organizations so as to determine the optimum quantity of water according to the soil and crop needs. It is not evident that national organizations can provide this kind of extension knowledge.

[79] There is plenty of literature on the subject prepared especially by FAO. FAO. 1971. Integrated farm water management. Irrigation and drainage paper No. 10: Rome.FAO. 1971d. General guidelines to the analysis of agricultural production projects. Planning and studies No. 14: Rome. FAO. 1975. Successful irrigation: planning, development, management. Rome FAO 2011 Save and grow: a policymaker's guide to the sustainable intensification of smallholder crop production. Rome. FAO. 2013. Climate-smart agriculture. Module 1, Rome,

Other vital knowledge to be upgraded either on farm or in national organizations is the effective support farmers need to commercialize the crops they produce. It is now clear that in order to ensure that irrigated agriculture is a sustainable operation, irrigated crops need to be economically profitable to cover the maintenance and operating costs of irrigation water-supply. Put differently, irrigated crops need to be sold in quantities and prices affordable to consumers and worthwhile to farmers. There is no national organization that can provide this kind of information to farmers that want to take up irrigation.

The above finding about market and market development applies to livelihood opportunities introduced by the Project, i.e. bee keeping, goat rearing, and aquaculture. Only the first two opportunities have been launched however, it must be noted that both operations have begun using Project start up kits. An unintended results is that farmers that have received the start up kits are reticent to share production figures to measure performance [sec. 5.4 of Annex 7] Obviously, the reason is because they are afraid to show evidence that there is no longer the need for a free good. It remains to be seen if the farmers will invest their own resources in the maintenance and expansion of both lines. The key constraint is that there are no firm estimates about the market demand and markets of both lines, however.

+*Was there capacity for monitoring and evaluation about transferring technology?*

The relevant documents show that the project planners did not identify the specific requirements for the monitoring of technology transfer in agriculture. The Prodoc [Annex N] ranked the national capabilities as limited.

What was the national policy for agricultural schemes and cost recovery?

There is a national irrigation policy to promote the development of irrigated agriculture and indirectly, cost recovery is broadly considered. However, there is an absence of substantive mechanisms and tools to support irrigated agriculture. There are global figures about water availability in the country as whole, but there are no water budgets per watershed. Nor are there detailed soil use maps to establish the quantity of irrigable land per watershed. Irrigated agriculture normally requires a tenure system for the long term, as there is the need to invest in the irrigated plots, in land levelling, and in other factors, depending on the specific conditions. As the bulk of the agricultural land is within the jurisdiction of customary law, so far there have been no arrangements to install irrigation plots.

What changes could have been made in the project design in order to improve the achievement of the project's expected results?

The total project-design required an Appraisal Review conducted by an independent team composed primarily of an agro-economist, an agronomist and an irrigation engineer. The overall purpose would be to establish the feasibility of the project design with particular reference to the implementation of the water development works, taking into consideration the economic logic of adaptation, as discussed in section 6.1.2. The specific issues that this Appraisal Review would deal with are discussed in section 6.5.1

5.4-Efficiency (*)

Was the project implemented , in-line with international and national norms and standards?

The national or international norms and standard for climate change adaptation projects are in the making. The Project was designed and implemented in less- than- ideal conditions. As discussed previously, the Project's silver lining was the farmers interviewed in the sample, especially women, testified to consistent motivation and interest in the technologies proposed that benefitted their families and helped them cope with their subsistence needs a little better. This technology transfer was facilitated by the fact that know-how does not require on-farm investments, i.e.

soil improvement, land levelling, and other skills that require either assets or liquidity. Agricultural experience shows that this is the most effective method of poverty alleviation in rural areas.

Was implementation of the programme and its achievements been done in the most cost effective way?

From the documentation review, it has been determined that the execution modality used, i.e. joint design-implementation, is not cost effective. It has been used in countries under crisis situation in transition from humanitarian to development frameworks. In this context, joint design-implementation pays-off because it establishes a certain amount of stability by generating jobs for a large number of people. These jobs provide the population with an absolute minimum of resources so that they can meet the family's subsistence needs. This avoids massive and uncontrollable displacement of populations, as is currently the case in Syria and nearby countries.

The evidence shows that the joint design-implementation modality is questionable economically, as it does not deliver development results, in general, and as a result does not deliver agricultural results.

=*Were progress reports produced accurately, timely and responded to reporting requirements including adaptive management changes?*

The project- planners, wittingly or unwittingly, omitted designing a monitoring system for agricultural performance. In the absence of the relevant information needed to carry out adaptive management, the accuracy and timeliness of the reports produced becomes a moot question.

Were financial disbursements conducted timely as planned ?

According to the latest Audit Report,[80] and as examined in Annex 5, the Project carried out its administrative and financial operations in accordance with the Project Document, financial rules, regulations, practices, and procedures of the Government of Zambia, and in accordance with UNDP rules and regulations. The Project's assets and equipment were also properly managed; it maintained an appropriate financial management structure, internal control and record-keeping system.

There is an approximate 20% difference [USD 1,126,638.10] between the projected and actual expenses from GEF funds. The UNDP CO indicates that this GEF funding discrepancy was due to the fact that the final disbursement to the TE consultant, along with other expenses, have not yet been paid out. Furthermore, there are pending payments for the project support costs to be paid to UNDP. Once these are paid, the balance is expected to be nil.

The subtext of the finance/co-finance picture conveys that the Project, as it was designed and implemented, did not need additional funds. Specifically, cancelling the water resource development works after the MTR contributed to the 20% unspent resources. Information on yearly disbursements were not made available.

Did financial resources reach the pilot sites timely as planned?

From the discussions with UNDP financial officers financial resources reached pilot sites with banks that had an ICT system. The absence of ICT facilities in some banks in the pilot sites was a problem in terms disbursements, and so some financial disbursements were conducted with delay.

[80] Source: MKM Solutions. Audit Report on the Statements of Expenses (CDR), Assets and Cash Position. For the year Ended 31 December 2014. pp 21-32

How was results-based management used during project implementation?

The principal tool used to conduct the results-based project preparation is the Logical Framework Analysis (LFA) or logframe. An LFA helps to ensure a project's orientation from managing through inputs and activities to managing for results (outputs and outcomes). According to the UNDP Programme Manual (Ch 4) a logframe is a matrix that summarizes the main elements of a project's design. It is used to ensure consistency among outcomes, outputs, activities and inputs; to identify important risks or assumptions; and to ensure that the intervention is likely to achieve measurable results. The available evidence indicates that the standard logframe is unable to capture the dynamic interaction between project implementation and the institutional evolution associated with the technological transformation of agriculture. It is not being suggested here that the logframes, which help to plan M&E work, be abandoned. There is, however, the need to consider more iterative processes, moving from one approximation to another. Above all, in the case of agricultural projects, there is the need to focus on measurements used to gauge local realities about technological transfers in the context of climate change issues. This is expounded in detail in section 4 of Annex 9.

Was a framework set up to measure changes in farm income?

Project-planners did not design a system to monitor the performance of agricultural indicators such as yields and cropping patterns. Therefore, there were no indicators to measure output per farmer, thus, it was not possible to measure farm income.

Was an appropriate balance struck between utilization of international expertise as well as local capacity?

It is evident that the Project needed expertise in agricultural development and specific skills in agricultural marketing, irrigation engineering, small ruminants husbandry, and aquaculture. The evidence is weak in terms of efforts to obtain the skills needed, either nationally or internationally. The Prodoc identifies skills needed primarily for macro measurements of climate change and meteorological issues. It did not identify the skills required to foster adaptation to climate change by small land holders, in matters such as commercialization, post harvest technology, the cottage industry used to process perishable crops, and others.

5.5-Country Ownership

National plans have targeted areas highly prone to climate hazards such as AER I and II. These areas are characterized by drought, an unreliable rainy season, flooding, and dry spells. All these factors are associated with crop failure and have negative repercussions on food and water security, soil quality, wildlife and, ultimately, the sustainability of livelihoods including the displacement of human populations[81]. This is assumed to be a manifestation of long-term climate change[82]. For these reasons, national authorities have decided to undertake this initiative with the UNDP, leading to the adaptation to global warming and climate variability in the context of the agricultural sector.

Further, the Project has incorporated key national policies into its framework, such as one policy advocating for an improved early warning system [EWS] that is effective at a local level. In addition, the Project was jointly formulated with the participation of stakeholders from the outset. This was essential, as the Project's interventions were comprehensive and comprised the implementation of eight water resource infrastructure works, the extension and diffusion of four agricultural techniques to cope with climate variability and global warming, and four lines of livelihood alternatives. Consequently, the intervention included twelve government agencies, primarily from MAL and local

[81] Zambia National Adaptation Programme of Action, September 2007.

[82] Jain, S. An Empirical Economic Assessment of Impacts of Climate Change on Agriculture in Zambia. The World Bank Development Research Group. Sustainable Rural and Urban Development Team. 2007

NGOs other than the UNDP. The Project interventions were all- inclusive and ranged from the national government to the village farmer, with an emphasis on women from small holding farmers.

5.6-Mainstreaming

As the Project has only been run for three years, its findings are often inconclusive. However, there has been early success in mainstreaming efforts in [1] the prevention and recovery from natural disasters, [2] poverty alleviation, and [3] gender equality.[83]

Prevention and Recovery from Natural Disasters

It must be acknowledged that the communities in the Project areas have been coping with a harsh environment for at least the past 50 years, according to the available ethnographic evidence [Box 7.1 of Annex7]. Consequently, the communities in the pilot sites, with the help of the Project, were able to easily grasp the characteristics of climate variability and the associated adverse effects, specifically increased in water stress due to the shortening of the rainy season, coupled with the rise in temperatures. This has led to competition for limited surface water sources among people, domestic animals, and wildlife, alike.

The area peoples have been able to cope with these vagaries thanks to social mechanisms within their social structure. The social mechanisms of labor reciprocity and bartering act as social loans from individuals to the community and vice versa. These loans allow individual families to absorb the shocks from climate variability. Sharing information from indigenous knowledge among community members also helps them to cope with the shocks from climate variability. Some are even able to monitor weather patterns and predict natural disasters by observing the flora, fauna and star constellations. However, the accuracy of this indigenous interpretation of meteorological data has not been adequately studied.

It is important to note that there is promising potential for the organized collective action in response to the leadership of the management organizations currently operating in each pilot site. The MSC data has shown preliminary evidence of managers, male and female, already in the process of organizing the community for the reception and delivery of the Project's outputs. When this potential for organized social action comes to fruition, ongoing efforts to manage natural disasters will be greatly strengthened as well as natural resources governance.

Poverty Alleviation

The Project has been able to mainstream poverty alleviation with relative success. Concretely, the data shows that the Project target of a 10% increase in farm income across the outputs associated with outcome-two is attainable through the production of the most successful crops [drought-resistant/high-yielding] and honey-bee production. Based on the Mission's estimates for 2015 [proxy information elaborated in section 3 of Annex 7], the expected target farm income should be K 2310.[84] The "winning" crops were found to be rice [K12300/ha] and cowpeas [average K4610/ha] in Kazungula; sorghum [K3384/ha] in Siavonga; and maize [K3530/ha] in Chongwe. If a honey bee producer reaches a production of 60 liters/year, he/she can also reach the targeted income of K2400 [cf Table 7.6 of Annex7].

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[83] The reality on the ground was that there was no time assigned to these themes [Annex 2], and so there were no interaction with organizations on these themes [Annex 3]. Furthermore, evaluations do not generate information; terminal evaluations are information-users. In many countries, the reality is that the stock and flow of required information is irregular and unreliable. Even project documents, such as the Terminal Report, is still under development. In this context, the TE's pervasive challenge was to understand reality on the basis of partial information. Therefore, the focus of the Inception Report was on a minimum set of priority core themes, i.e. outcome-two which was the Project's cornerstone—rather than on a desired set of themes. As Annex 7 testifies, the data-collection and analysis was labour-intensive and time-consuming.

[84] The baseline was not established at the beginning of the Project. The proxy farm income without the project was estimated at USD 300 or K 2100 [see section 3.2 of Annex 7]

There is no data, however, to determine what percentage of the total number of the Project's beneficiaries have adopted the technologies proposed by the Project.[85] It is evident that drought-resistant crops [supported by the agronomic techniques introduced] are the winning crops because they command a high market-price, and are not water-demanding or labor intensive. In sum, all evidence indicates that the farmers, especially female farmers, adopted the Project's technology transfer in the form of skill development, facilitated by the fact that soil improvement, land levelling, and other skills do not require assets or financial liquidity. Past agricultural experience shows that this is the most effective method of poverty alleviation in rural areas.

Gender Equality

All evidence points towards a relative empowerment of women in the Project, as nearly half of the beneficiaries were women.[86] Women empowerment is understood as the process by which those who have been denied the ability to make strategic life choices acquire such choices. It must be understood, however, that most female farmers were members of small holding families. There was insufficient time and resources to further analyze whether or not the women were single heads of households, or married in a monogamous or polygynous union, and if they were cultivating their own land or land allotted to them by their husband. These issues are essential to ensuring women's access to land or land allotted to them by their husband and their effective participation in resource management and use. They should be thoroughly studied to ensure the equal access of female farmers to opportunities and benefits.

The farmers in the Project areas, especially women, testified to consistent motivation and interest in the technologies proposed that benefitted their families and helped them cope with their subsistence needs. The interviewed farmers , in different degrees and within their own cultural milieu and gender, exhibited continuous experimenting and informed decision-making about the new crops and techniques proposed. They are all becoming avid learners and are predisposed to continue with the learning curve.

5.7-Sustainability: financial resources (*), socio-economic (*), institutional framework and governance (*), environmental (*), and overall likelihood (*)

Sustainability		
Overall likelihood of risks to sustainability:	□MS	Based on the preliminary results showing that targets are attainable, there is a potential for sustainability if the trend continues to grow.
Financial resources	□MS	One key step towards a financial sustainability is to reach an agreement between local traditional leaders, project authorities and beneficiaries on the repayment rate of the agricultural inputs and animals distributed during the early phase. Distribution of free goods was not an intended action in either the Prodoc or UNDP policies. The use of resources to stimulate new actions with repayment modalities, so that the resources distributed in the communities are passed on within a sustainable framework, is a key policy principle.
Socio-economic	□S	All farmers interviewed in the Project areas, especially women, testified to consistent motivation and interest in the technologies proposed that benefitted their families and helped them cope with their subsistence needs. The interviewed farmers , in different degrees and within their own cultural milieu and gender, exhibited continuous experimenting and informed

[85] The Terminal Report which is the responsibility of agencies involves in implementation is in process.

[86] The definition of empowerment used in this TE is descriptive because the TE did not focused on measuring women's empowerment. The Project has not done yet any analysis on this important theme: ."Women empowerment is about the process by which those who have been denied the ability to make strategic life choices acquire such choices." Cf. N. Kaber. Resources, agency, achievements. Reflections on the measurement of women's empowerment. UNRISD. Discussion paper 108, 1999

		decision-making about the new crops and techniques proposed. They are all becoming avid learners and are predisposed to continue with the learning curve.
Institutional framework and governance	□MS	There is promising potential for the organized collective action in response to the leadership of the management organizations currently operating in each pilot site. The MSC data has shown preliminary evidence of managers, male and female, already in the process of organizing the community for the reception and delivery of the Project's outputs. When this potential for organized social action comes to fruition, ongoing efforts to manage natural disasters will be greatly strengthened as well as land tenure systems and associated water rights. If and when, irrigation works and other investments on land and water management are outlaid. Also the consolidation of outcome-two will reverberate in enhancing the institutional framework and governance in climate change adaptation.
Environmental	□MS	As there were no baseline measurements and ensuing monitoring of the ecological systems under review, it is not possible to gauge either contributing or enabling progress to reduce environmental stress. However, there is an incipient trend towards agricultural intensification led by the Project. As mentioned, the Project has distributed packages of fertilizers and herbicides. Although the effect on the environment appears either minor or negligible, it would be environmentally diligent and responsible to promote IPM and other environmentally sustainable techniques for agricultural intensification. The prevailing small units of production can facilitate this process.

To what extent are there financial, institutional, socio-economic, and/or environmental risks to sustain long-term project results?

There are financial risks because there are no alternative sources of financing the necessary inputs for the continuous application of the fundamental techniques adopted [crop diversification, crop rotation and conservation agriculture] and the purchase of seeds for the high-yielding, drought resistant crop varieties; and the livelihood operations related to goat rearing and honey-bee production.

The institutional risks include the barriers that the Project has not been able to address effectively. Concretely, the economic results of crops produced by small holding farmers are hindered by the absence of price information and markets, i.e. commercialization in general. Furthermore, farmers' skills [both men and women] need considerable revamping through literacy and numeracy. Farmers need to determine the most profitable crop mix on their farms on their own. They need to become sound decision makers, which requires elementary mastering of budgeting techniques and information management. Production intensification through the use of pesticides, herbicides and inorganic fertilizers can bring about biodiversity losses, especially with pollinators. This has moderate implications on bee production, which the Project has been promoting.

What should be the weight placed on the sustainability of stakeholder collaboration, management committees, the pass on mechanism and the sustainable scale-up of the adopted farming practices and alternative livelihoods?

In hierarchical terms it appears reasonable that scaling up the adopted farming practices and alternative livelihood has the highest weight because of their role in both adaptation to climate variability and global warming and poverty alleviation. The next weight corresponds to stakeholder collaboration, management committees and pass-on mechanisms. These social mechanisms provide the support needed to strengthen the social relations of production.

Do the various key stakeholders see that it is in their interest that project benefits continue to flow?

All of the farmers interviewed from the sample, both men and women, had economic interests closely linked to the Project. The Project had distributed: 1- production inputs [start up kits], 2- goats under the pass on procedures,

and 3- start up equipment for honey production. In some extreme cases where the weather was particularly harsh, as in the pilots site of Kazulunga, some farmers were able to raise crops for their own consumption only because the project distributed seeds. The unintended effect of this procedure of distributing inputs was that farmers who got the free goods were unwilling to respond to the questions concerning the results obtained from these free goods. It is possible to infer that the perception must have been that if there was progress reported, the free goods wouldn't longer be distributed.

Unintentionally, this approach has questioned the sustainability of honey production. From the information obtained most of the operations were launched because of the free start up kit. Once the start up kit stops, it is not clear if the operations will continue and/ or other operations will commence.

Is there sufficient public/stakeholder awareness in support of the project's long-term objectives?
Based on the interviews conducted with farmers, long term objectives are not evident. Life events experienced by the villagers, such as liberation wars, droughts, HIV pandemic, makes it difficult for farmers to plan more than one year at a time.

Are there ongoing activities that may pose an environmental threat to the sustainability of project outcomes?
The Project's supply of herbicides have raised moderate concerns in regards to the health of honey bee colonies, especially considering the fact that the Project itself has successfully promoted honey bee production. Recent research[87] shows that since 2006, managed honey bee colonies in the USA have seen sustained and significant annual winter colony losses at around 30%, while Europe has seen smaller but substantial losses (15%). Similarly, for non-managed wild pollinators for which quantitative abundance data is more sparse, numerous studies have documented significant declines in their diversity and range over the past three decades throughout North America, Europe, and Asia, with many species going extinct. Additionally, bird and mammal pollinator species have also experienced increasing scarcity, extinction, and narrowing ranges globally over the past 25 years.

Despite recent investigations, the exact cause of these trends remains poorly understood, although a consensus is forming to attribute decreased insect pollination—the predominant type of animal pollination—to a combination of causes, including pest infestations, disease, increased use of pollinator-harming pesticides, and loss of habitat and forage. To be exact so far the research has not shown that herbicides are another cause. But it does not release herbicides as potential cause.

Policy makers in countries at risk of pollinator declines have addressed this vulnerability by implementing management strategies. In the context of Zambian agriculture, it is essential to keep in mind that pollinators contribute to the agricultural yield for an estimated 35% of global food production and are directly responsible for up to 40% of the world's supply of some micronutrients, such as vitamin A. Regions where pollinators contribute most heavily to nutrient production are often also those where populations have the largest burdens of micronutrient deficiency diseases. In addition, insufficient intake of the key foods affected by pollinator species—fruits, vegetables, nuts, and seeds—are each risk factors for non-communicable diseases, including cardiovascular diseases, diabetes, oesophageal cancer, and lung cancer. Micronutrients vital for children and pregnant women—vitamin A and folate—are also affected, and inadequate intake can lead to increased mortality from infectious disease and increased

[87] Matthew R Smith, Gitanjali M Singh, Dariush Mozaffarian, Samuel S Myers. Effects of decreases of animal pollinators on human nutrition and global health: a modelling analysis. Extracted on 19-08-2015 from. www.thelancet.com.Published online July 16, 2015. http://dx.doi.org/10.1016/S0140-6736(15)61085-6 Sub-Saharan Africa, central and eastern Europe, and south and southeast Asia are especially at risk for the health outcomes associated with a potential loss of pollinators. These regions also lack data about the status and trends for local pollinators. Most pollination-dependent foods that contribute to human health are grown locally rather than imported, meaning that greater emphasis should be placed on local pollination and its relationship to agricultural yield.

incidence of blindness and neural tube defects. Thus, pollinator declines could lead to substantial new disease burdens from both micronutrient deficiencies and chronic diseases. Therefore, Zambia might benefit from increased monitoring and protection of their local pollinators to preserve economic, agricultural, and public health wellbeing and especially honey production, which has the potential of improving the economic wellbeing of small holding farmers.

5.8-Impact

Rating	Impact Ratings:	
X	3.	Significant (S)
	2.	Minimal (M)
	1.	Negligible (N)

Has the project results demonstrated verifiable improvements in the living conditions of small holding farmers including women from farm families?

From the sample examined by the TE, it is evident that there is an undetermined amount of small holding farmers that have improved their living conditions, especially women. The results of the Mission survey either using farm budgets or MSC techniques indicate that those farmers that have adopted the new techniques proposed and/or are now growing high- yielding and drought- resistant crops, have increased their farm revenues. The unused potential appears considerable.

Are there indications that the project has contributed to, or enabled progress toward reduced environmental stress and/or improved ecological status?

As there were no baseline measurements and ensuing monitoring of the ecological systems under review, it is not possible to gauge either contributing or enabling progress to reduce environmental stress. However, there is an incipient trend towards agricultural intensification led by the Project. As mentioned, the Project has distributed packages of fertilizers and herbicides. Although the effect on the environment appears either minor or negligible, it would be environmentally diligent and responsible to promote IPM and other environmentally sustainable techniques for agricultural intensification. The small units of production can facilitate this process.

What are the manifestations or early indications of long term changes in the living conditions, resilience and environmental considerations of the targeted communities that can be attributed to the project or those outcomes that the project has contributed to?

From the sample examined, there is a trend towards cropping changes from maize to high-yielding, drought-resistant crops. Another trend that has been observed is the use of conservation agriculture. These two trends come from the Project. Furthermore, the data reveals that non-targeted segments of the rural communities have already begun adapting climate proofed technologies promoted by the Project to their specific conditions. This signals an early impact as there is a good fit between the technologies proposed and the needs and conditions of the end-users.

Has the project results demonstrated verifiable improvements in ecological status?

There are no demonstrably verified improvements in ecological status because there was no measurement of the ecological systems involved through baseline studies and the ensuing follow up.

Has the project results demonstrated verifiable reductions in stress on ecological systems?
There are no verifiable reductions in stress on ecological systems. There was no measurement of the ecological systems involved through baseline studies and the ensuing follow up

C CONCLUSIONS, RECOMMENDATIONS AND LESSONS

6.1-Corrective Actions for the Design, Implementation, Monitoring and Evaluation of the Project.

6.1.1 Transition to a Scale Up Mode[88]

There are outstanding actions that should be definitely executed so that the Project exits implementation mode and enters a scale up mode. [89] Within the legal and administrative procedures of the relevant ministries of the GRZ, three prerequisites are essential to conducting the scale up approach. [90]

First, there are transitional actions that need to be taken to ensure the sustainability of an exit process. These critical actions include:

- developing technical manuals for district staff related to the techniques adapted in the technology transfer process ;
- guidelines for inputting revolving funds;
- consolidating market linkages for inputs and crops produced in the pilot sites;
- registration of cooperatives, associations and business enterprises in the current operation;
- developing business plans, and financial and business systems for the cooperatives, associations and business enterprises;
- establishing "Community Trusts" to manage assets (such as value addition centers) to be handed over to the communities by project staff;
- sourcing funds to support the business plans and trusts; and
- wider use of ICT applied to the conditions of the pilot sites, such as the utilization of iPads, smart phones, etc., to retrieve market information through the use of solar battery power available at the Resource Centers.

Second, a framework for continuous institution building needs to be established. This includes:

- arranging district planning of climate change activities;
- arranging district reporting and coordination meetings;
- beginning the capacity building of district staff;
- aligning partnerships with district stakeholders;
- organizing on-going training/ monitoring of farmer groups and sub-committees by district staff;
- arranging management procedures for revolving funds by the sub-committee; and
- arranging the implementation of business plans by the boards and management of the established cooperatives, associations , business enterprises and trusts.

Third, embedding the Project's technology transfer process in the operational plans of ministries for the purpose of mainstreaming. To this end, the following key guidelines and manuals produced by the Project must be published and disseminated :

- entrepreneurship manual;
- technical production manuals;
- iPad/ video on different climate change topics;
- inputting a revolving fund manual;
- goat pass-on system manual;

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[88] The data used to draft these recommendations comes from the Consultant's report on an exit/sustainability strategy. It is likely that some specific activities have being undertaken. Other recommendations are based on the Annexes attached, like the value-chain related recommendations. It is the concept of the recommendation that matters more than the letter

[89] This remedial action, discussed on the 10 of July 2015 in Siavonga, was outlined as a step wise approach and is hereunder concurred It must be remembered that this meeting on exit strategy was a recommendation of the MTR. Thus, the material used in this section comes from this meeting. The TE took advantage of the meeting to interact with the implementing cadre of the seven pilot sites on agricultural results. See Appendix 1 of Annex 7.

[90] UNDP/MAL Adaptation to the effects of Climate Change and Variability in Agro-ecological Regions I and II in Zambia Exit Strategy. ppp. Siavonga, July 2015

- community nurseries and seed bank manual;
- honey and rice marketing reports;
- business plans for honey, rice, and cooking oil;
- eight [8] district sustainability plans ;
- exit strategy report;
- and others as required.

The successful application of these prerequisites would lead the way to a sustainable exit. To this end, line ministries would ensure the allocation of adequate resources to ensure not only sustainability but also replication and expansion. It is understood that many of these specific requisites need further elaboration in the context of national and local legal procedures and customary law.

6.2-Actions to Follow up or Reinforce Initial Benefits from the Project.

6.2.1 Consolidate the Technological Transfer to Enable the Full Economic Exploitation of the Proposed Techniques

The data shows that institutional barriers have arisen which can delay and even send the process stray. Both female and male farmers show apprehension to adopting the proposed technologies. Interview data from both male and female farmers, especially those living in Siavonga, showed severe uncertainty concerning the availability of buyers to accommodate surplus production from high-yield crops. The uncertain commercialization of surplus production from high-yield crops appears to hinder efforts to exploit the economic potential of the technology introduced.[91]

In essence, when the commercialization conditions are unproblematic, as in the Chongwe site, the technology uptake and expected economic results are unfettered. Thus, the evidence reveals that the economic results of this early uptake of know-how related to climate proofed agriculture is heavily influenced by the commercialization conditions in a given site and time context. To this extent, the level of farm income is also shaped. The data evinces that the full extent of the economic potential of the proposed technologies is being underutilized.

Thus, introducing improved marketing arrangements which should allow small-holding farmers to take advantage of the market opportunities available either for staple or non-staple crops.is critical. This is the lynchpin to unleashing the full economic potential of the climate proofed technologies so that communities can effectively cope with the long term effects of climate variability and global warming. Concretely, the initial spurt needs institutional integration to ensure that the technological process takes root among rural communities.

To consolidate the achievements of early-adopters and continue with the learning curve, farmers now need to upgrade their skills to fully unleash the potential of the proposed technology. Put differently, farmers need to learn how to attain the optimum crop mixes in terms of their subsistence needs and the market demand of crops, i.e. roots, vegetables, fruits, pulses, and others in relation to market demand. Farmers should be able to exploit the full economic potential of the technology by identifying the actual market opportunities of the new crops introduced by the Project [in terms of their comparative advantages within the country and neighboring countries]. To this end, a complementary two- pronged approach is proposed.

- [1] To continue building skills for farmers and their families to take full advantage of climate proofed agriculture, and

[91] In a typical situation subsistence farmers have little or no assets to take risks in uncertain commercialization conditions.

- [2] address the forces at play that exclude most small holding farmers from becoming active players in the value- chain.

Put differently, each crop has specific production and marketplace dynamics which make it difficult to apply a single solution to enhance the overall performance of markets and marketing. All interested farmers must learn how to address these specific production and marketplace dynamics so they can take advantage of the process.

The enhancement of skills enables farmers and their families to take advantage of available and potential value chains. These skills are within the purview of the farmers interviewed in the sample. They showed consistent motivation to learn the things that benefit their family and are consistent with their cultural values.

6.2.2 Building Skills for Farmers and their Families

The response to climate change adaptation has been centered on learning new values. This type of learning has been referred to as rapid learning, that is, a plan of action geared towards the application of principles to address resilient agricultural productivity. Rapid learning systems can be considered to be the overarching principles which govern agricultural education for climate adaptation. They comprise climate proofed knowledge and best practices for every farmers' family including women and children. To this end, the methods should include farmer's field schools, online learning, apps, and much more.

Foremost, farmers must learn how well they have done in each cropping season through feedback information on economic profit/loss. The profits/losses for each harvest create incentives for every farmer to learn about, and to match or exceed the improvement practices of others. However, field work in the pilot sites has shown that there are cultural norms inhibiting the sharing of information related to economic profit/loss on the homestead. Additional probing has shown, nonetheless, that when it becomes clear that the sharing of information will advance the farmer's self-interest, the information becomes available. Therefore, built-in "feedback loops" based on self-interest need to be created.

This is an essential part of enabling small holding farmers, both men and women, to fully unleash the potential of resilient productivity. It must begin with literacy and numeracy, which should lead to financial literacy so that all farmers can keep minimal farm accounts. The development experience shows that farmers, both men and women, can use minimal farm accounting practices when it is in their interest to do so. Mastering the basics of farm management will enable farmers to determine the best crop mix for their situation in terms of family-subsistence and market demand. Literacy, numeracy and financial literacy will also allow farmers to enter into agreements. Some resources are already available but need consolidation, as discussed above in section 6.1.1.

Farmers' Resource Centres

The Resource Centre should be used as a community foci and as a repository of the community's technological information and diffusion on:
1- new crops adapted to the conditions of the pilot sites;
2- farm management techniques directed to enhancing the productivity of the farm unit; especially environmentally-friendly techniques such as the promotion of IPM and ecological farming, i.e. environmentally sustainable techniques for agricultural intensification;[92]

[92] Hassanali, A, Herren, H, Khan, ZR, Pickett, JA, Woodcock, CM 'Integrated pest management: the push-pull approach for controlling insect pests and weeds of cereals, and its potential for other agricultural systems including animal husbandry' Philosophical Transactions of the Royal Society . London, vol. 363, no. 1491, pp. 611-621.

3- e-Agriculture, as the centre has solar energy and an internet connection, through the use of a smart telephone. It should be possible, for example, to gather prices of crops in nearby markets and other consumption centres, including surrounding countries that already trade with pilot sites;
4-. post-harvest technology , especially the promotion of the cottage-industry to process perishable food in order to elongate the shelf- life of food crops either for the consumption of the family unit or the market. The processing of perishable foods is critical for areas like Siavonga, who have limited market outlets for the sale of agricultural crops. Besides the obvious economic benefit, avoiding losses, this process can also enhance the nutrition of the family unit; and
5- all technical information on crops that have already been adapted as well as proposed crops, in addition to livelihood techniques, should be available in the Community Centres in the form of posters, or folders in plastic laminated pages. The information should primarily be pictographic, with a small amount of literature available in the local language. It is noteworthy that all of the above activities are gender-neutral, and in fact, female farmers may draw the lion's share of the benefits, as they are deeply involved in the production and marketing of food crops.

The Mission requested the opinion of a few farmers, both male and female, on these ideas. The response was overwhelmingly positive, as trade across borders appeared to be on their minds. They were interested in learning about exchange rates, especially those farmers who trade with surrounding communities in neighboring countries. The current method of trade seems to be bartering, but farmers wondered if there would be additional benefits using money, hence, their interest in exchange rates.

Early Warning Systems

There is inconclusive evidence on the ground about the benefits of EWS. The systems have been installed in the three sites visited and others. The Mission in the field requested copies of the information provided to farmers to help them to plan their cropping calendars and other cultural practices. Regrettably, no information was provided to the Mission. However, from interviews conducted with relevant government officers, it was indicated that the probability of the occurrence of the meteorological information provided to farmers is less than 50%. In Kazulunga a farmer-leader shared his gratefulness for having learned how to cope with frost using water. Additional information was requested from the implementing organizations on the site, however none came forward.

The bulk of small holding farmers currently lack numeracy and literacy skills. From all of the most immediate skills they need to learn in order to cope with climate change, i.e. new land use techniques, new seeds, etc., it seems counter-intuitive to assume that meteorological information [with less than 50% probability of occurrence] could make a difference in their tool kit to cope with climate change.

On the contrary, the meteorological information, such as it is, it would be useful to extension agents involved in providing assistance in cropping calendars, livestock operations and the like. This is especially true if the meteorological information is accompanied with mitigating measures, like the case of coping with frost.

Secondly, it would be even more useful if the meteorological information generated is used jointly in demonstration plots in selected pilots sites, ideally situated nearby the Farmers' Resource Center. To begin with, measurements of actual precipitation, temperature, and other parameters associated with productivity from the different crops grown in the demonstration plots would go a long way in showing the potential of certain crops in terms of drought-resistance. Along this same line, water management techniques could also be shown in pilot sites. Irrigation is an expensive agricultural input, and until such a time when the economics of crop production under irrigation are viable, drought resistance crop varieties and the use of adequate water management techniques on-farm would be most useful to small holdings farmers

6.2.3 Value-Chain Analysis to the Service of Small Landholding Farmers

Zambia, in spite of thousands of farmers producing fresh vegetables, seasonal fruits and other crops, only provides a small percentage of their domestic market's needs. The remainder is made up of cross-border imports. Each crop has specific production and marketplace dynamics which make it difficult to apply a single solution to enhance the overall performance of markets and marketing, especially if the goal is to make this solution accessible to small holding farmers.

Under the conditions pervasive in the pilot sites visited, it is essential to understand that an integrated set of interventions targeting the whole value chain is needed, not just interventions that target the end buyer level (as some donors prefer), or the farmer level (as other donors prefer). This is a vertical approach to project intervention, rather than a horizontal approach. The production processes, however, will be environmentally-friendly. Production intensification will use IPM and other organically-based processes. Annex 10 contains a detailed exposition of value-chained analysis.

The value-chain approach ordinarily starts with the markets, both global and national, and works back to the producers. It builds on the fact that all actors along the value chain are linked and that problems at one level have repercussions for all levels. The ultimate determinant of a sector's ability to respond to growth potential is the buy-in of the private sector players. The actors themselves must understand the constraints and opportunities, the business environment, the relative roles of each actor, and the forces that are driving the growth along each crop's value chain.

The most promising development is an intervention that can be tackled from an individual farm and individual value chain perspective. Helping the largest number of poor increase their incomes and livelihoods is the fundamental goal of development. This is carried out by national agencies, parastatals, NGOs and donors. Based on previous development experience, one must be aware that a working partnership between these stakeholders is vital in order to avoid duplication of activities. A division of labor articulated around specific comparative advantages has proven useful in this context. Table 10.1 of Annex 10 schematically shows one possible division of labour to promote the development of SMEs through the value-chain approach.

6.3 Proposals for Future Directions Underlining the Main Objectives.

6.3.1Preamble to Scale Up the Project

Although the Project is contractually finished, key actions are pending, as identified in the exit/sustainability strategy [cf. section 6.1.1]. Without the effective realization of these pending actions, the Project's scaling up would be compromised for the following reasons:

- First, there is a potential risk arising from the absence of concrete information as to what has been completed, what is currently in process, and what has yet to be done at each site. In the absence of this information, the scaling up process could create duplications of already-existing outputs, result in already-known and unadvised practices, miss out on key targets, or omit vital unidentified actions. [93]
- Second, national authorities would also run the risk of not knowing with certainty the cost of incorporating initiatives in processes, including the deployment of a subject matter specialist, how these initiatives conjugate with already ongoing operations, and the technical expertise needed to carry out these initiatives. The specifics are clearly delineated in the exit/sustainability strategy, discussed in section 6.1

6.3.2 An Actionable Agenda

Given this context, the following actionable agenda, composed of four pillars, should be considered as a way to help scale up the Project:

[93] The Terminal Report does not measure the percentage of overall targets achieved [Table 1]

- Consolidating the agronomic and livelihood operations undertaken during the Project;
- Enhancing the commercialization process through value-chain analysis;
- Introducing nutrition planning as an intermediary strategy, given the fact that reforms and/or improvements in the commercialization process are time consuming, and, finally;
- Re-introducing water resources development and management to address water scarcity.

It is understood that the agenda is composed of directives, as no field work was conducted in regards to the preparation of project profiles, enabling activity identification. Likewise, capacity building actions identified to strengthen the embryonic trend in technology transfer, discussed in detail in section 6.3.1, are essential to scaling up the Project, i.e. continuous strengthening of skills for farmers and their families, the development of the each site's Farmers' Centre as a depository of the community's technological information, and diffusion, among other actions. Last but not least, yearly and aggregate agricultural planning must be scheduled within a timeline such that outputs lead to outcomes. The simple distribution of inputs must be avoided.

Pillar 1: Consolidating Phase of the Agronomic and Livelihood Operations

This phase's purpose is to lay the foundations for the scaling up. The foundations constitute the achieved outcomes during the process and Project outputs that occur once it is contractually finished. Within the framework of the exit/sustainability strategy for each of the eight sites, one key element is to conduct a stocktaking of what has been achieved in terms of:

- amount of ha incorporated by the Project, separated by gender;
- composition of cropping patterns with special reference to yields achieved with the Project; and
- number of participants in livelihood operations proposed by the Project, including performance rates, i.e. number of animals received, sales, home consumption, total number etc..

An agreement should be reached between local traditional leaders, project authorities and beneficiaries on the repayment rate of the agricultural inputs and animals distributed during the early phase.[94] Those individuals from each of the eight site who agree to the repayment terms, and reveal their preference to continue with the learning curve with the Project's agronomic interventions and/or livelihoods already in operation on a repayment basis [pass-on system].will provide the indicative number of potential participants.

Pillar 2: Value-Chain Analysis to the Service of Small Landholding Farmers

The goal is to make solutions to commercialization accessible to small holding farmers. Each crop has specific production and marketplace dynamics which must be understood and managed to enhance the overall performance of markets and marketing to the service of small landholding farmers.

Under the conditions pervasive in the pilot sites visited, it is essential to understand that an integrated set of interventions targeting the whole value chain is needed, as opposed to just using interventions that target the end buyer level (as some donors prefer), or the farmer level (as other donors prefer). This is a vertical rather than a horizontal approach to project intervention. Annex 10 contains a detailed exposition of value-chained analysis.Value-chain analysis is carried out by national agencies, parastatals, NGOs and donors. Based on previous experience, a working partnership between these stakeholders is vital in order to avoid duplication of activities. One division of labor articulated around specific comparative advantages is schematically outlined in Table 10.1 of Annex 10.

[94] Distribution of free goods was not an intended action in either the Prodoc or UNDP policies. The use of resources to stimulate new actions with repayment modalities, so that the resources distributed in the communities are passed on within a sustainable framework, is a key policy principle.

It is anticipated that the production and marketing processes will be environmentally-friendly. Production intensification will use IPM and ecological agriculture so that the use of agro-chemicals will be minimized in the marketing process.

Pillar 3: Nutrition Planning as an Intermediate Strategy

As time consuming commercialization arrangements need to be sorted out so that small-holding farmers can benefit from market opportunities, an intermediate strategy should be considered to enhance the nutrition level of the family unit. Growing nutritious crops can provide additional business opportunities in addition to improving the nutrition levels of family units.[95] Annex 11 outlines the directives of nutrition policies in the context of the Project conditions.

Nutrition security is now recognized as an evolved definition of food security. It is thus important to assess dietary diversity within food insecure populations as a means of measuring food security. Dietary diversity is defined as the number of different foods or food groups consumed over a given time period.[96] The nutrients required by a human body must be obtained through the consumption of a variety of foods, which is why a healthy and balanced diet tends to be the most diverse.[97] Nutrition experts recommend a diet that includes animal and plant based foods to ensure all essential macro and micro nutrients are consumed.[98]

The concept of a national nutritional policy (NNP) may open up a window of opportunity for the Project, as the bulk of the rural population, especially in the pilot sites, is now producing crops strictly for the family unit's consumption. The farm family unit's consumption preference should be a starting point for enhancing nutrition. The strategic entry point is to incorporate nutritious crops into current cropping patterns.

More importantly, a NPP enables the programming of community-based initiatives designed to promote the production of a variety of vegetables and fruits for home consumption. The majority of Zambian farmers consume their own produce, and buy very little from local markets. These families should have incentives to enhance their quality of living conditions by learning about new varieties of vegetable crops.[99] Development evidence suggests that vegetable production is neutral in terms of equity and gender issues because it is knowledge-based and extension-oriented. Thus, all farmers, irrespective of their assets and gender, can improve their living standards if they have access to the know-how of vegetable production and supporting services.

Moreover, a NPP can provide livelihood opportunities for women or men interested in opening up restaurants for urban dwellers and tourists, while following national guidelines for cooking simple healthy meals. These restaurants can link up with more innovative farms who could provide the necessary fresh staple foods such as vegetables, fruits, and root crops, as well as small livestock such as chicken, pork and fish.

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[95] This intermediate strategy will require greater efforts in post-harvest technology, especially with the promotion of the cottage-industry to process perishable food in order to elongate the shelf-life of food crops. However, the biggest economic and social benefit of this approach would be improving the nutrition of the family unit.

[96] Hatloy, A, Torheim, LE, & Oshaug, A. (1998). Food variety a good indicator of nutritional adequacy of the diet? A case study from an urban area in Mali, West Africa. European Journal of Clinical Nutrition, 52, 891-898.

[97] Burlingame, B, Charrondiere, R, & Halwart, M. (2006). Basic human nutrition requirements and dietary diversity in rice-based aquatic ecosystems. Journal of Food Composition and Analysis, 19(6–7), 770. doi: http://dx.doi.org/10.1016/j.jfca.2006.03.009

[98] Murphy, S. P, & Allen, L. H. (2003). Nutritional importance of animal source foods. J Nutr, 133(11 Suppl 2), 3932S-3935S.

[99] Inculcating healthy eating as a lifestyle choice involves learning how to cook from scratch and taking the time to sit down and eat with others. This urges people to be critical of food-industry advertising and the dietary short comings of fast food.

There can be several potential outcomes from a well-thought-out NPP. To begin with, it would induce a demand-pull of staple crops, vegetables, and fruits across all smallholding farmers. This would be generated by [1] virtue of farm families improving their own diets with different varieties of vegetables and fruits, and [2] farm families getting involved in livelihood opportunities as restaurant owners and/or suppliers to restaurants.

Additionally, a NPP would bring about opportunities for youth and women from smallholding farms in terms of leadership roles in the production and marketing of vegetables. In this manner, a NPP has the potential to mobilize rural Zambia. This will be facilitated by the fact that there is normally no need for considerable investments in physical infrastructure such as heavy equipment, dams, and the like. The "soft" investments depend almost exclusively on capacity development at the national, sub-national and farm levels, meaning an NPP can be a viable mechanism for poverty alleviation through the enhancement of the wellbeing of the family unit.

Pillar 4: Water Resources Development and Management

The goal is to address water scarcity in a least-cost approach supported by sustainable environmental management and acceptable socio-economic modality. To this end, the following complex issues must be tackled : [1] the dataset needs identification with respect to the irrigation potential in the sites under consideration, and [2] the organizational requirements for implementing irrigation projects among subsistence farmers should be determined. These are discussed in detail in Annex 8.

The dataset needed for the design of an irrigation system includes climate data, water resources, water drainage, soil conditions and topography, as well as adaptation methods to deal with climate change. Ordinarily, this dataset is gathered and analyzed within the watershed[s] where the sites are situated.

The next step consists of establishing the technical/socio-economic/environmental feasibility of the Project within the context of the small-holders' management level currently operating in a given site.

- This process should be focused on solving water scarcity in a way that is socio-economically acceptable and environmentally sustainable. To this end, and from the standpoint of the sustainable management of natural resources, the use of geological structures for water bodies such as the regeneration of *dambos* must be emphasized during this process.

Subsequently, the planning process must focus on [1] how the farmers enhance their skills to adapt to the Project, and [2] how the servicing institutions reduce the risks involved in the process to enable the small farmers to successfully uptake the technology. The services should enable irrigated agriculture to be economically worthwhile for the producer, the consumers, and for the overall process to be sustainable. The produce must be marketed to ensure the economic return necessary to cover operation and maintenance costs so that the irrigation scheme is financially sustainable. One planning process is schematically illustrated in Graph 8.2 of Annex 8.

Ultimately, the relevant questions are: What are the consequences of a dam construction [or a weir] on the users of the water resources? Whose land will be used to build the reservoir? Furthermore, women should not be left out of this process due to land tenure considerations and/or water rights. Adequate gender-neutral land tenure and water rights must be arranged by the traditional authorities in close coordination with local and central authorities before the implementation of the irrigation system.

To sum up, if the feasibility studies suggest economic potential to justify the investments on irrigated agriculture and issues concerning land tenure and water rights have been reasonably established for a gender- free and egalitarian operation, then the community can be approached for their participation.

6.4-Best and Worst Practices in Addressing Issues Relating to Relevance, Performance and Success

6.4.1 Unadvised Planning-Implementing Process

The Project's implementing modality [simultaneous execution of planning and implementation procedures] was defective for the adaptation/mitigation to climate change of the agricultural sector of Zambia, with special reference to small landholders. It was not possible to sequence information feedback to enable learning to take place, adaptation without sequencing learning into a moot question. Consequently, the key findings arising from examining this modality in light of the results on the ground, as portrayed in Annex 7, are:

The evidence indicates that this modality was ineffective for activity implementation and, in particular, for complex activities requiring the completion of one activity before the second activity could occur and be completed. Specifically, in the context of outcome- two, the most significant shortfall was the ineffective planning and preparation for the execution of complex water infrastructure works.

Another consequence of this faulty modality was that the Project's farmers were deprived of the anticipated improvement of access to the market, either to sell their produce or to purchase inputs. As the evidence shows [sec 5, Annex 7], the adoption of high-yielding and drought resistant crops introduced by the Project, which have a greater return than maize, is hindered by uncertain commercialization. The market and marketing studies and associated arrangements had to be sequenced at the very beginning so that the results could be incorporated by farmers as they began considering the adoption of crops and techniques proposed by the Project. To this extent, the intended benefits to be accrued by small farmers was compromised.[100]

In hindsight, what was needed was a standard implementation schedule that considered sequencing so that the implementation of sub-outputs within outputs would induce the synergy needed in agriculture outcomes. If the resulting synergy was sufficient, outputs could generate outcomes. This type of real-world planning might have highlighted at the start the actual number of years needed to execute the Project. In addition, the monitoring process would have identified procedures and techniques needed to track down agricultural results, in addition to the administrative monitoring of the UNDP. It is clear that the economic logic of adaptations/integration was not understood, as discussed in section 6.1.2. Lastly, there was the need for contingency planning to redirect implementation, if required, during the mid term review.

6.4.2 Best-Fit Practices in the Planning and Design of Agricultural Development Projects

Appraisal Review

Often one useful and standard procedure for complex projects, especially agricultural projects where irrigation development is a component, has been to have an independent organization appraise the total project design. . The appraisal process seeks to ensure that all technological, economic, environmental, marketing, and other relevant issues are properly addressed to warrant successful implementation.

Using the benefit of hindsight, the Project could have used an appraisal review conducted by an independent team composed of an agro-economist, an agronomist and an irrigation engineer. The overall purpose would be to establish

[100] It must be noted that simple activities, without any prerequisite, were executed. Regrettably there are no measurements on activity implementation.

the feasibility of the project design at the technical, economic, social and environmental levels. To this end, one way would have been for the team to jointly conduct:

- a reconnaissance study of the proposed sites for water resource development, with the purpose of establishing a pre-feasibility report [with a maximum of 20 % of error] to determine if these proposed sites were adequate for water development works based on the information available;
- an assessment to determine the conditions required to ensure a fair economic return of the crop and livelihood options proposed, with special reference to markets and marketing arrangements;
- a review of the proposed crops and techniques, including livelihood options, to ensure technical viability; and
- an overall environmental assessment to prevent/mitigate adverse effects from the production processes proposed and any infrastructure development.

The recommendations would focus on an implementation schedule based on sequencing the agricultural innovations to build up the absorption capacity of the farmers who are targeted to participate.
Secondly, the implementation of the water works would be ranked, by identifying which of the water works could be implemented after minor additional works, which would require detailed technical analysis and which are not feasible either for technical, environmental, economic or other reasons.
It noteworthy that an appraisal exercise costs no more than approximately 3 to 5% of a project's total cost. The potential losses that occur when projects run into implementation difficulties are costlier.

Consider an In-Depth Mid Term Review

When agricultural/livestock production is partially or entirely an ingredient of a climate change outcome, an in-depth MTR can be productive, especially in reference to baseline information and indicators. The key purpose of the MTR would be to identify corrective actions either at the level of final targets or baseline measurements. The upshot from this Project is that, unsurprisingly, it is not possible to measure any change without a baseline. And a the goal of a climate change project is nearly confounded without adequate measures with and without the project conditions.

More concretely, the fundamental reason for an MTR is that the countries involved do not yet have agricultural statistical services that generate information to measure outcomes. It is essential to keep in mind that the GEF/UNDP do not generate M&E data. As is the case with many others donors, they are second-tier users of national, sub national and local information systems. If the above process of measuring agricultural outcomes has not begun, the MTR is the best time to address these matters.

6.4.3 Best-Fit Practices for Agriculture M&E Information in Less-than-Ideal Conditions

M&E Framework Specifically for Agricultural Outcomes Based on Existing Procedures

The basic principle is that climate change is global and adaptation is local, especially in regards to agriculture, and consequently there is no "one-size-fits-all" approach. Therefore, the M&E plan and implementation has to reflect the realities on the ground.

The standard approach within the framework of UNDP / M&E procedures, in addition to dealing adequately with administrative issues, focuses on capacity development for institutional transformation. Although agricultural development does require institutional reform and alignment, the technical elements of output production [crops, trees, and animals including fish] are paramount in the agricultural transformation process. Effective technological transfer requires institutional leadership and support and adequate technology that is economically and socially viable as well as environmentally sustainable.

Along these lines, Annex 9 examines the type of information that is normally required during the monitoring and evaluation of agricultural projects, in the context of the present project. Essentially, it traces the steps conducted by

the Mission in the present exercise to gather a minimum core of information from the field through surveys and interviews, under less-than-ideal conditions. Clearly, the intent was not to propose M&E procedures for agricultural-based projects dealing with climate change adaptation, but to identify three types of datasets needed as narrated in section 3 of Annex 9.

There are ongoing efforts led by many donors to cast M&E procedures for climate change. This report has used some procedures proposed by the OECD,[101] especially to configure baseline information. All major regional banks and donors are doing work. The GEF is sponsoring the Climate Change Evaluation Community of Practice at the GEF Evaluation Office in Washington D.C. In the meantime, there are several works on M&E for agriculture projects designed between 1980-2000 when investment in agricultural development by all donors was of consequence.[102] The initiative led by the General Global Donor Platform Rural Development [GDPRD], FAO and the World Bank related to tracking results in agriculture and rural development in less-than-ideal conditions among developing countries where agriculture is the core sector is vital.[103]

Sharing Climate Change Data Across Ministries, Donor Agencies and NGOs

Climate-related data can be collected through primary methods, however this is a resource-intensive effort. It could also duplicate ongoing efforts, as many donors and agencies often work in the same regions, sometimes simultaneously. One option is for all stakeholders concerned to jointly gather baseline information and monitoring data.

This initiative would be similar to the one being led by the General Global Donor Platform Rural Development [GDPRD], FAO and the World Bank concerning tracking results in agriculture and rural development in less-than-ideal conditions .[104] The idea is to select a core set of standard climate change indicators, with the recommendation that they should be regularly compiled by all agencies, both national and international, in Zambia.. These "priority indicators" should be the same as in all climate change programs to allow for comparisons, and to facilitate the monitoring of climate change programs and goals at the national level.

Some of the starting steps would be:

- gather all previous information available on climate change nationally and regionally
- gather information on national and neighbouring ecosystems related to water, soils, vegetation and the like;
- supplement information related to agriculture, with special reference to small land holders related to commercialization; and
- consider gathering information related to the value chain, particularly those value chains of greater importance to small landholders in the process of applying techniques to cope with climate variability and global warming

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[101] OECD. Monitoring and Evaluation of Climate Change Adaptation: Methodological Approaches. Environment Working Papers, No. 74, Dinshaw, A. et al. 2014. Extracted 25-8-15. http://dx.doi.org/10.1787/5jxrclr0ntjd-en

[102] For example, Dennis J. Casley & Lury, D.A. Monitoring and evaluation of agricultural and rural development projects. World Bank Publication. John Hopkins University Press, 1984, pp 30-45; IFAD. A guide for project M&E. Rome 2003; IFAD Evaluation Manual Methodology and Processes. Office of Evaluation, Rome, 2009; FAO/WB/GDPRD. Tracking Results in Agriculture and Rural Development in Less-Than-Ideal Conditions: A Sourcebook of Indicators for Monitoring and Evaluation. 2008 Extracted from on 10/10/15 from www.fao.org

[103] FAO/WB/GDPRD. Tracking Results in Agriculture and Rural Development in Less-Than-Ideal Conditions: A Sourcebook of Indicators for Monitoring and Evaluation. 2008 Extracted from on 10/10/15 from www.fao.org

[104] FAO/WB/GDPRD. Tracking Results in Agriculture and Rural Development in Less-Than-Ideal Conditions: A Sourcebook of Indicators for Monitoring and Evaluation. 2008 Extracted from on 10/10/15 from www.fao.org

ANNEX 1
TERMINAL EVALUATION TERMS OF REFERENCE
INTRODUCTION

In accordance with UNDP and GEF M&E policies and procedures, all full and medium-sized UNDP support GEF financed projects are required to undergo a terminal evaluation upon completion of implementation. These terms of reference (TOR) sets out the expectations for a Terminal Evaluation (TE) of the ***Adaptation to Climate Variability and Change in Agro Ecological Regions I and II*** (PIMS # **3942**)

The essentials of the project to be evaluated are as follows:

PROJECT SUMMARY TABLE

Project Title:	Adaptation to Climate Variability and Change in Agro Ecological Regions I and II			
GEF Project ID:	PIMS # **3942**		*at endorsement (Million US$)*	*at completion (Million US$)*
UNDP Project ID:	ZMB10/00072197	GEF financing:	3,795,000	3,795,000
Country:	Zambia	IA/EA own:		
Region:	Africa	Government:		
Focal Area:	Environment & Sustainable Development	Other:		
FA Objectives, (OP/SP):	Environment & Sustainable Development	Total co-financing:		
Executing Agency:	Ministry of Agriculture & Livestock	Total Project Cost:		
Other Partners involved:	Forestry Department	ProDoc Signature (date project began):		21st January 2010
		(Operational) Closing Date:	Proposed: 30th June 2015	Actual:

OBJECTIVE AND SCOPE

The project was designed to: The Government of the Republic of Zambia through the Ministry of Agriculture and Livestock (MAL) has been implementing a project titled "Adaptation to Climate Variability and Change in Agro Ecological Regions I and II" to adapt to the negative effects of climate change with financial and technical assistance from the Global Environmental Facility (GEF) and the United Nations Development Programme (UNDP). This four year programme whose implementation commenced in 2010 is within the framework of priorities of Zambia and has a total budget of USD 3,795,000.

Most communities in Zambia are vulnerable to the adverse effects of climate change ranging from floods, droughts, and prolonged dry spells. The result of these Impacts is crop failure, food and water insecurity and unsustainable livelihoods. The project goal is to improve food security through enhanced adaptive capacity to respond to the risks posed by the effects of climate change (including variability) in AER I and II of Zambia while its objective is to develop adaptive capacity of the Small Scale Farmers and Rural Communities to withstand climate change in Zambia. This involves integration of adaptation considerations into agricultural planning at national, district and community levels in order to protect and improve agricultural incomes from the adverse effects of climate change. Specifically, the project will contribute to the achievement of the following outcomes:

1. Climate change risks integrated into critical decision making processes for agricultural management at the local, sub-national and national levels.
2. Agricultural productivity in the pilot sites made resilient to the anticipated impacts of climate change.
3. National fiscal, regulatory and development policy revised to promote adaptation responses in the agricultural sector.
4. Knowledge and lessons learned to support implementation of adaptation measures compiled and

disseminated.

This programme has been implemented by the Department of Agriculture under the Ministry of Agriculture & Livestock (MAL). The programme has been implemented by a dedicated Programme Management Unit (PMU) that comprises staff recruited by UNDP on behalf of the government and a Government representative as National Project Coordinator.

The TE will be conducted according to the guidance, rules and procedures established by UNDP and GEF as reflected in the UNDP Guidance for Conducting Terminal Evaluations of UNDP-supported GEF-financed Projects.

The objectives of the evaluation are to assess the achievement of the project goal, objectives and results, and to draw lessons that can both improve the sustainability of benefits from this project, and aid in the overall enhancement of UNDP programming. The evaluation will also assess the strategies used, including partnerships established to achieve the project's goal, objectives and results

EVALUATION APPROACH AND METHOD

An overall approach and method[105] for conducting project terminal evaluations of UNDP supported GEF financed projects has developed over time. The evaluator is expected to frame the evaluation effort using the criteria of **relevance, effectiveness, efficiency, sustainability, and impact,** as defined and explained in the UNDP Guidance for Conducting Terminal Evaluations of UNDP-supported, GEF-financed Projects. A set of questions covering each of these criteria have been drafted and are included with this TOR (*see Annex C*) The evaluator is expected to amend, complete and submit this matrix as part of an evaluation inception report, and shall include it as an annex to the final report.

The evaluation must provide evidence-based information that is credible, reliable and useful. The evaluator is expected to follow a participatory and consultative approach ensuring close engagement with government counterparts, in particular the GEF operational focal point, UNDP Country Office, project team, UNDP GEF Technical Adviser based in the region and key stakeholders. The evaluator is expected to conduct a field mission to Lusaka-Zambia, including the following project sites *(Chongwe, Luangwa, Mambwe, Chama, Siavonga, Kazungula, Sioma and Senanga).* Interviews will be held with the following organizations and individuals at a minimum: Ministry of Agriculture and Livestock, Forestry Department, members of the District Development Coordinating Committee, Beneficiaries, District Commissioners, village headmen and other stakeholders.

The evaluator will review all relevant sources of information, such as the project document, project reports – including Annual APR/PIR, project budget revisions, midterm review, progress reports, and GEF focal area tracking tools, project files, national strategic and legal documents, and any other materials that the evaluator considers useful for this evidence-based assessment. A list of documents that the project team will provide to the evaluator for review is included in Annex B of this Terms of Reference.

Other methods to be used by the evaluator provided they are agreed with the Project Team and the Quality Assurance team could include In-depth Interviews and Focused Groups Discussions with beneficiaries and key informants, as well as beneficiary surveys and case studies.

EVALUATION CRITERIA & RATINGS

An assessment of project performance will be carried out, based against expectations set out in the Project Logical Framework/Results Framework (see Annex A), which provides performance and impact indicators for project implementation along with their corresponding means of verification. The evaluation will at a minimum cover the criteria of: **relevance, effectiveness, efficiency, sustainability and impact.** Ratings must be provided on the following performance criteria. The completed table must be included in the evaluation executive summary. The obligatory rating scales are included in Annex D.

Evaluation Ratings:			
1. Monitoring and Evaluation	***ating***	**2. IA & EA Execution**	

[105] For additional information on methods, see the Handbook on Planning, Monitoring and Evaluating for Development Results, Chapter 7, pg. 163

			ating
M&E design at entry		Quality of UNDP Implementation – Implementing Agency (IA)	
M&E Plan Implementation		Quality of Execution - Executing Agency (EA)	
Overall quality of M&E		Overall quality of Implementation / Execution	
3. Assessment of Outcomes	**ating**	**4. Sustainability**	**ating**
Relevance		Financial resources:	
Effectiveness		Socio-political:	
Efficiency		Institutional framework and governance:	
Overall Project Outcome Rating		Environmental:	
		Overall likelihood of sustainability:	

PROJECT FINANCE / COFINANCE

The Evaluation will assess the key financial aspects of the project, including the extent of co-financing planned and realized. Project cost and funding data will be required, including annual expenditures. Variances between planned and actual expenditures will need to be assessed and explained. Results from recent financial audits, as available, should be taken into consideration. The evaluator(s) will receive assistance from the Country Office (CO) and Project Team to obtain financial data in order to complete the co-financing table below, which will be included in the terminal evaluation report.

Co-financing (type/source)	UNDP own financing (mill. US$)		Government (mill. US$)		Partner Agency (mill. US$)		Total (mill. US$)	
	Planned	Actual	Planned	Actual	Planned	Actual	Actual	Actual
Grants								
Loans/Concessions								
In-kind support								
Other								
Totals								

MAINSTREAMING

UNDP supported GEF financed projects are key components in UNDP country programming, as well as regional and global programmes. The evaluation will assess the extent to which the project was successfully mainstreamed with other UNDP priorities, including poverty alleviation, improved governance, the prevention and recovery from natural disasters, and gender.

IMPACT

The evaluators will assess the extent to which the project is achieving impacts or progressing towards the achievement of impacts. Key findings that should be brought out in the evaluations include whether the project has demonstrated: a) verifiable improvements in ecological status, b) verifiable reductions in stress on ecological systems, and/or c) demonstrated progress towards these impact achievements.[106]

CONCLUSIONS, RECOMMENDATIONS & LESSONS

[106] A useful tool for gauging progress to impact is the Review of Outcomes to Impacts (ROtI) method developed by the GEF Evaluation Office: ROTI Handbook 2009

The evaluation report must include a chapter providing a set of **conclusions**, **recommendations** and **lessons**.

IMPLEMENTATION ARRANGEMENTS

The principal responsibility for managing this evaluation resides with the UNDP CO in Zambia. The UNDP CO will contract the evaluators and ensure the timely provision of per diems and travel arrangements within the country for the evaluation team. The Project Team will be responsible for liaising with the Evaluators team to set up stakeholder interviews, arrange field visits, coordinate with the Government etc.

The Project Team will be supported by a quality assurance team comprising of evaluation and natural resource management experts in UNDP and key stakeholder organisations, including UNDP's and GEF's regional natural resource management and evaluation teams. The quality assurance team will guide the consultants during the entry meeting, review and approve the inception report, interim, draft and final evaluation reports. Quality assurance in this regard also extends to upholding both GEF and UNDP evaluation principles.

EVALUATION TIMEFRAME

The total duration of the evaluation will be 29 days over a time period of 13 weeks according to the following plan:

Activity	Timing	Completion Date
Preparation	3 days	26th April 2015
Evaluation Mission	19 days	29th May 2015
Draft Evaluation Report	5 days	24th June 2015
Final Report	2 days	14th July 2015

EVALUATION DELIVERABLES

The evaluation team is expected to deliver the following:

Deliverable	Content	Timing	Responsibilities
Inception Report	Evaluator provides clarifications on timing and method	No later than 2 weeks before the evaluation mission: 8th May 2015	Evaluator submits to UNDP CO
Presentation	Initial Findings	End of evaluation mission: 15th June 2015	To project management, UNDP CO
Draft Final Report	Full report, (per annexed template) with annexes	Within 3 weeks of the evaluation mission: 24th June 2015	Sent to CO, reviewed by RTA, PCU, GEF OFPs
Final Report*	Revised report	Within 1 week of receiving UNDP comments on draft: 14th July 2015	Sent to CO for uploading to UNDP ERC.

*When submitting the final evaluation report, the evaluator is required also to provide an 'audit trail', detailing how all received comments have (and have not) been addressed in the final evaluation report.

TEAM COMPOSITION

The evaluation team will be composed of 1 international or national evaluator. The consultant shall have prior experience in evaluating similar projects. Experience with GEF financed projects is an advantage. The evaluator selected should not have participated in the project preparation and/or implementation and should not have conflict of interest with project related activities.

The evaluator must present the following qualifications:

- Minimum 10 years of relevant professional experience
- Knowledge of UNDP and GEF
- Previous experience with results-based monitoring and evaluation methodologies;
- Technical knowledge in the targeted focal areas climate change adaptation, agricultural planning, food security, climate resilience, rural sustainable development planning, etc.
- Demonstrated ability to assess complex situations in order to concisely and clearly distil critical issues and draw well-supported conclusions.

EVALUATOR ETHICS

Evaluation consultants will be held to the highest ethical standards and are required to sign a Code of Conduct (Annex E) upon acceptance of the assignment. UNDP evaluations are conducted in accordance with the principles outlined in the UNEG 'Ethical Guidelines for Evaluations'

PAYMENT MODALITIES AND SPECIFICATIONS

%	Milestone
20 %	At submission and approval of inception report
30 %	Following submission and approval of the 1st draft terminal evaluation report
50 %	Following submission and approval (UNDP-CO and UNDP RTA) of the final terminal evaluation report

APPLICATION PROCESS

ANNEX 2

MISSION'S ITINERARY

Date	Activity	Annotations
29 June	Consultant arrives to Lusaka	
30 June	Working session with UNDP-Lusaka	Review Project concept and performance; Implementing Inception report's methods and procedures
1 July	Working session with MAL	Review Project performance Review documentation and monitoring procedures
2 July	Working session with MAL	Review of Inception report's framework Implementing procedures for Inception report
3 July	Working session with MAL	Review Project documents Addressing evaluation dataset Studying selection of pilot sites
4 July	Saturday	Mission revises project site's issues
5 July	Sunday	Mission examines documentation
6 July	National holiday	Mission analyses sampling issues
7 July	National holiday	Mission's preliminary tailoring of field instruments
8 July	Working sessions with project team	Mission's preliminary tailoring of field instruments
9 July	Travel to Siavonga by road	
10 July	Project Results Workshop	Presentation and discussion of Project's key results; Administration of Limiting Factor Analysis format
11 July	Saturday -Exit strategy Workshop	Attend workshop recommended by Mid Term review
12 July	Sunday	Mission reviews information gathered
13 July	Siavonga site	Orientation and pre-testing of field instruments
14 July	Siavonga site	Administration of field instruments
15 July	Siavonga site	Preliminary tabulation of data collected
16 July	Travel to Livingstone by road	

17 July	Kazungula site	Orientation and pre- testing of field instruments
18 July	Saturday - Kazungula site	Administration of field instruments
19 July	Sunday	Mission reviews information gathered
20 July	Kazungula site	Preliminary tabulation of data collected
21 July	Travel to Lusaka by road	
22 July	Chongwe site	Orientation and pre- testing of field instruments
23 July	Chongwe site	Administration of field instruments
24 July	Chongwe site	Preliminary tabulation of data collected
25 July	Saturday	Consolidate all field data
26 July	Sunday	
27 July	Lusaka	Establish coherence of field data
28 July	Lusaka	Establish coherence of field data
29 July	Lusaka	Drafting Debriefing report
30 July	Lusaka	Drafting Debriefing report
31 July	Lusaka	Drafting Debriefing report
1 August	Saturday	Drafting Debriefing report
2 August	Sunday	Drafting Debriefing report
3 August	National holiday	Drafting Debriefing report
4 August	UNDP/CO and MAL	Debriefing session
5 -6 Aug		Consultant returns to home- base
7-14 August		Validating Project documentation by project team
24 August		Drafting Terminal Evaluation report
25 October		Submission of TE preliminary draft report & mngt review
2 December		Submission of final version of TE report

ANNEX 3

LIST OF PERSONS MET & PARTICIPANTING FARMERS / ENUMERATORS

A--UNITED NATIOS DEVELOPMENT PROGRAMME / LUSAKA & MINISTRY OF AGRICULTURE AND LIVESTOCK

Name	Position	Organisation
Martim Faria e Maya	Country Director	UNDP
Winnie Musonda	Assistant Resident Environment.	UNDP
Ian Milimo	Assistant Resident MDG/Poverty	UNDP
Jin Jing Wang	Renewable Energy Resources Mobilization Advisor	UNDP
Sergio Valdini	Deputy Country Director	UNDP
Stanislaus Chisakuta	Deputy Director	MAL
Evaristo Nyanoka	Principle Agricultural Specialist	MAL
Rasford Kalamatila	Chief Engineer	MAL
Reynolds K Shula	Principle Agricultural Specialist	MAL
John Lungu	Senior Agricultural Officer	MAL Chongwe
Charles Simulunda	District Agricultural Coordinator	MAL Chongwe
Ndashye Kunda	District Agricultural Coordinator	MAL Siavonga
Kilubi Valentine	Senior Agricultural Officer	MAL Siavonga
Kaonga Tundu	Senior Agricultural Officer	MAL Kazungula

Silvasy Shibulo	Technical officer	MAL Kazungula
Biston Mbewe	Project Officer CCAP	UNDP/MAL/CCAP
Andson Nsune	Monitoring and Evaluation Analyst	UNDP/CO
Owen Ngoma	Project Administrative Associate	UNDP/MAL/CCAP
Kafula Ng'andu	General Staff	UNDP/Lusaka

MAL: PROVINCIAL AND DISTRICT MANAGEMENT

PROVINCE	DISTRICTS	PACO	DACO	SAO
EASTERN	MAMBWE	Dr Obvious Kabinga	Kaputo Kennedy	Adamson Mwale
	CHAMA		Danny Musukwa	Issac Sindazi
WESTERN	SIOMA	Mr Alex Chilala	Belvin Muntanga	Derrick Sinkala
	SENANGA		Mwangala Mukelebai	Hillary Kasumu
SOUTHERN	KAZUNGULA	Dr Max Choombe	John Soko.	Tundu Kaonga
	SIAVONGA		Dr Ndashye Kunda	Kilubi valentine
LUSAKA	CHONGWE	Dr Munsimbwe Linous	Charles Simulunda	John Lungu
	LUANGWA		Ernest Munthali	Mubanga Raphel

B--FIELD SURVEY: PARTICIPATING FARMERS/ENUMERATORS BY DISTRICT

Summary

Total male enumerators	**33**
Total female enumerators	**4**
Total male farmers	**73**
Total female farmers	**84**

LIST OF PARTICIPATING FARMERS AND ENUMERATORS BY DISTRICT

No	NAME	GENDER	POST	DISTRICT
1	Abby Lungu	Male	Enumerator	Chongwe
2	Lubasi Mbumwae	Female	Enumerator	Chongwe
3	James Nkhalamo	Male	Enumerator	Chongwe
4	Fredrick Mooya	Male	Enumerator	Chongwe
5	Kubi Francis	Male	Enumerator	Chongwe
6	Fabian Phiri	Male	Enumerator	Chongwe
7	Dennis M. Mwinazi	Male	Enumerator	Chongwe
8	Eve Chipeta	Female	Enumerator	Chongwe
9	Adam Mwiwa	Male	Enumerator	Chongwe
10	Chintu Chintu	Male	Enumerator	Chongwe
11	John Lungu	Male	Enumerator	Chongwe
12	William Chanda	Male	Enumerator	Chongwe
	Subtotal - male enumerators		10	
	Subtotal – female enumerators		2	
13	Simulunda Gwen	Female	Farmer	Chongwe
14	Janet Mweemba	Female	Farmer	Chongwe
15	Mirriam kawina	Female	Farmer	Chongwe

16	Chisha Helen	Female	Farmer	Chongwe
17	Getrude chiwaya	Female	Farmer	Chongwe
18	Godwin Mubaka	Male	Farmer	Chongwe
19	Enala Mukangasa	Female	Farmer	Chongwe
20	Muswana Esnart	Female	Farmer	Chongwe
21	Peggy Muyaya	Female	Farmer	Chongwe
22	Joyce Mwakabosha	Female	Farmer	Chongwe
23	Roda Lizimu	Female	Farmer	Chongwe
24	Peter Muswala	Male	Farmer	Chongwe
25	Friday Mpango	Male	Farmer	Chongwe
26	Esnart Muswala	Female	Farmer	Chongwe
27	Joyce Kamwa	Female	Farmer	Chongwe
28	Josphat Sinzala	Male	Farmer	Chongwe
29	Stephen Makusa	Male	Farmer	Chongwe
30	Dorothy Shipikili	Female	Farmer	Chongwe
31	Hellen Simbuwa	Female	Farmer	Chongwe
32	Kebeleka Fales	Female	Farmer	Chongwe
33	Belita Kawina	Male	Farmer	Chongwe
34	Leonard like	Male	Farmer	Chongwe
35	Mathews Sabao	Male	Farmer	Chongwe
36	Veronica Susu	Female	Farmer	Chongwe
37	Beatrice Machina	Female	Farmer	Chongwe
38	Noah Kubocha	Male	Farmer	Chongwe
39	Judith Mwaluputa	Female	Farmer	Chongwe
40	Rodah Lizhimu	Female	Farmer	Chongwe
41	Robinson Muledema	Male	Farmer	Chongwe
42	Rita Mulumbi	female	Farmer	Chongwe
43	Simon Kambwe	Male	Farmer	Chongwe
44	Supuni Mirrian	Female	Farmer	Chongwe
45	Machina Eunice	Female	Farmer	Chongwe
46	Malaicha Rosta	Female	Farmer	Chongwe
47	Mandelena Mpelembe	Female	Farmer	Chongwe
48	Sabas Emmanuel	Male	Farmer	Chongwe
49	Mache Spencer	Male	Farmer	Chongwe
50	B. Mukandala	Male	Farmer	Chongwe
51	Peter Lizimu	Male	Farmer	Chongwe
52	Shakemba Agness	Female	Farmer	Chongwe
53	George Kuyeli	Male	Farmer	Chongwe
54	Robert Hamainde	Male	Farmer	Chongwe
55	Patrick Mwakapitisha	Male	Farmer	Chongwe
56	Theresa Chimamba	Female	Farmer	Chongwe
57	Idah Nyendwa	Female	Farmer	Chongwe
58	Malama Chilala	female	Farmer	Chongwe
59	Charles Chigongo	Male	Farmer	Chongwe
60	Christopher Chipoya	Male	Farmer	Chongwe
61	Stephen Makusa	Female	Farmer	Chongwe
62	Mache Spencer	Male	Farmer	Chongwe
63	David Banda	Male	Farmer	Chongwe

64	Obvious Kanzala	Male	Farmer	Chongwe
65	Gelard Musopelo	Male	Farmer	Chongwe
66	Musanje Alice	Female	Farmer	Chongwe
67	Stainly Mbelenga	Male	Farmer	Chongwe
68	Samuel Njovu	Male	Farmer	Chongwe
69	Edward Mwakakwele	Male	Farmer	Chongwe
70	Judith Mwaluputa	Female	Farmer	Chongwe
71	Elizabeth Tembo	Female	Farmer	Chongwe
	Subtotal male farmers		24	
	Subtotal female farmers		37	
72	Mulema Nyambe	Male	Enumerator	Kazungula
73	Munkombwe Muchima	Male	Enumerator	Kazungula
74	Kayombo Chipagu	Male	Enumerator	Kazungula
75	Imatta Mutafala	Male	Enumerator	Kazungula
76	Maseka Tembo	Male	Enumerator	Kazungula
77	Liuwa Namakando	Male	Enumerator	Kazungula
78	Chipupila Mumba	Male	Enumerator	Kazungula
79	Daniel mwikisa	Male	Enumerator	Kazungula
80	Patrick Sitali	Male	Enumerator	Kazungula
81	Hamankolo Anthens	Male	Enumerator	Kazungula
82	Kauwa Grey S.	Male	Enumerator	Kazungula
83	Silvasy Shibulo	Male	Enumerator	Kazungula
	Subtotal male enumerators		12	
	Subtotal female enumerators		0	
84	Ireen Lisulo	Female	Farmer	Kazungula
85	Maurice Mutema	Male	Farmer	Kazungula
86	Patricia Simakole	Female	Farmer	Kazungula
87	Zea Mudenda	Male	Farmer	Kazungula
88	Beatrice kashenda	Female	Farmer	Kazungula
89	Omi Malimo	Male	Farmer	Kazungula
90	Maria Saseko	Female	Farmer	Kazungula
91	Liswaniso Christopher	Male	Farmer	Kazungula
92	Cathrine Sibunde	Female	Farmer	Kazungula
93	Elinah Samba	Female	Farmer	Kazungula
94	Rachael Silimbani	female	Farmer	Kazungula
95	Precious Mooka	Female	Farmer	Kazungula
96	Brenda Spawa	Female	Farmer	Kazungula
97	Ruth Kalaluka	Female	Farmer	Kazungula
98	Raphael Mudenda	Male	Farmer	Kazungula
99	Billy Muleya	Male	Farmer	Kazungula
100	Chris Kwandu	Male	Farmer	Kazungula
101	Austine Muchumaeli	Male	Farmer	Kazungula
102	Freedom shulikwa	Male	Farmer	Kazungula
103	Ireen Lisulo	Female	Farmer	Kazungula
104	Patricia Sililo	Female	Farmer	Kazungula
105	Samuel Likando	Male	Farmer	Kazungula
106	Ngenda Mukwenda	Male	Farmer	Kazungula
107	Henly lemba	Male	Farmer	Kazungula

108	Bagshow Njamba	Male	Farmer	Kazungula
109	Pelekelo chanda	Female	Farmer	Kazungula
110	Patricia Munuela	Female	Farmer	Kazungula
111	Elina samba	Female	Farmer	Kazungula
112	Victor Segwa	Male	Farmer	Kazungula
113	Jacob Nyambe	Male	Farmer	Kazungula
114	Folden pelekelo	Male	Farmer	Kazungula
115	Steven katamba	Male	Farmer	Kazungula
116	Mungala Felistus	Female	Farmer	Kazungula
117	Maria Maseko	Female	Farmer	Kazungula
118	Christine Simasiku	Female	Farmer	Kazungula
119	Lemba Raphael	Male	Farmer	Kazungula
120	Goliate Sikute	Male	Farmer	Kazungula
121	Habasimbi Gift	Male	Farmer	Kazungula
122	Kalimbwe kandonga	Male	Farmer	Kazungula
123	Kaluba Mungala	Male	Farmer	Kazungula
124	Deniel Adonsi	Male	Farmer	Kazungula
125	Mervis Mutema	Female	Farmer	Kazungula
126	Sonity Kabuka	Female	Farmer	Kazungula
127	Hilder Maila	Female	Farmer	Kazungula
128	Obert Mubita	Male	Farmer	Kazungula
129	Golden Kamkemba	Female	Farmer	Kazungula
130	Martha Ngandu	Female	Farmer	Kazungula
131	Precious Mooka	Female	Farmer	Kazungula
132	Subtotal male farmers		24	
133	Subtotal female farmers		24	
134	Hamusute mutinta	Enumerator	Male	Siavonga
135	Oscar Mulamifu	Enumerator	Male	Siavonga
136	Hibanyama Choongo	Enumerator	Male	Siavonga
137	Kambuyu V. Pumulo	Enumerator	Male	Siavonga
138	Kasasaka Maybin	Enumerator	Male	Siavonga
139	Siame Mwale	Enumerator	Male	Siavonga
140	Nseniuwe Grace	Enumerator	Female	Siavonga
141	Ireen M. Chisanga	Enumerator	Female	Siavonga
142	Felix Chama	Enumerator	Male	Siavonga
143	Wiseman Mulenga	Enumerator	Male	Siavonga
144	Namakando Geoffrey	Enumerator	Male	Siavonga
145	Kilubi Valentine	Enumerator	Male	Siavonga
146	Siamani warred	Farmer	Male	Siavonga
	Sub total male enumerators		11	
	Sub total female enumerators		2	
147	Maggy Chisabi	Farmer	Female	Siavonga
148	Getrude Siagawa	Farmer	Female	Siavonga
149	Munyama Thomson	Farmer	Male	Siavonga
150	Hilda Simunyama	Farmer	Female	Siavonga
151	Pearson Mutare	Farmer	Male	Siavonga
152	Luke Siapika	Farmer	Male	Siavonga
153	Siambulo Kisa	Farmer	Male	Siavonga

154	Conference Siabusu	Farmer	Male	Siavonga
155	Dixio Siakaligonya	Farmer	Male	Siavonga
156	Munsase Alfred	Farmer	Male	Siavonga
157	Prisca Kabila	Farmer	Female	Siavonga
158	Austine Dobola	Farmer	Male	Siavonga
159	Tydose Siabanzibe	Farmer	Male	Siavonga
160	Charles Siamapabi	Farmer	Male	Siavonga
161	Kaluwe Blair	Farmer	Male	Siavonga
162	Tido Siabazibi	Farmer	Male	Siavonga
163	Joyce Simwami	Farmer	Female	Siavonga
164	Neria Chimuka	Farmer	Female	Siavonga
165	Burton sikayamba	Farmer	Male	Siavonga
166	Ever Siapemo	Farmer	Female	Siavonga
167	Lontia Simusi	Farmer	Female	Siavonga
168	Rita Hakasili	Farmer	Female	Siavonga
169	Ivy Hanani	Farmer	Female	Siavonga
170	Machina mweemba	Farmer	Male	Siavonga
171	Mary Chazangwe	Farmer	Female	Siavonga
172	Robert Muleya	Farmer	Male	Siavonga
173	Julius Mufana	Farmer	Male	Siavonga
174	Siabusu Perason	Farmer	Male	Siavonga
175	Rosemary Kagele	Farmer	Female	Siavonga
176	Euphrasia Mwape	Farmer	Female	Siavonga
177	Siakayamba Friday	Farmer	Male	Siavonga
178	Best Muchindu	Farmer	Male	Siavonga
179	Anna Millimo	Farmer	Female	Siavonga
180	Trezer Siawela	Farmer	Male	Siavonga
181	P Siabusu	Farmer	Male	Siavonga
182	Friday Sikayamba	Farmer	Male	Siavonga
183	Mary Siamakaba	Farmer	Female	Siavonga
184	Joyce Siamwami	Farmer	Female	Siavonga
185	Maxon Sianganya	Farmer	Male	Siavonga
186	Maxwell Bozeka	Farmer	Male	Siavonga
187	Jeremiah Sianguzu	Farmer	Male	Siavonga
188	Loveness Chisabi	Farmer	Female	Siavonga
189	Ester Dolo	Farmer	Female	Siavonga
190	Maggy Chisabi	Farmer	Female	Siavonga
191	Monica Simulonde	Farmer	Female	Siavonga
192	Tido Siabazibi	Farmer	Female	Siavonga
193	Vinia Simunyama	Farmer	Female	Siavonga
194	Prisca Kabila	Farmer	Female	Siavonga
	Sub total female farmer		23	
	Sub total male farmer		25	
	Total male enumerators		**33**	
	Total female enumerators		**4**	
	Total male farmers		**73**	
	Total female farmers		**84**	

ANNEX 4

EVALUATION QUESTION MATRIX FOR PROJECT

Evaluation Criteria Matrix: Evaluation Questions			
Evaluative Criteria Questions	**Indicators**	**Sources**	**Methodology**
Relevance: How does the project relate to the main objectives of the GEF focal area, and to the environment and development priorities at the local, regional and national levels? Was the project appropriate solution to the problem?			
How does the project support the GEF [Env & Sust Dev] area and strategic priorities? How does the project support the environment and sustainable development objectives of Zambia?	Existence of a clear relationship between the project objectives and GEF focal area Degree to which the project supports national environmental objectives together with poverty reduction	Project document Mid-term Review National policies and strategies GEF focal area docs Project partners' key docs	Content analysis of documents Interviews with UNDP, project team & partners Interviews with national officials Direct interaction with stakeholders at large
Were local beneficiaries and stakeholders adequately involved in project design and implementation? Is the project country-driven?	Level of involvement of government officials and other partners in the project design process Degree of coherence between the project and nationals priorities, policies and strategies	Project document Mid-term Review National policies and strategies GEF focal area docs Project partners' key docs	Content analysis of documents Interviews with UNDP, project team & partners Interviews with national officials Direct interaction with stakeholders at large
Is the length of the project sufficient to achieve project outcomes? How do GEF-funds help to fill gaps (or give additional stimulus) that are necessary but are not covered by other donors?	Appreciation from national stakeholders with respect to adequacy of project design and implementation to national realities and existing capacities	Project document Mid-term Review National policies and strategies GEF focal area docs Project partners' key docs	Content analysis of documents Interviews with UNDP, project team & partners Interviews with national officials Direct interaction with stakeholders at large
Effectiveness: To what extent have the expected outcomes and objectives of the project been achieved? To what extent were the appropriateness, evaluability and measurability of the results framework and its associated indicators and the M&E system that was put in place? What were the factors beyond the control of executing and implementing agencies that may have affected the attainment of results and how the risks have been managed during programme implementation?			

Has project been effective in achieving expected outcomes with respect to the following: +Institutional capacity in place to assess, plan and implement mechanisms for the management of irrigated agriculture? +Was there farmers' capacity and incentives for their participation in irrigated agriculture and alternative livelihoods? +Was there capacity for monitoring and evaluation about transferring technology?	Logframe indicators concerning M&E Performance indicators in each pilot site	Project documents Mid-term Review Technical specifications of water resources works National policies about small irrigation works & recovery cost	Content analysis of documentation Interviews with national officials Interviews with chiefs & chiefdom officials Interviews with farmers make and female
What was the national policy for agricultural schemes and cost recovery?	Logframe indicators concerning M&E Performance indicators in each pilot site	Project documents Mid-term Review Technical specifications of water resources works National policies about small irrigation works & recovery cost	Content analysis of documents Interviews with UNDP, project team & partners Interviews with national officials Direct interaction with stakeholders at large
What changes could have been made in the project design in order to improve the achievement of the project's expected results?	Logframe indicators concerning M&E Performance indicators in each pilot site	Project document Mid-term Review National policies and strategies GEF focal area docs Project partners' key docs	Content analysis of documents Interviews with UNDP, project team & partners Interviews with national officials Direct interaction with stakeholders at large
Efficiency: Was the project implemented, in-line with international and national norms and standards? Was implementation of the programme and its achievements been done in the most cost effective way?			
Were progress reports produced accurately, timely and responded to reporting requirements including adaptive management changes? Were financial disbursements conducted timely as planned? Did financial resources reach the pilot sites timely as planned?	-Quality of results-based management reporting (progress reporting, monitoring and evaluation) -Modifications in project design/ implementation approach (i.e. restructuring) when needed to improve project efficiency -Compare alternatives costs associated with delivery mechanism and management structure	Project documents Mid-term Review Project supervision reports Data reported in project annual and quarterly reports	Content analysis of documentation Interviews key informants Interviews with partners
How was results-based management used during project implementation? Was a framework set up to measure changes in farm income?	-Quality of results-based management reporting (progress reporting, monitoring and evaluation) -Modifications in project design/ implementation approach (i.e. restructuring) when needed to improve project efficiency -Compare alternatives costs associated with delivery mechanism and management structure	Project document Mid-term Review National policies and strategies GEF focal area docs Project partners' key docs	Content analysis of documentation Interviews key informants Interviews with partners

Was an appropriate balance struck between utilization of international expertise as well as local capacity?	-Quality of results-based management reporting (progress reporting, monitoring and evaluation) -Modifications in project design/ implementation approach (i.e. restructuring) when needed to improve project efficiency -Compare alternatives costs associated with delivery mechanism and management structure	Project document Mid-term Review National policies and strategies GEF focal area docs Project partners' key docs	Content analysis of documentation Interviews key informants Interviews with partners
Sustainability: To what extent are there financial, institutional, socio-economic, and/or environmental risks to sustain long-term project results? What should be the weight placed on the sustainability of stakeholder collaboration, management committees, the pass on mechanism and the sustainable scale-up of the adopted farming practices and alternative livelihoods			
Do the various key stakeholders see that it is in their interest that project benefits continue to flow?	Performance indicators from different pilot sites	-Project documents -Mid-term review -Monitoring reports -Relevant national documents	Content analysis of documentation Interview with key stakeholders Field work on sites
Is there sufficient public/stakeholder awareness in support of the project's long-term objectives?	Performance indicators from different pilot sites	-Project documents -Mid-term review -Monitoring reports -Relevant national documents	Content analysis of documentation Interview with key stakeholders Field work on sites
Are there ongoing activities that may pose an environmental threat to the sustainability of project outcomes?	Performance indicators from different pilot sites	-Project documents -Mid-term review -Monitoring reports -Relevant national documents	Content analysis of documentation Interview with key stakeholders Field work on sites
Impact: Are there indications that the project has contributed to, or enabled progress toward reduced environmental stress and/or improved ecological status? What are the manifestations or early indications of long term changes in the living conditions, resilience and environmental considerations of the targeted communities that can be attributed to the project or those outcomes that the project has contributed to?			
Have the project results demonstrated verifiable improvements in the living conditions of small holding farmers including women from farm families?	Performance indicators from different pilot sites	-Project documents -Mid-term review -Monitoring reports -Relevant national documents	Interview with key informants Field work on sites
Have the project results demonstrated verifiable improvements in ecological status? Have the project results demonstrated verifiable reductions in stress on ecological systems?	Performance indicators from different pilot sites	-Project documents -Mid-term review -Monitoring reports -Relevant national documents	Content analysis of documentation Interview with key stakeholders Field work on sites

ANNEX 5

CO-FINANCING TABLE FOR UNDP SUPPORTED GEF FINANCED PROJECTS

Table 5.1 Disbursement of Co-Financing Funds [as of November, 2015]

Co-financing (type/source)	UNDP own financing (mill. US$)	Government (mill. US$)	Partner Agency (GEF) (mill. US$)	Total (mill. US$)

	Planned	Actual	Planned	Actual	Planned	Actual	Planned	Actual
Grants	175 000	770 857.87	1,529,000	0	3,795,000	3, 768, 202.59	5,499,000	4,372,361.9
Loans/ Concessions	0	0	0	0	0	0	0	0
In-kind support	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0
Totals	175,000	770 857.87	1,529,000		3,795,000	3,768,202.56	5,499,000	4,372,361.9

Source: UNDP/CO

The following factum on the Project's financing and co-financing has been submitted by the UNDP CO to the Mission.

UNDP expenses
In line with the Project Steering Committee's request, UNDP's own financing increased to finance the incorporation of additional beneficiaries in the Project. This was reflected in the Annual Work plans. These additional UNPD funds also covered supplementary transportation needs that were identified during Project implementation, as well as a saddle dam to avoid flooding in downstream communities.[107]

Government of the Republic of Zambia
The Government contribution in-kind was mostly dedicated to office spaces and their maintenance, and officers' emoluments who were supporting the Project in regional, provincial, and national levels.

GEF
There is an approximate 20% difference [USD 1,126,638.10] between the projected and actual expenses. The UNDP CO indicates that this GEF funding discrepancy was due to the fact that the final disbursement to the TE consultant, along with other expenses, have not yet been paid out. Furthermore, there are pending payments for the project support costs to be paid to UNDP. Once these are paid, the balance is expected to be nil.

The Latest Audit Report Findings as of December 31, 2014 [108]

The key findings relevant to the TE from the latest Audit report are as follows:

- The rate of Project delivery is as per work plans
- All Project disbursements were made in accordance with Prodoc, financial rules, practices and procedures of the Government of Zambia and with the UNDP
- All Project disbursements were valid and supported by adequate documentation
- The Project's financial statements accurately present assets, cash and expenses as of December 31, 2014
- The assets and equipment of the project were properly managed
- The Project maintained an appropriate financial management structure, internal control and record-keeping systems

From the review of prior-year performance of activities executed, the Auditor submitted the following observations:

[107] The specific site where the saddle was constructed was not identified, neither were the characteristics and cost of saddle pinpointed.

[108] MKM Solutions. Audit Report on the Statements of Expenses (CDR), Assets and Cash Position. For the year Ended 31 December 2014.

Cause	Counts	Risk	Potential effects
Inadequate planning	6	Medium-low	Delayed project completion
Inadequate monitoring & guidance	3	Low	Delayed project completion
Inadequate policies related to bank statements & reconciliations	3	Low	Errors & possible fraud may go unnoticed and/or reversed accountability

Source: MKM Solutions. Audit Report on the Statements of Expenses (CDR), Assets and Cash Position. For the year Ended 31 December 2014. pp 21-32

Synthesis

It is clear that the Project carried out its administrative and financial operations in accordance with the Project Document, financial rules, regulations, practices, and procedures of the Government of Zambia, and in accordance with UNDP rules and regulations. The Project's assets and equipment were also properly managed; it maintained an appropriate financial management structure, internal control and record-keeping system. The subtext of the finance/co-finance picture conveys that the Project, as it was designed and implemented, did not need additional funds. Specifically, cancelling the water resource development works after the MTR contributed to the 20% unspent resources. It is, therefore, logical to infer that efforts to acquire additional funds were not a priority. Discussions with UNDP and MAL confirm this statement. However, this situation does not imply that financial resources are available to cope with adaptations needed in the agricultural sector as a whole.

ANNEX 6

MATRIX FOR RATING THE ACHIEVEMENT OF OUTCOMES

Preamble

The Terminal Report is an opportunity for the implementing entity to present the project's outcomes, particularly with regard to meeting the expected accomplishments. Given this context, there is a measure of accountability as the implementing agency has the obligation to (i) demonstrate that work has been conducted in accordance with agreed rules and standards and (ii) report fairly and accurately on performance results vis-à-vis mandated roles and/or plans.[109]

The Terminal Report is still work in progress. In the absence of a comprehensive Terminal Report from either the Project Team or the GRZ, it is not yet possible to determine to what extent the outcomes have been achieved. Accountability considerations do not allow the elaboration of proxy- Terminal Report. By contrast, it was possible to triangulate a proxy-baseline against which the results of the survey conducted could be assessed. Because the findings relate to the early-adopters of the technologies proposed by the Project, both men and women, including the emerging constraints to the full economic fruition of the expected project results.

Goal: to improve food security through enhanced adaptive capacity to respond to the risks posed by the effects of climate change (including variability) in AER I and II of Zambia
Objective: to develop adaptive capacity of subsistence farmers and rural communities to withstand climate change in Zambia

[109] Executive Board of the United Nations Development Programme and of the United Nations Population Fund. The UNDP accountability system Accountability framework and oversight policy. New York, 2008

Outcomes	Indicators	2010 Baseline Value	2014 End-of-Project Value	2014 End-of-Project Target	Comments	Rating
Outcome 1: Climate change risks integrated into critical decision-making processes for agricultural management at the local, sub-national and national levels.	1. Number of Government planners and extension staff that include climate risk information in their decision processes	Work in progress	Work in progress	Work in progress	From TE survey conducted the evidence is inconclusive concerning the immediate use of EWS by the farmer.	
	2. Early Warning Systems developed and applied effectively in 3 pilot sites.	Work in progress	Work in progress	Work in progress		
Outcome 2: Agricultural productivity in the pilot sites made resilient to the anticipated impacts of climate change	1. Number of interventions in selected pilot sites implemented, with appropriate management (including cost recovery) plans in place, agreed by all stakeholders, for sustainability beyond the project grant.	Work in progress	Work in progress	Work in progress	Early-adopters show clear potential to increase farm income through the adoption of agronomic techniques proposed	
	2. Percentage increase in agricultural incomes in the pilot sites.	Work in progress	Work in progress	Work in progress		
	3. Number of women involved in interventions in the pilot sites.	Work in progress	Work in progress	Work in progress		
Outcome 3: National fiscal, regulatory and development policy revised to promote adaptation responses in the agricultural sector.	1. The number of policies that are adapted to take into account climate change risks.	Work in progress	Work in progress	Work in progress	Relevant outputs have been produced	
	2. Awareness level of rural population in pilot sites and local/national government of climate change and its impacts improved.	Work in progress	Work in progress	Work in progress		
Outcome 4: Lessons learned and knowledge management component established.	1. Number of proposals, papers and other documents that incorporate learning from the project.	Work in progress	Work in progress	Work in progress	Relevant outputs have been produced	
	2. Number of lessons included in the ALM.	Work in progress	Work in progress	Work in progress		
	3. Number of regional and national workshops conducted for dissemination of project lessons.	Work in progress	Work in progress	Work in progress		
	4. The number of awareness campaigns conducted on the need to incorporate adaptation needs in policy.	Work in progress	Work in progress	Work in progress		

ANNEX 7

FIELD DATA COLLECTION AND SUMMARY OF RESULTS

1. INTRODUCTION

In line with the UNDP GEF guidelines for Terminal Evaluations,[110] this annex expounds on the best mix of tools used to ensure reliable and valid answers to the evaluation questions within the limits of current resources and availability of data.[111]

Concretely, the Inception report proposed a methodology and procedures for collecting data, with special reference to data collection instruments (e.g., crop budgets, MSC stories, LFA questionnaires), the selection of representative pilot sites and associated sampling procedures to ensure reliability and validity.[112] The purpose of this Annex is:

1-To articulate a narrative to validate the procedures used in the field data collection, with special reference to clarifying any differences from the planned procedures set out in the Inception report;

2- To understand the conditions in the pilot sites without the project so as to assess how the conditions have changed with the project. To this end, reconstruction techniques based on historical evidence, rapid surveys, and a wide range of indicators, including those monitoring the changes in the agricultural sector are used in addition to the project components.

3-To sum-up the results obtained in each of the pilot sites visited in order to assess to what extent a tangible adaptation in skills has taken place to cope with climate variability and global warming —and ensuing consequences in crop yields, cropping patterns and farm income.

2. ORGANIZATION, METHODOLOGY AND PARTICIPANTS

2.1 Organizational Framework

In line with the TOR, the evaluation team was composed of one international consultant, the project team and a team of enumerators. Through this arrangement many of the data collection tasks were conducted by the project team and the enumerators under the supervision of the consultant. The enumerator's team was made up of a set of extension agents belonging to each of the sites visited; however, these agents were not previously involved with Project activities. The National Project Coordinator accompanied the implementation of all the Mission activities as an observer.

The TE's organizational framework was participatory and consultative. Using this approach every stakeholder had an opportunity to present its case, as the focus was on achievements and learning. This enabled an appreciation for shared activities, coordinated efforts, and linkages among those who were involved with the Project. In turn, this allowed the assessment of potential and actual synergies, or lack thereof, in operation.

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[110] UNDP.Project-Level Evaluation Guidance for Conducting Terminal Evaluations of UNDP-Supported, GEF-Financed Projects. Evaluation Office, New York, 2012.

[111] The TOR suggested the review of the relevant sources of information, i.e. project document, project reports – including Annual APR/PIR, project budget revisions, midterm review, progress reports, and GEF focal area tracking tools, project files, national strategic and legal documents, including other methods such as in-depth interviews and focused groups discussions with beneficiaries and key informants, beneficiary surveys and case studies.

[112] UNDP /GEF/ GOZ/ MAL Adaptation to Climate Variability and Change in Agro Ecological Regions I and II (PIMS # 3942) TERMINAL EVALUATION Inception Report Eduardo Quiroga UNDP Consultant. Draft: July 14, 2015 Final Version, pp 5-19

2.2 Methodology: the Model of Technology Transfer for Resilient Productivity

By their nature, small holders and their families are the first people required to cope with climate change. The Project's Outcome 2 approach is strategically oriented to induce resilience to the negative impacts of climate change among these small holders. Consequently, outcomes 1, 3, and 4 reflect the fiscal and regulatory policies developed at different organizational levels of the Ministry of Agriculture and Livestock based on what works and does not work in Outcome 2.

The expected results from Outcome 2 constitute the backbone of the adaptation to climate variability and change in agro-ecological regions I and II, through the implementation of eight pilot sites (Chongwe, Luangwa, Mambwe, Chama, Siavonga, Kazungula, Sioma and Senanga). To this end, a wide range of options have been proposed so that farmers can learn adaptive skills to cope with climate change and the environment's variability. Specifically:[113]

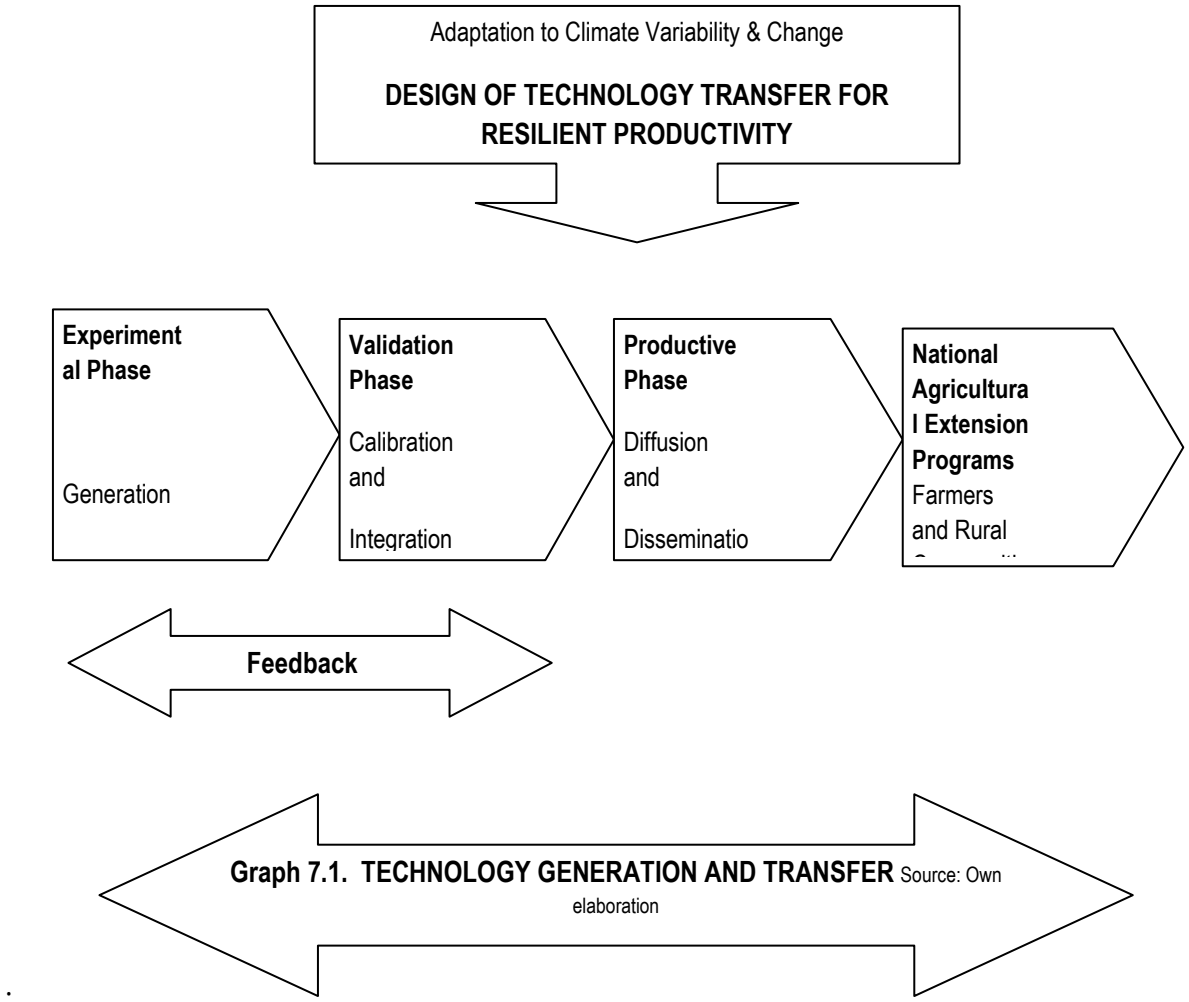
- Water and soil conservation techniques reaching 900 farmers, 8 management centers [with the same number of male and female members], and an undetermined number of ha.
- Crop diversification, with special reference to drought resistant varieties, reaching 1000 farmers in addition to 300 farmers trained to produce and market drought-resistant seeds; 8 management centers [with the same number of male and female members]; and an undetermined number of ha.
- Alternative livelihoods including bee-keeping, fish-farming, traditional rice-faming, rice cum fish-farming, exploitation of NTFP opportunities, and goat-rearing.
- Development of irrigated agriculture through the construction of varied hydraulic infrastructure, i.e. four multipurpose dams for four different communities, one earth-dam for one community alone, six dams to store water to provide water to one community, two reservoirs surrounding one community, three weirs in another community, and the rehabilitation of two irrigation schemes.

It became evident that the assessment of the results of such a comprehensive approach called for a Model of Technology Transfer for Resilient Productivity, as illustrated in Graph 7.1. Agricultural development experience suggests that the implementation of innovations for resilient productivity should be conducted as a process of technology adaptation and transfer. This consists of sequencing three phases:[114]

- The experimental phase includes the identification of parameters associated with the generation and potential adaptation of the technology by small landholders in AER I and II, in the context of their socio-economic needs, skills, and ecosystem.
- The validation phase deals with the process of integrating the technology into the socio-economic milieu of the small landholders together with their ecosystem conditions. At this phase, the process of feedback is decisive, as the success of the calibration depends on the quality and timely uptake response from small-holding farmers. Sound monitoring information leads to a successful calibration of the technology.
- The productive phase, based on the sound calibration of the technology, proceeds with the diffusion and dissemination of the proposed technology in the AER I and II, targeted to small holding farmers.
- As the diffusion and dissemination of the technology is accomplished satisfactorily, the technology can be mainstreamed through national programs of agricultural extension, such as the National Agricultural Extension Programmes, including linkages with Policies and Incentives.

[113] These list of expected outputs correspond to the list contained in the original Prodoc.

[114] Cf. V. Ruttan. Induced innovation and agricultural development. Food policy. Vol 2, no 3, 1977



Graph 7.1. TECHNOLOGY GENERATION AND TRANSFER Source: Own elaboration

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The Model's key principle is that agricultural transformation is location-specific.[115] As will be demonstrated, the adaptation of technology is influenced not only by the local ecology, but also by social norms, and economic conditions particular to the social structure of the given site. These latter aspects are usually referred to as institutional factors. Therefore, the task of assessing technological change in agriculture is to determine the institutional factors that impede or incentivize the technology transfer process —taking into consideration the fact that successful agricultural innovations are grafted onto traditional agricultural modes. [116]

Within the framework of this Model, a set of procedures and instruments have been designed to capture key qualitative features of the results obtained. Although these instruments have not delivered rigorous proof, they have provided insight; that is, a glimpse beneath the surface of the technology transfer process and associated issues. This, coupled with the accumulation of interviews, has triggered alternative options to problems and issues arising from the present review. These will be reflected in the lessons learned.

115 Hayami, Y & V Ruttan. Agricultural development: An international perspective. 2nd ed. John Hopkins University, 1985

116 Cf. Southworh, H & B. Jonhston [eds] Agricultural development and economic growth. Cornell University Press, 1974. Eicher, C. & J. Staatz. Agricultural development in the third world. The John Hopkins University, 1985

2.2.1 Field Procedures in Data Collection

The Farm Survey

From the eight pilot sites, a representative set of pilot sites was jointly selected, i.e. Chongwe, Siavonga and Kazungula, after taking into consideration the limited time allocated to the Terminal Evaluation, site proximity and ease of access. Given the time and resources available, the survey's intent was exploratory and problem-learning rather than predictive. A purposive sample of farmers appeared to be a sufficient representation to examine the effect of Project actions on the varied agro-ecological zones and socioeconomic conditions of the pilot sites reviewed. Thus, the sample selected in each site was purposive and stratified.[117] In each site five groups were selected with the participation of the project and implementation teams. [118] For each group, five male and female farmers were selected.

- **Group A**. This is a successful group in the uptake of know-how introduced by the Project.
- **Group B.** This group has had limited or no success from the Project's interventions.
- **Group C**. This group has had some tangible results from the Project's interventions.
- **Group D**. This group of small holders is currently outside the Project's interventions but has shown initiative in replicating the Project's know-how.
- **Group E**. This group of small holders is currently outside the Project's interventions, conducting itself in a "business as usual" manner.
- **Group F**. This group is made up of each site's Management Committee and is composed of an equal number of male and female farmers.

The goal of examining these five groups was to learn the behavioral response to the technology transfer. Groups A,B, and C were early-adopters of the know-how proposed, but had different degrees of economic success. Groups D and E were test groups. Both groups had not been targeted by the Project actions, but Group D was already in the uptake of the know-how imparted by the Project while Group E behaved in a "business as usual" manner. Group F was made up of the members from the management committee; it proved useful to learn their response to the technology transfer.

In each site the data collection procedure was as follows. The first day was dedicated to the orientation of the team of enumerators and pre-testing of the instruments. The next day was exclusively assigned to administering the instruments in accordance with the sample's strata and corresponding number. The selected farmers were convened in one venue chosen by the pilot site's management so as to maximize the use of time. This also allowed the consultant to interview selected farmers and visit farms near the venue. The final day was used to review the data collected to ensure consistency and reliability.

There were slightly more female [84] than male [73] farmers that participated in the survey. The final list of farmers [male and female] from each of the three sites, including the list of enumerators, is in Annex 3. It was not always

[117] A purposive sampling leaves considerable freedom of choice to the interviewer in the selection of respondents. Although the technique varies from one researcher to another, there are restrictions related to specific characteristics, such as (gender, etc.) or the respondents must be representative of a certain area (pilot sites) or a specific group being interviewed, such as women of rural households in a given pilot sites. Potential biases were avoided since the project team and pilot site's focal points selected the respondents. See: W.J.Goode and P.K. Hatt. Methods in social research. McGraw Hill Book Company. 1952, p. 230.

[118] The term "group" and "strata" are used interchangeably..

possible to ensure the desired number of female enumerators, as practical matters emerged which limited their participation, such as the duty of looking after sick children, and recently deceased community members. The local social norm compelled the women to be in charge of the ritual funeral arrangements for the dead. These minor variations did not seem to bias the results obtained either for the male or female farmers. The sample proved sufficient to depict the trends associated with the status of farm income, and perceptions about the technology up-take by the beneficiaries, with special reference to food security

Timeframe

The field data collection was launched on July 9 in Siavonga [July 9-15], continued on to Kazungula [July 16-20] and ended in Chongwe [July 21-24]. The remainder of the Mission's Itinerary is found in Annex 2. As indicated, the list of persons interviewed is in Annex 3.

The Evaluation Dataset

The structure and function of the different instruments used were discussed in detail in the Inception report.[119] The different instruments used were intended to elicit information from particular components of the sample's strata or groups to meet the demands of the evaluation data set.

Farm Income

Using the crop budget and the income & expenditure budget, information on farm income was collected from five groups, and included similar numbers of male and female farmers involved in crop production and livelihood operations, i.e. beekeeping and goat rearing.

Group	Female Farmers	Male Farmers	Female Enumerator	Male Enumerator
A	5	5	1	1
B	5	5	1	1
C	5	5	1	1
D	5	5	1	1
E	5	5	1	1
Total	25	25	5	5

Food Security and Gender

The MSC technique was used to collect information on food security and associated gender issues. Since the women of small holder households are primarily concerned with the food needed to feed the family unit, the MSC technique was administered exclusively to women.

[119] See: UNDP /GEF/ GOZ/ MAL Adaptation to Climate Variability and Change in Agro Ecological Regions I and II (PIMS # 3942) TERMINAL EVALUATION Inception Report Eduardo Quiroga UNDP Consultant. Draft: July 14, 2015 Final Version: Annex 1, Crop budget & Livestock operation; Annex2, Income and expenditure budget; Annex 3, Assessment of irrigation management; Annex 4, The Most Significant Change technique; Annex 5, Sample. Significant change story; Annex 6, Limiting factor analysis.

Group	Female Farmers	Female Enumerator
A	5	1
B	5	1
C	5	1
D	5	1
E	5	1
Total	25	5

Farmers' Perceptions on the Uptake of Project Know How

The MSC technique was used to assess the impediments and drivers in the uptake of knowledge leading to the adaptation of resilient productivity, including capacity issues. Data was collected from five groups that included similar numbers of male and female farmers involved in crop production and livelihood operations.

Group	Male Farmers	Female Farmers	Male Enumerator	Female Enumerator
A	5	5	1	1
B	5	5	1	1
C	5	5	1	1
D	5	5	1	1
E	5	5	1	1
Total	25	25	5	5

Management Committee's

Five male and female farmers belonging to the three Project groups' Management Committees were interviewed using the MSC technique in relation to their facilitation role in the Project's implementation.

Group	Male Farmers	Female Farmers	Male Enumerator	Female Enumerator
A	5	5	1	1
B	5	5	1	1
C	5	5	1	1
Total	15	15	3	3

Joint Review of Implementation Issues with the Eight Pilot Sites

A workshop in Siavonga was scheduled on July 9, 2015 to consider the project exit strategy.[120] The TE took advantage of this opportunity to interact with the teams involved in the implementation of the 8 pilot sites. Each team included the Provincial Agricultural Coordinator [PACO], the District Agricultural Coordinator [DACO], the Senior Agricultural Officer [SAO] or the Focal Person and the Camp Extension Officer.

The meeting focused on the results achieved and issues arising during the project's implementation. Each pilot site was asked to submit a 15-minute presentation (with 10 minutes for discussion) on the following themes:

- 1-What are the best results achieved and what are the reasons to explain these results ? [one page]
- 2-What are the results achieved that had limitations and what are the reasons to explain these results [one page]

This workshop provided the opportunity to validate the representativeness of the three sites jointly selected for field visits. From the discussions it emerged that the three pilot sites selected shared the bulk of the issues reviewed during the Workshop. The Minutes of the Siavonga workshop are attached as Appendix 1 of the present Annex 7. Participants also filled out a Limiting Factor Analysis rapid questionnaire prepared to configure a proxy baseline, as discussed below in section 3.3

The next section proceeds with the assessment of agricultural outcomes. To this end, the assumptions of the economics of project analysis has shown that it is productive to draw comparisons in the process of assessing changes in crop yields, cropping patterns, farm income and the like. These assumptions are made with the purpose of approximating reality.[121] Therefore:

- The economic value of farm income intends to appraise how much farm families participating in the project will have to live on. Part of the income the family gains may be the food that is consumed directly by the household as a result of participating in the project. Its absolute income may be so low that nearly all of the incremental production is consumed by the household. The farm budget becomes the basis for making this assessment.
- Project analysis is a species of partial analysis; this type of analysis assumes that the project itself is too small in relation to the whole economy to have a significant effect on prices. Based on this assumption, to determine key economic parameters, constant prices can be used for comparative purposes while using a five year timeline. This may also be applicable to exchange rates.
- Project analysis allows for the remuneration to labor, especially family labor, as it is a key farm resource. Labor requirements per hectare for each crop have been estimated. The value of this labor is assessed by using the going wage rate in the particular area. There is no objective criteria to determine the management fee of a farm family enterprise. Some commercial management fees for procurement and project management run at about 10%. On the whole, family farm managers need to identify and assess risks and then decide whether to take the risk or not. In this project, a 20% management fee appeared to be reasonable.

3- BASELINE TO EVALUATE AGRICULTURAL OUTCOMES

[120] The exit strategy was a recommendation of the Mid Term Review.

[121] J. Price Gittinger Economic analysis of agricultural projects. Economic development institute of the World Bank. John Hopkins University Press, Baltimore, 1982, pp 3-43

A baseline is a framework for measuring changes over time in terms of the performance of a project 's outcome indicators. Logically these indicators are set up at the beginning of the project through surveys [special studies] conducted for this purpose.[122] The idea is that these indicators will be compared with the condition of the same indicators at specific points during implementation [mid-term and / or terminal evaluations]. A baseline framework is the basis for a "with" and "without" project assessment or a 'change over time' assessment. Without baseline data to establish conditions "without" the project for outcome indicators, it is difficult to gauge the kinds of changes that have in fact occurred at the end of the project. Carefully designed baselines and targets are necessary to measure the performance of adaptation actions within the planned timeframe, especially during the process of climate change adaptation. Experience indicates that several structural factors militate against constructing baselines and targets to measure change over time.[123]

- Data availability: Although some climate-related data can be collected through primary methods, it can be resource intensive to do so, especially for eight pilot sites. Most often, climate specific information is scattered across different departments, sectors, agencies, donors or projects. The cross-sectoral nature of climate change often means that the relevant information may rest with different cross-sectoral ministries and agencies due to institutional constraints.
- Complex contexts: Given the uncertain nature of climate change, the specificity of expected outcomes of interventions may not be discernible. As the phenomena is evolving, the links between outputs and outcomes may not be supported by strong evidence. As a result, setting targets and baseline indicators is fettered by unknowns. For example, the information available associated with the conditions without the project in the Prodoc is incomplete, as the required surveys were not conducted. In order to carry out a terminal evaluation, there is the need to configure a baseline to assess change.

The OECD manual outlines practical strategies for estimating baselines.[124] In this context, in order to understand the conditions at the pilots sites *without* the project and assess how the conditions have changed with the introduction of the project, the following techniques are briefly discussed below.

- In most agricultural interventions, the uptake of the new technologies used to grow the crops proposed is the core issue. This is inextricably linked with commercializing the proposed crop and deriving revenue or benefits from the process. Therefore, farm revenue and yields obtained in conditions without the project was triangulated from the information available for comparison with the results obtained at sites with the project. It is understood, however, that revenue leads to a certain degree of food security and benefits for the overall wellbeing of the family unit.
- A rapid survey using the Limiting Factor Analysis[125] was administered to all pilot sites' implementation teams. The purpose was to appraise the set of issues associated with the "big picture," i.e. to determine the factors

[122] :World Food Programme. How to plan a baseline study. Office of Evaluation and Monitoring, Rome [no date]

[123] Partly this is due to the uncertain nature of climate change, making it difficult for project designers to plan long term outcomes with special reference to the metrics of baselines. Gaps not only in climate change information systems but also about the quality of statistics and information available for sustainable development pose difficult tasks. A data revolution has been called by the UN New Global Partnerships See: A New Global Partnership: Eradicate Poverty and Transform Economies Through Sustainable Development. United Nations. New York, 2013, p 8.

[124] Dinshaw, A. et al. (2014), "Monitoring and Evaluation of Climate Change Adaptation: Methodological Approaches", OECD Environment Working Papers, No. 74, OECD Publishing. pp 16-22 Extracted 25-8-15. http://dx.doi.org/10.1787/5jxrclr0ntjd-en

beyond the control of the pilot sites' management that played a dominant role in climate change adaptation.

More importantly, it was critical to estimate a baseline of the conditions in the pilot sites without the Project in terms of prices, markets and others factors relevant to agricultural production and commercialization.

- Based on historical and empirical evidence, an anatomy of the Kayuni village (situated in the Siavonga District), was configured highlighting the intricate mutual-help and patron-client relationships governing the economic activity and decision-making process whereby innovations are appraised and experimented with to make informed decisions.

3.1 Crop Yields Without the Project

As there were no baseline crop yields and targets established at the beginning of the project's implementation, the baseline information for crop yields grown in the pilot sites has been drawn from the 2010 Crop Forecast Survey led by the Ministry of Agriculture. Although these yields [Table7.1] are national averages, most of them are lower than the provincial average of Lusaka. Maize yields (the most important crop), contain a yield estimated for small land holders.

Table 7.1 Proxy Baseline [2009-2010]: Crop Yields Without Project

Crop	Mt/ha
Maize	1.68
Maize: small scale farms*	1.50
Sorghum	0.54
Rice	1.35
Millet	0.79
Sunflower	0.47
Groundnuts	0.56
Soya-beans	1.84
Cotton	0.84
Mixed beans	0.56
Cowpeas	0.58
Sweet potatoes	3.12
Paprika	3.27

Source: Ministry of Agriculture and Co-operatives. The Central Statistical Office. 2009/2010 Final Crop Forecast Survey Report. May 2010: Table 5: yield rates [mt/ha] based on the 2009/2010 CFS by crop [national]
*Maize production, op cit page 13

3.2 Proxy Farm Income Without Project

[125] The LFA contained a list of technical and institutional factors considered obstacles to the Project's success. These were customized with the participation of the project teams. The status of each factor was ranked based on the conditions with and without the Project. The latter provided a glimpse of a retrospective baseline. The degree of control or influence on the limiting factors, with few exceptions, are beyond the scope of project management.

Farm income is a complex concept because typically production, consumption and investment activities are the result of simultaneous family decisions and sometimes even extended kinship decisions.[126] Operationally, it is even more complicated as there is no information on these processes unless it is collected specifically, as was done for some Asian villages.[127]

To this end, we began triangulating by estimating the yields of crops grown in the sector on or around the agricultural season of 2009/2010. The most important crop is maize, and the available data shows that the maize yields are lower in farms owned by small landholders [Table 7.1]. In terms of farm size, the available data suggests that small landholders operate farms of about 1.3 ha [Table 7.2]. In this context, it has been estimated that for the cropping season [2008/2010] the monthly cash income of the small landholder was approximately USD 20-29.[128] For the purposes of this proxy baseline, as the Project has selected beneficiaries with limited means, it is assumed that in the conditions without the project, small holding farmers in the pilot sites had a monthly cash income of USD 25, or USD 300 per year. This is less than USD 1 per day.[129] It is also assumed that certain amounts of food crops will be available on their farms such as fruits, edible herbs, poultry, in addition to mutual-help arrangements.

Table 7.2 Mean Farm Area Planted, by Crop Type and Farm Size, in Hectares

Item	Cropping season 2008-2009		
	Food crops	Non-food crops	All crops
National	1.0	0.1	1.0
Farm size [rural]			
Small holding farms	1.3	0.1	1.4
Medium size farms	5.7	0.3	6.1
Large size farms	50.2	0.7	50.8

Source: World Bank estimates based on 2006 and 2010 Living Conditions Monitoring Survey. Central Statistical Office of the Republic of Zambia: Lusaka. Cited in: WB. Zambia Poverty Assessment. Stagnant Poverty and Inequality in a Natural Resource-Based Economy. Report No. 81001 – ZM . 2012: Table 2.6

3.3 Proxy Farm Production-Commercialization and National Policy Issues

The Limiting Factor Analysis [LFA][130] is a list of technical and institutional factors derived from programmatic experience which need to be effectively addressed to prevent them from becoming barriers to achieving expected outcomes. LFA is done with the participation of key stakeholders. Those stakeholders who were involved with project

[126] Hayami, Y. Anatomy of a peasant economy. International Rice Research Institute. Los Banjos, Philippines, 1978, pp 2-6

[127] Hayami, Y & M. Kikuchi. Asian village economy at the crossroads. The John Hopkins University Press & University of Tokyo Press, 1981

[128] WB. Zambia Poverty Assessment. Stagnant Poverty and Inequality in a Natural Resource-Based Economy: Report No 81001-ZM. 2012, p73.

[129] Since we are using an economic approach in project analysis, we can assume under constant prices an exchange rate of USD 1 = K 7. Thus we have as yearly family income of K 2 100 for small holders under conditions without project.

[130] Dinshaw, A. et al. (2014), "Monitoring and Evaluation of Climate Change Adaptation: Methodological Approaches", OECD Environment Working Papers, No. 74, OECD Publishing. pp 25-26 Extracted 25-8-15. http://dx.doi.org/10.1787/5jxrclr0ntjd-en

activities on or about 2008 - 2010 ranked the status of key factors.[131] The same key factors were then ranked by the same stakeholders for the conditions of 2015. This creates a retrospective baseline and is portrayed in Table 7.3.

Table 7.3 Proxy Retrospective Baseline on Farm Production- Commercialization

{Rank: [3]=agree ; [2] slightly agree; [3] disagree}

Survey Questions	2008 without project	2015 with project
[1, 9] Farmers feel comfortable that they can sell their produce within the community	Agree **[3]**	Agree **[3]**
[2, 10] Farmers feel comfortable that they can sell their produce to external buyers	Agree **[3]**	Agree **[3]**
[3, 13] All necessary agricultural inputs are available in the District in sufficient quantities and at an affordable price, including appropriate varieties	Disagree **[1]**	Disagree **[1]**
[4, 14] The prices farmers get in the community for their produce are good enough to cover production costs and to support their family needs.	Disagree **[1]**	Disagree **[1]**
[5, 15] The transportation network is extensive enough to bring the necessary supplies to the District or to take produce beyond the community.	Agree **[3]**	Agree **[3]**
[6, 19] The Climate Adaptation Project limited results on the ground because there are no leaders shaping actions about climate adaptation.	Disagree **[1]**	Slightly Agree **[2]**
[7, 25] The weak enforcement of regulations against deforestation affects climate change adaptation results	Agree **[3]**	Agree **[3]**
[8, 24] Insufficient long term expenditure on infrastructure and information systems in the rural areas hinders climate change adaptation results	Agree **[3]**	Agree **[3]**

Source: Mission data collected in Siavonga, July 2015

This snapshot provides a sharp picture of the conditions with and without the Project in the project areas. Product and input prices have remained unchanged as have the infrastructure requirements, including the enforcement of deforestation regulations. Prices do not stimulate production. The absence or limited ancillary facilities can slow down activities needed for agricultural growth.. Lastly, fundamental policies for natural resource management seem to show a deficit in implementation.

3.4 Kayuni: Anatomy of a Village Undergoing Agricultural Adaptation

Most developing countries lack an economic history of agricultural interventions and associated outcomes. This social structure baseline could contribute to configuring pathways to introduce agricultural innovations. The brief history of agriculture interventions of the Kayuni village [Box 7.1] provides a portrait of how the Kayuni people have been coping with changing conditions beyond their control and under difficult odds.

[131] In this case, they were 53 respondents, who were members of the implementing team leading 7 pilot sites. The responses were tabulated by means of the mode, i.e. using the rank which occurred with the greatest frequency. The resulting distribution was unimodal.

The village of Kayuni had the best location of any inland Lusitu village for several reasons. It extended along a ridge from the Lusitu river inland and across the road to the Ngombe Ilede. It also overlooked a former bend of the Lusitu that extends to Pambazana and contained a fertile area of Lusitu alluvial silt which was periodically recharged by Lusitu floods. Lastly, the village was in close proximity to the Lusitu river bank gardens.[132]

The evidence testifies to the villager's ability to appraise the stream of outside interventions, not only agricultural but also in the domain of livelihoods. Whatever is useful to their context is retained and what does not seem to fit their needs is discarded; this is the essence of resilience. This behavioral pattern has important implications in the present assessment, and is discussed in section 5.

Box 7.1 Kayuni: Anatomy of a Village

1930

The Northern Rhodesian Agricultural Department set up a number of agricultural stations on the Tonga Plateau at the end of the 1930s and introduced compulsory contour ridging and an improved farmer system that required participants to follow a four year crop rotation that included maize, beans, and manure [Cf. Charles Johnson, Tonga agriculture, published by NRG; Allen, Trapnell, Gluckman, Peters, Tonga Land-holding and Land Usage]. Dip tanks were provided and there was compulsory dipping of cattle. None of this affected the Valley Tonga, but many, including men from Kayuni, spent months and sometimes years living with kin who had moved to the Plateau or were working on European farms.

1940

In the late 1940s, Gwembe Valley became a separate administrative unit with its own district staff. An energetic District Commissioner was determined to deal with the frequent famine in the valley and initiated a food reserve scheme. Each family had to bring baskets of bulrush millet to their chief's village to be stored in communal granaries on which they could draw if their crops failed. This was in place by 1949 and led to a rapid clearance of new fields for growing bulrush millet. People accepted this, though they grumbled. The plan was abandoned by 1956 when the increased output of millet seemed to be enough of a safeguard.

1950

The same DC also was behind the order that every family had to grow cassava. Over much of the Valley, this was an utter failure. The people refused, sometimes violently. In later years some said they were willing to try cassava but weren't willing to be told to do so. More popular was the initiation of a progamme to immunize cattle against trypanosomiasis. By 1956 people living along the Zambezi began bringing in cattle and some had begun ploughing.

By 1956, the Agriculture department had a number of experimental plots in Gwembe, including one not far from Kayuni, where they were experimenting with different kinds of crops and cropping patterns most suitable to Valley soils, rainfall, and temperature, especially for those areas that would become resettlement areas. There was only a limited market for grain. Kayuni then was located in an upland valley on the Chezia River about ten miles inland from the Zambezi, with good soils and better rainfall than at the (river and some distance from the road Finished in 1951 that ran from the railway line to the Zambezi) During the dry season farmers could grow small gardens on the banks of the Chezia so they had green vegetables during the dry season. Principle crops were sorghums, bulrush millet, and maize. Its people had sheep and goats, but did not keep cattle until after the move; some, however, owned cattle herded by kin who lived in Munyumbwe Chieftancy, higher into the escarpment hills or on the Plateau.

The District Council made a number of stipulations before agreeing to issue the order for people to move to the resettlement areas. Three of these stipulations affected agriculture: Those who moved were not to be required to adopt new agricultural practices; the areas were to be cleared of the tsetse fly before people moved in; and the government was to provide them in perpetuity with adequate water resources.

In 1958 Kayuni was relocated to an area along the Lusitu River in Sigongo Chieftancy, 100 miles from their old site, with different vegetation, sandier soils, and lower rainfall. They were taking over land claimed by the local BaGoba people, much of which they had to clear. Now they were only about five miles from the tarred road leading to the Kariba Dam and the growing settlement of Siavonga, while an all-weather road led through their settlement area to the sub-district headquarters on the Zambezi River. An agricultural experimental plot was established, as was an agricultural station near the Lusitu bridge and a buying station for maize and cotton which became a cash crop. By the time of Independence, the Lusitu was also being served by a vet and cattle dipping was routine. Compensation money, local employment and profits

[132] Communication from Prof Thayer Scudder author of *The Ecology of the Gwembe Tonga,* and other numerous scholarly publications.

from the new Kariba Lake fishery meant people had surplus cash which they used to purchase cattle and plows. They also retrieved cattle previously herded by kin. The wealthiest bought scotch carts and wagons.

1960

By 1963 many were plowing and selling surplus maize to government buyers. Among those settling in the new Kayuni was a man from another hill neighborhood who had worked as a driver and agricultural supervisor for the missionaries at Chabbuboma Mission, founded in 1951.

In 1957 he bought a motor vehicle, possibly the first Valley man to do so. By 1962 he was registered as a progressive farmer and was farming on a considerable scale. In 1972 he was hiring a tractor to plow his fields. He also owned a vehicle used to transport people between Lusitu and villages left behind in the old area. He was considered someone to emulate, but there were others in Kayuni reported to also be doing well. By 1972 Lusitu had a number of well-stocked shops owned by local men. It also had a growing number of beerhalls as women were regularly brewing beer for sale using their own grain. At this time Kayuni was an active, busy, forward looking place with people eager for new opportunities.

1970

Unfortunately, in the late 1970s much of this activity ended throughout the Valley due both to Zambia's economic problems and the Rhodesian war. Rhodesian commandos launched attacks across the Zambezi and Kariba Lake against Freedom fighters based in the area, setting off landmines and attacking vehicles. It became impossible to stock shops. Teachers and other personnel left their posts. With the end of the war in 1980, conditions improved somewhat but shops remained closed or had little to sell. Even in cities on the railway line shops had little to sell. People in the Valley complained that it was useless to grow commercial crops when there was so little to buy. It was only by the end of the 1990s that this changed. By that time Zambia was being devastated by HIV, which took many of the educated young and sapped the energy of many others. People were unhappy and depressed and suspected the future would be worse. Only after the role out of ARVs in late 2004 did this change. People again became ambitious for the future.

In the 1960s agricultural development was largely due to programmes funded by the Zambian Government. From the 1970s on, various donors replaced government as the chief sponsors, especially after the late 1970s when government services were drastically cut.

By 1970 the Diocese of Milan had established the Zambezi Training Farm near Chirundu that recruited men from various villages in Lusitu for a one year course in irrigation agriculture, using small diesel pumps. In the 1970s and early 1980s, produce from the farm and its graduates were being trucked to Lusaka and it was possible to buy onions, cabbages, tomatoes and pineapple at several local stands.

1980-1990

In the 1980s, with the increase in oil prices, training programs to encourage hand pumps were started. By the early 1990s Italian Volunteers were sponsoring agricultural projects including irrigation at the Sub-Centre, the old sub-district headquarters, close to Kayuni. They also introduced oil presses and encouraged planting sunflowers and ground nuts.

The German Government development assistance agency stationed agriculturalists near Lusitu Bridge. In the 1990s an NGO was supporting the distribution of goats to women's groups. First LINTCO and then another company organized the sale of inputs and the purchase of the cotton crop within Kayuni. Cotton remained a major cash crop until about 2011 when well into the growing season buyers set the price so low that people who depended on hiring labor for picking cotton found it did not pay to harvest.

Various attempts were made to encourage growing sorghums as this crop is more drought resistant than maize. People knew

this was true, but the market for maize had been largely non-existent and the need to protect crops against bird damage made it labor intensive. A short-stemmed early maturing bird-resistant variety was developed. Although the taste was too bitter to make it a good food crop, its sponsors hoped it would be in demand by commercial breweries in brewing the white beer called chibuku, which was delivered by tanker truck to beer halls throughout Zambia. In expectation of a good market many planted this crop only to find the breweries were not interested.

2010

About 2010 the Agricultural Department joined with a commercial company to promote the growing of Gwar oil beans. The crop would do well under Lusitu conditions and the promised price was good, however many bought seed only to find that the promised buyer did not appear. Some sold months later at a lower price.

In 2013 people were encouraged to grow guar and again some responded. This time the buyer took the bagged guar to Lusaka where it was weighed in the growers' absence. Most now say they will not grow guar again.

There have been other attempts to influence Kayuni farmers, promises that draw on long experience with the enthusiastic efforts of successive agencies, eager to promise but unable to deliver.

Source: Unpublished monograph prepared by Prof. Elisabeth Colson. Professor Emeritus, Anthropology, University of California, Berkeley and Research Affiliate, Institute for Social and Economic Research, University of Zambia. Lusaka, 2015

4. SUMMARY OF OUTCOMES IN PROCES: KEY FEATURES

4.1 Preliminary Metrics

All evidence points in the direction that there has been an initial spurt of technological uptake which has made an early positive impact in the food security conditions among Project beneficiaries.

- At a minimum, farmers interviewed, both female and male, are clearly aware that there are technological options to cope with climate variability and global warming. This trend is consistent with the historical pattern of the area peoples of continuous experimenting, appraising, and making informed decisions, as illustrated in the portrait of the Kayuni village [Box 7.1].

4.2 Outcomes in Process: Key Features
4.2.1 Food Security

The field data collected provides a glimpse of the Project's early impact on the beneficiaries' food security.[133] Table 7.4 synthesizes the frequency of MSC stories elicited from farmers in the three sites reviewed. It must be remembered that every effort was made to incorporate into the strata a similar proportion of female and male farmers. In the specific case of food security, however, the stories collected come exclusively from women farmers. This approach was validated through interviews that suggested that women have a more detailed understanding of food security issues as they deal with them daily. To be certain, however, men are equally aware of food security issue; however the division of labor appears to make women more pragmatic in their understanding of food security as testified in the representative MSC stories from each site available in Appendix 2 of this Annex.

Specifically, the data indicates that in addition to learning new farming techniques to ensure food availability throughout the year, women also searched for business opportunities and financial sources to place products on the market. This is a remarkable trait. In fact, it constitutes social capital for the development of small enterprises for the exploitation of potential value chain opportunities.

Table 7.4 SYNOPSIS OF MOST SIGNIFICANT CHANGE STORIES

Frequency Distribution by Location	Domains of Change									
	Food security					Uptake of Project Know-how			Management Committee Member	
	Searching financial sources	Year round food security	Searching business options	Found market for product	Learned new farming techniques	Alternative livelihood options	Learned crop diversification crop rotation conservation agriculture	Seed growing	Exercised leadership & organizational skills	Enable training facilitation

[133] . As the data was gathered through a qualitative technique [the Most Significant Change stories] the early impact's evidence is indicative.

Kazungula Subtotal	5	15	3	2	13	5	37	1	6	5
Siavonga Subtotal	11	25	9	6	18	5	46	2	10	8
Chongwe Subtotal	11	24	2	1		34	53		10	9
Total	27	64	14	9	31	44	136	3	26	22

Source: Mission data collected during field visits to the Kazungula, Siavonga and Chongwe sites [9th to 24th July, 2015.]

4.2.2 Assessing the Uptake of Technological Change

A large-scale survey of farmers in eleven different African countries[134] revealed that significant numbers of farmers believe temperatures have already increased and that precipitation has declined. Those with the greatest farming experience appear more likely to notice climate change. This is consistent with the conditions in the pilot sites under review. Farmers interviewed, both men and women, have already made adaptations proposed by the Project in response to climate change. As shown in Table 7.4, the most prominent techniques adopted are crop diversification, crop rotation and conservation agriculture.

Through these techniques farmers are planting different varieties of the same crop and changing the dates of planting. When temperatures change farmers have begun to plant different varieties suggested by the Project. Farmers are also practicing increased water conservation and use shading and sheltering techniques. For changes in precipitation, particularly with the timing of the rains, varying the planting date appears to be an important response. One farmer explained that his father planted maize during the second half of August, and now he plants maize late in December or early January. In concurrence with the aforementioned survey, the evidence indicates that adaptation measures appear to occur mainly on those sites that are already marginal in the sense of being hot and dry.

It is important to keep in mind that conservation farming was by and large what Zambian farmers were doing in the 1920s when missionaries, then European settlers, then the agricultural department and donors insisted that they ought to shift to stumping, plowing, single cropping for the market, the use of commercial fertilizers, and the use of pesticides and herbicides.[135] This historical fact is relevant for policy considerations, as what is emerging is the fact that the recovery of indigenous knowledge may induce adaptation to climate variability and global warming.[136]

Some farmers are moving from farming to livelihood options, i.e. beekeeping and goat rearing, which are the most prominent options undertaken, as is discussed below. These options proposed by the Project have had different effects on farmers in terms of access to markets. Goat rearing seems to have been widely accepted in the Kazungula pilot site. As the site has limited market outlets, with the exception of those consumption centers situated in surrounding countries, goat-rearing appears tantamount to opening a savings account. However, those farmers interviewed to analyze the revenue and expenses of the operation, seldom acknowledge the economic value of

[134] World Bank. The Perception of and Adaptation to Climate Change in Africa. Policy Research Working Paper 4308, Washington, DC, 2007. Summary

[135] Personal communication from Prof. E. Colson author of numerous publications on the human ecology of the Tonga people.

[136] This historical pattern appears recurrent. When European settlers arrived in Africa and Latin America , their attitude that the outsider knows best brought about unintended ecological and economic disasters. Agro-ecological studies have established that agricultural yields before the Spaniards arrived on coastal Peru were much higher than the yields of the farming system imposed during the Spanish empire. The Mediterranean agricultural techniques were inadequate for arid, semi-arid, and mountainous agriculture production. It took centuries of agriculture failure to come to terms. Ref. Cornejo, A. T. 1970. Resources of arid South America. In Dregne, H.E. (ed) Arid lands in transition. Pub. 90. Washington, DC: Amer. Assoc. Adv. Sci.

goat's milk for home-consumption, market sales, or ritual consumption, with the exception of pass-on operations.[137]

By contrast, the MSC stories reflect another reality. Goat-rearing is widely acclaimed as a source of milk for children and often their education expenses are covered from the proceeds of selling goats. Indeed, the Project's Household Survey indicates that Kazungula has the highest number [9] of animals per household. [138]

Bee keeping has been widely accepted in the Chongwe pilot site and much less so in the other sites. The honey is sold in the city of Chongwe and most likely in the city of Lusaka as well.

During the Siavonga workshop, one key discussion centered on two additional livelihood options, rice-cum-fishing and NTFP, with ostensibly limited results. From the discussions, both activities appear to be short of technical information essential to generating expected results. For example, the parameters to build ponds for aquaculture were unclear in one specific site. Another site had identified a potential NTFP activity but could not move forward for lack of marketing information. Yet the required information for both activities was available in different pilot sites. During the wrap up session, one senior officer conceded the sites were working as silos and there was a need to share communication horizontally. This feature was acknowledged by all participants. In the present age of the internet, cell phones, and tablets, this communication gap should be solvable.

4.2.3 Trends in Farm Income Changes

Farm budgets collected on crops grown during the last season can provide a realistic value of the revenue at the farm level including the technology used . Further, as the farm size of most farms in all sites reviewed corresponded to about one ha, the unitary economic returns on crops grown can be considered as being representative of the current trends in income conditions. Likewise, nationally the mean farm size of small holders operating in the production of food crops is approximately 1 ha [Table 7.2]. From a total of 150 farm budgets collected, 36 have been selected for review in this report. The criteria for selection has been representativeness of the cropping patterns and consistency of data collected.[139]

4.2.3.1 The Chongwe Pilot Site

<u>Current Conditions</u>

The pilot site is situated in the Chongwe District, Lusaka Province, under Senior Chieftainess Nkomeshya, and headman Kabeleka. The city of Lusaka, with nearly 1.7 million inhabitants, is only 45 km away. The area's key economic activity is farming and associated commerce of farming inputs, food, clothing and trade in consumer goods. Capacity building addressed to community members, with a special reference to women, was one Project key output. As a result, up to 48% of the women participated in project activities.

[137] "Pass on" is a mechanism introduced by the Project whereby the beneficiary who receives a pair of goats from the Project agrees to pass on another pair to another beneficiary after the pair received begin reproduction.

[138] MAL/UNDP Participating Household Status Report for the CCAP. 2015, table 28

[139] As expected, the farmers in the sites do not use metric measurements. A considerable amount of miscalculations emerged due to the conversion from traditional to metric measurements. In addition, though enumerators found the instruments simple and useful, they had not use them previously. This became another source of inaccuracies..

With an altitude of 1051 m above sea level and precipitation averaging between 800 mm to 1000 mm per annum, the pilot site's surface area is about 10 500 Km2. The soils are moderately shallow, dark brown, strong to moderately acidic, and contain fine clay loam soils. The area is drained by the Chalimbana and Chaboba seasonal streams.

The water supply for the rural communities comes from rivers, streams, shallow wells and some hand pumps from boreholes dotted across the land, which are available to a few communities. The boreholes provide insufficient water and some of the pumps have broken down. Often, the available ground water is not suitable for human consumption due to the chemical composition of the underlying rocks. Thus, the majority of the communities have no access to clean drinking water and sanitation.

Chongwe district has been one of the major suppliers of cooking charcoal to Lusaka. This has led to deforestation resulting in a number of rivers and streams drying up. Consequently, the rainy season is shorter and the onset is late; the dry spells during the growing season are frequent and include extreme weather events. During the 2012/2013 season there was an outbreak of army worms that destroyed the bulk of the maize and sorghum crop. Hence, water stress for livestock, human and crop production has increased.

Results in Process

Table 7.5 shows the economic results from the technology uptake as reflected in the execution of crop budgets carried out by the selected groups. The data shows a diversified cropping pattern composed of maize and cassava, with the exception of one male farmer who grew primarily maize for seeds, and therefore did not sell the output. What is remarkable, as compared with other pilot sites, is that the farm revenue in nearly all of the cases was sufficient to pay the daily wages of family members who participated in the production, including 20% of the total labor as a management fee paid to the head of the family enterprise.[140] These findings are consistent with the cited study conducted on perception and adaptation to climate change in the continent.[141] It was found that farmers who have enjoyed free extension advice and who are situated close to the market where they sell their produce are also more likely to take up technology to adapt to climate change. This is a key finding and will be discussed in section 5.

Table 7.5- CHONGWE PILOT SITE : REPRESENTATIVE CROP BUDGETS

		CHONGWE GROUP A					
		[male]		[female]		[male]	
Item	Unit	Quantity	Value	Quantity	Value	Quantity	Value
Crop		Maize		maize		maize	
a. Yield	Kg/ha	2120		2250		4000	
b. Farm-gate price	K/kg	1.2		1.2		1.3	
c. Output sold	kg	1220	1464	1250	1500	2500	3250
d. Output consumed	kg	900	1080	1000	1200	1500	1950
e. Total output	Kg	2120	2544	2250	2700	4000	5200
f. Input cost	K		1100		1740		1670
g. Labour and mgmt cost			192		144		250
h. Farm Net Revenue. (e – [f+g])			1252		816		3280

[140] There is no objective criteria to determine the management fee of a farm family enterprise. Some commercial management fees for procurement and project management run at about 10%. On the whole, family farm managers besides assessing risks they need to make the decision whether to take the risk or not. Thus, a 20% management fee did not appear unreasonable.

[141] World Bank. The Perception of and Adaptation to Climate Change in Africa. Policy Research Working Paper 4308, Washington, DC, 2007. Summary

i. Farm Gross Revenue (e –f)			1444		960		3530
CHONGWE GROUP B							
		[male]		[female]		[male]	
Item	Unit	Quantity	Value	Quantity	Value	Quantity	Value
Crop		maize		cassava		Maize	
a. Yield	Kg/ha	300		1500		2750	
b. Farm-gate price	K/kg	0		1		1.3	
c. Output sold	Kg	0	seed	1000	1000	1500	1950
d. Output consumed	Kg	300	seed	500	500	1250	1625
e. Total output	Kg	300	0	1500	1500	2750	3575
f. Input cost	K		1130		300		1890
g. Labour and mgmt cost			110		768		150
h. Farm Net Revenue. (e – [f+g])			[1240]		432		1535
i. Farm Gross Revenue t (e –f)			[1130]		1200		1685
CHONGWE GROUP C							
		[female]		[female]		[female]	
Item	Unit	Quantity	Value	Quantity	Value	Quantity	Value
Crop		Cassava		Cassava		Cassava	
a. Yield	Kg/ha	1200		900		900	
b. Farm-gate price	K/kg	2		2		1	-
c. Output sold	Kg	800	1600	800	1600	700	700
d. Output consumed	Kg	400	800	100	200	200	200
e. Total output	Kg	1200	2400	900	1800	900	900
f. Input cost	K	-	700	-	300	-	300
g. Labour and mgmt cost			300		800		800
h. Farm Net Revenue. (e – [f+g])			1400		700		[200]
i. Farm Gross Revenue (e –f)			1700		1500		600

Source: Mission data collected on the pilot site, July 2015

Chongwe has had a successful bee keeping operation as shown in Table 7.6; labor requirements appear negligible and the Project has contributed start up funds. It will be important to observe if going forward the operation will be able to continue without Project financing. The honey is sold in the city of Chongwe and most likely in Lusaka as well. There are no market studies to establish the firm demand of honey in the country and possibly neighboring countries. However, potential barriers have emerged.

Because of its proximity to the city of Lusaka, the Chongwe site's production level is becoming increasingly commercially-oriented. This relative production-intensification has brought about a moderate increased in of herbicides and insecticides. The current use of herbicides and insecticides could threaten the production of honey. Extension officers were unaware of the negative effects of herbicides and insecticides on bee populations. Section 5.3 discusses the potential environmental and health consequence of this trend and should be reconsidered by decision-makers.

Table 7.6 Chongwe Pilot Site: Selected Bee Keeping Operations

Pilot Site: Chongwe	**Livelihood Operation Bee Keeping**
Name of Farmer Group A Sex Male	
Raw material : Colony, wax [1] beehive [5]	[project]
Subtotal of cost	K 101
Total value [farm gate price] 55litre x K40/liter	K 2200
Home consumption [liquid {l} wax {kg}] 5litres x K40	K 200

Sales [liquid {l} wax {kg} unprocessed {kg}] 50liters x K40	K 2000
Net Revenue	K 2199
Name of Farmer Group A Sex Male	
Raw material beehive, wax	[project]
Subtotal of cost	K 144
Total value [farm gate price] (110liters x K40)	K 4400
Home consumption [liquid {l} wax {kg}] (30liters x k40)	K 1200
Sales [liquid {l} wax {kg} unprocessed {kg}] (80liters x K40)	K3200
Net Revenue	K 4256
Name of Farmer Group A Sex Male	
Raw material (colony,beehive,wax)	[project]
Subtotal of cost	K 101
Total value [farm gate] (100 bottles x K45)	K4500
Home consumption [liquid {l} wax {kg}] (2 bottles x K45)	K90
Sales [liquid {l} wax {kg} unprocessed {kg}] (98 liters x K45)	K 4410-
Net Revenue	K 4256

Source: Mission data collected on the pilot site, July 2015

4.2.3.2 The Kazungula Pilot Site

Current Conditions

The pilot site is situated in the Southern Province and is drained by the Kasaya and Ngwezi rivers within the Kasaya catchment. The Sikaunzwe community, drained by the Ngwezi River, has a population of about 8000 people and the main language spoken is Lozi. The project targeted women by providing training together with starter packs [composed of seeds and fertilizers]. Women's participation reached 50%. Gender roles were emphasized during the project's implementation. Women held decision making positions in management committees in the same proportion as men.

The main vegetation is the Mopane woodland, *Colophospermum mopane* with clumps of acacia, and ephemeral streams and wetlands known as ***dambos*** . Subsistence agriculture predominates with some cattle rearing and sporadic fishing. The community became acutely aware of global warming and climate variability issues due to the area's shortening of the rainy season, a rise in temperatures, and greater frequency of extreme weather events. Consequently, a surge in water stress due to the decrease of the rainy season, and exacerbated by the rise in temperatures, took place. Several unexpected reverberations ensued: 1- the competition for limited surface water for domestic use, animal and wildlife consumption has amplified; 2- cattle as well as crop diseases have increased, i.e. cob rot, weevil and rodent infestations; 3- previously unknown animal diseases have appeared; 4- crop raiding and predation by elephants and birds has augmented; 5- an invasion of grasshoppers swarmed the 2008/9 season; and 6- siltation and course changes of the Ngwezi River took place.

Results in Process

As indicated, the economic performance of farmers in the Kazungula and Siavonga sites show greater disparity with that of Chongwe. As illustrated in Table 7.7 the cropping pattern is diversified and is a response to the harsh climatic conditions. Those farmers who took up drought-resistant varieties [cowpeas, sorghum, and groundnuts] have been handsomely rewarded. Most importantly, from the interviews , it became apparent that they are happy to share their results with neighbors. It must be noted that this is the most potent process of technology diffusion and adaptation.

Table 7.7 KAZUNGULA PILOT SITE: REPRESENTATIVE CROP BUDGETS

KAZUNGULA GROUP A							
		[male]		[male]		[male]	
Item	Unit	Quantity	Value	Quantity	Value	Quantity	Value
Crop		rice		cowpeas		Goat rearing	
a. Yield	Kg/ha	2600		500			
b. Farm-gate price	K/kg	5		12			
c. Output sold	Kg	2300	11500	475	5700		
d. Output consumed	Kg	300	1500	25	300		
e. Total output	Kg	2600	13000	500	6000		
f. Input cost	K		700		580		
g. Labour and mgmt cost			528		816		
h. Farm Net Revenue. (e – [f+g])			11772		4604		
i-. Farm Gross Revenue (e –f)			12300		5420		K 1200 as farm asset
KAZUNGULA GROUP B							
		[male]		[male]		[female]	
Item	Unit	Quantity	Value	Quantity	Value	Quantity	Value
Crop		maize		maize		goats	
a. Yield	Kg/ha	75		2000			
b. Farm-gate price	K/kg	1		1.2			
c. Output sold	Kg	0	0	800	960		
d. Output consumed	Kg	75	75	1200	1440		
e. Total output	Kg	75	75	2000	2400		
f. Input cost	K		315		308		
g. Labour and mgmt cost			0		110		
h. Farm Net Revenue. (e – [f+g])			[315]		1982		
i. Farm Gross Revenue (e –f)			[315]		2092		K 2000 value of goats
KAZUNGULA GROUP C							
		[female]		[male]		[male]	
Item	Unit	Quantity	Value	Quantity	Value	Quantity	Value
Crop		maize		cowpeas		goats	
a. Yield	Kg/ha	500		100			
b. Farm-gate price	K/kg	0		7			
c. Output sold	Kg	0	0	50	350		
d. Output consumed	Kg	500	0	50	350		
e. Total output	Kg	500	0	100	700		
f. Input cost	K		140		0		
g. Labour and mgmt cost			120		432		
h. Farm Net Revenue. (e – [f+g])			[260]		[268]		
i. Farm Gross Revenue (e –f)			[140]		700		K 1200 as asset
KAZUNGULA GROUP D							
		[male]		[female]		[male]	
Item	Unit	Quantity	Value	Quantity	Value	Quantity	Value
Crop		cowpeas		sorghum		Rice	
a. Yield	Kg/ha	600		1500		50	[for seed]
b. Farm-gate price	K/kg	7		1.2		5	
c. Output sold	Kg	400	400	1300	1560	0	0
d. Output consumed	Kg	200	200	200	240	0	0

e. Total output	Kg	600	4200	1500	1800	0	0
f. Input cost	K		400		0		450
g. Labour and mgmt cost			430		500		456
h. Farm Net Revenue. (e – [f+g])			3370		1300		[906]
i. Farm Gross Revenue (e –f)			3800		1800		[450]

Source: Mission data collected on pilot site, July 2015

Despite the availability of drought resistant crops with good economic return, farmers continue growing maize and rice. For instance, as risky as it is to grow rice in an semi-arid environment with unpredictable and limited rainfall, the farmers interviewed seem to estimate that considerable gains can be made. This is because buyers who come from neighboring countries often purchase the whole crop at on-farm prices set by the buyers themselves.

One rice farmer interviewed shared that he has spent his own money to dig approximately one kilometer of canal from the Ngwezi river, a tributary of the Zambezi river, to his field to draw irrigation water for the next rice season. Another female rice farmer with almost no resources, except her labor and motivation, was also banking on the next rice season for the same reasons. These risky decisions lead to one inescapable conclusion. These are market driven farmers. This is an asset. Interventions should be carefully calibrated in such a manner so as to give space to the play of incentives. Put differently, interventions should be based on what the farmers perceive as a benefit. As highlighted in Box 7.1, historically, farmers have retained whatever is useful to their context and what they perceive does not fit their needs is discarded.

Table 7.7 shows that farm revenue in the site is mixed. More often than not the total farm value is unable to pay the salaries of family members and there are no funds to cover the management fee. It should be noted that the weather is inclement and highly variable, and unfriendly to agricultural production. For example, the last season was a particularly dry year and many farmers could only produce what the Project distributed as seed.

This physical harshness is compounded by limited marketing outlets. Although the mission did not have the time or opportunity to review the markets in surrounding countries, those farmers interviewed that achieved economic results or expect to do so bank on buyers from neighboring countries. It is critical to assess the Kazungula farmers' comparative advantage with respect to their neighbors. Is it the quality of the production, i.e. is there a gustative consumer preference for rice grown in the dambos, or is it the competitive price?

Lastly, goat rearing appears to be a preferred activity by farmers on the site. The rearing of goats has increased significantly in Kazungula and consequently, so has the number of goats. As discussed earlier, it has been verbally acknowledged that goat rearing has brought the opportunity for children to drink milk as well as to pay school expenses from the proceeds of the sale of a goat [s]. However, this information has not been reflected in any of the budgets collected on goat rearing.

Farmers interviewed were not cooperative when sharing information on performance. It can only be conjectured that, as mentioned, the fact that the project provided free goats under the pass on facility was the reason not to share successful results, as the potential free source would close down. This topic is discussed in greater detail in section 5.4.

It is noteworthy that the Project Household Status Report [Table 29] found that the mean number of livestock raised per household is seven goats, two sheep, eleven chickens, ten guinea fowl and five ducks. This suggests the possibility, therefore, that with sustainable management an average household could have an average off take rate of

10 goats. However, it is not clear what the firm demand of goats per year is, in the project areas or nationally. An ecological assessment of the carrying capacity of livestock, large and small is cardinal for the sustainable resource of pastureland. . Communal pastureland is difficult to manage once livestock takes on its biological growth, especially under the current conditions of raising livestock as a ritual or a savings account.

4.2.3.3 Siavonga Pilot Site

The Current Situation

The Siavonga Pilot site is situated in the Lusaka Province. Lusitu, with a population of 8, 510, is the most important settlement. The most common language spoken in Chirundu is Tonga. Chirundu District has two Chiefdoms namely Chief Sikongo and Chief Chipepo. The Tonga and Goba tribes are found in each of the two chiefdoms.

The pilot site has an average altitude of 400m above sea level and is on a plateau sloping towards the Zambezi River in the south-east. The mean annual rainfall is between 450–750 mm. The mean temperature ranges from 16° C in the winter to 50° C in the summer. The Zambezi and Lusitu Rivers run through the site. The soils are slightly acidic alluvial formations classified as vertisols, and are heavy, cracking-clay, often containing lime concretions at some depth in the subsoill. The area is mainly open grassland interspersed with some woody species, i.e. the Miombo vegetation dominates the upper valley, and Munga woodlands, floodplain grassland and wetland [**dambos]** are common.

The major economic activity is farming and general trade in consumer goods, i.e. farming inputs, food, clothing and accessories. Lusitu has a piped water supply but not all communities have access to piped water. The communities far from the main center continue to rely on river water and groundwater.

Results in Process

As discussed earlier, as compared with Chongwe, the economic performance of farmers in the Siavonga sites show disparity. The return on crops in the Siavonga sites are more uneven due to the fact that the previous season was a particularly dry one and many farmers could only produce what the Project distributed as seed.

Specifically, as illustrated in Table 7.8, the cropping pattern is diversified and is a response to the harsh climatic conditions. However, the choice of crops seems to concentrate primarily on those staples that can feed the family unit, like maize and sorghum, and can also be stored without difficulties.

The composition of the cropping pattern appears to be a response to the limited market opportunities for their crops. The buyers come primarily from the Lusaka area. Since the Chongwe site is closer to Lusaka, where maize, sorghum and vegetables can be purchased, it seems that buyers do not appear frequently in Siavonga site as the increase in the transportation cost is not justifiable. If Siavonga had specialized in a set of crops that are not available elsewhere the increase in transportation cost would be justifiable. The production of groundnuts, a drought resistant crop, has just begun, it appears as if for subsistence purposes. However, to exploit the full economic benefit of the crop, a substantial portion must be destined for the market.

Table 7.8- SIAVONGA PILOT SITE: SELECTED CROP BUDGETS

SIAVONGA GROUP A				
		[male]	[male]	[female]

Item	Unit	Quantity	Value	Quantity	Value	Quantity	Value
Crop		Sorghum		Maize		Groundnuts	
a. Yield	Kg/ha	1000		615		1080	
b. Farm-gate price	K/kg	1 .8		1.6		1.8	
c. Output sold	Kg	666	1198.8	75	120	720	1296
d. Output consumed	Kg	333	599.4	540	864	360	648
e. Total output	Kg	1000	1800	615	984	1080	1944
f. Input cost	K		595		550		240
g. Labour and mgmt cost			255		344		336
h. Farm Net Revenue. (e – [f+g])			695		90		1368
i. Farm Gross Revenue (e –f)			1205		434		1704
SIAV0NGA GROUP B							
		[male]		[female]		[female]	
Item	Unit	Quantity	Value	Quantity	Value	Quantity	Value
Crop		maize		maize		maize	
a. Yield	Kg/ha	1200		1200		750	
b. Farm-gate price	K/kg	1.6		1.8		1.2	
c. Output sold	Kg	300	480	800	1440	500	600
d. Output consumed	Kg	900	1440	400	720	250	300
e. Total output	Kg	1200	1920	1200	2160	750	900
f. Input cost	K		380		833		560
g. Labour and mgmt cost			228		222		228
h. Farm Net Revenue. (e – [f+g])			1312		1105		112
i. Farm Gross Revenue (e –f)			1540		1327		340
SIAVONGA GROUP C							
		[male]		[male]		[female]	
Item	Unit	Quantity	Value	Quantity	Value	Quantity	Value
Crop		maize		sorghum		sorghum	
a. Yield	Kg/ha	1500		2000		1550	
b. Farm-gate price	K/kg	1.5		2		1.5	
c. Output sold	Kg	500	750	500	1000	300	450
d. Output consumed	Kg	1000	1500	1500	3000	1250	2250
e. Total output	Kg	1500	2250	2000	4000	1550	2700
f. Input cost	K		570		616		525
g. Labour and mgmt cost			256		276		220
h. Farm Net Revenue. (e – [f+g])			1424		3108		1955
i. Farm Gross Revenue (e –f)			1680		3384		2175
SIAVONGA GROUP D							
		[male]		[female]		[female]	
Item	Unit	Quantity	Value	Quantity	Value	Quantity	Value
Crop		sorghum		sorghum		sorghum	
a. Yield	Kg/ha	1050		1200		1500	
b. Farm-gate price	K/kg	1.5		2		1	
c. Output sold	Kg	1000	1500	600	1200	750	750
d. Output consumed	Kg	50	75	600	1200	750	750
e.Total output	Kg	1050	1575	1200	2400	1500	1500
f. Input cost	K		415		360		0
g. Labour and mgmt cost			212		280		360
h. Farm Net Revenue. (e – [f+g])			948		1760		1140
i. Farm Gross Revenue (e –f)			1160		2040		1500

Source: Mission data collected on pilot site, July 2015

5 RESILIENT PRODUCTIVITY : RESULTS IN PROCESS

Concretely, within the framework of the model of technology transfer for resilient productivity [Graph 7.1], all combined evidence suggests the necessity to calibrate the institutional parameters of the technologies proposed so that their economic potential is effectively exploited and, consequently, is integrated into the National Agricultural Extension system for diffusion and dissemination among the farmers and rural communities of Zambia.

To put it differently, the initial spurt needs institutional calibration and integration to ensure that the technological process takes root among rural communities. Unsurprisingly, the data evinces that the economic potential of the technologies proposed has only begun to be tapped. The institutional calibration is the lynchpin to unleashing the full economic potential of the climate proofed technologies so that communities can effectively cope with the long term effects of climate variability and global warming.

5.1 Progress Towards Adaptation of Skills

All combined evidence confirms that the process of technology transfer for resilient productivity [cf Graph 7.1] has surged through the generation and validation phases.

> All farmers interviewed in the three pilot sites, both men and women, have made adaptations proposed by the Project in response to climate variability and global warming. They have adopted the most prominent techniques: crop diversification, crop rotation and conservation agriculture.
>
> Furthermore, it is also evident from the three sites that extension advice and accessibility to markets where produce can be sold are key drivers in this process. These findings are consistent with the cited survey of farmers in eleven different African countries on perception and adaptation to climate change [142]

However, institutional barriers have arisen which can brake and even send the process stray. Farmers interviewed, both female and male, are aware that there are technological options to cope with climate variability and global warming and have begun using them with a certain degree of apprehension. This trend is consistent with the historical pattern of the area peoples of continuous experimenting, appraising, and making informed decisions [cf Box 7.1]. Whatever is clearly perceived as benefit in the local context is retained and what does not seem to fit their needs is discarded.

The data evinces that the full extent of the economic potential of the technologies proposed is underutilized. Institutional calibration is the lynchpin to unleashing the full economic potential of the climate proofed technologies so that communities can effectively cope with the long term effects of climate variability and global warming. What follows is the framework to ascertain the institutional calibration needed now.

5.2 Structure of Institutional Calibration towards Resilient Productivity

As discussed, theoretically the effects of new agricultural technology should be measurable by observing shifts in factor proportions, costs, crop yields, output levels, and, in turn, farm income. In practice, however, all variables in the system simultaneously change so that the effect of the new technology becomes intertwined with concurrent shifts in the system, and the task of disentangling one from another poses formidable methodological problems. On the ground, regardless of how the problem is tackled the resulting measurements are approximations and the instrument must be calibrated with respect to each site's situation. Next the evolution of crop yields, cropping patterns and their reverberations on farm income are reviewed.

<u>Evolution of Crop Yields</u>

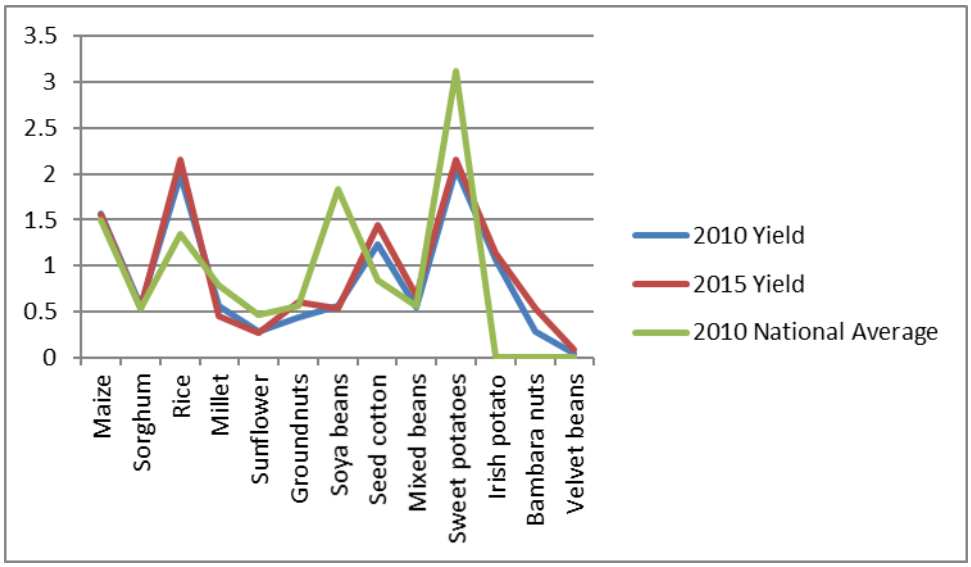
[142] World Bank. The Perception of and Adaptation to Climate Change in Africa. Policy Research Working Paper 4308, Washington, DC, 2007. Summary

Table 7.9 depicts the evolution of crop yields in the project areas. The national average of crop yields for the 2010 season is used as a proxy baseline [the year the Project began its implementation]. This baseline is compared with those crop yields obtained corresponding to 2010 and 2015. Based on these figures, Graph 7.2 illustrates minor changes upwards and downwards from 2010 to 2015. The overall fluctuation follows the national averages indicating that the national trend leads the production conditions in the project areas. Although national crop yields are slightly higher than in the project areas, this can be accounted for by the fact that the Project intended to target farmers in the project areas that had limited assets and resources.

Table 7.9 Evolution of Yields: Project [2010-2015] and National Average [2010]

Crop	Yield		
	2010 Project	2015 Project	2010 Nat Ave
Maize	1.57	1.56	1.5
Sorghum	0.56	0.53	0.54
Rice	1.98	2.16	1.35
Millet	0.56	0.45	0.79
Sunflower	0.29	0.27	0.47
Groundnuts	0.44	0.6	0.56
Soya beans	0.56	0.54	1.84
Seed cotton	1.23	1.44	0.84
Mixed beans	0.55	0.67	0.56
Sweet potatoes	2.05	2.16	3.12
Irish potato	1.07	1.13	//
Bambara nuts	0.28	0.53	//
Velvet beans	0.04	0.09	//

Source: The national average [2010] comes from :Table 7.1: Proxy baseline [2009-2010] Crop yields without project. Project yields [2010-2015] comes from: UNDP/MAL Participating household status report for the Climate Change Adaptation Project. 2015: Table 22 [2010]; Table 21 [2015]



Source: Table 7.9

Graph 7.2 Evolution of Yields: Project [Project 2010-2015] and National Average [2010]

Evolution in Cropping Patterns

Perhaps it is not surprising that if changes in crop yields from the conditions with and without the Project are minor, so are the changes in cropping patterns shown in Table 7.9 and displayed in Graph 7.3. The cropping patterns of 2010 and 2015 are practically similar.

Maize continues to predominate not only because it is the staple crop used nationally in daily consumption but also because some new high-yielding varieties have been taken up by some farmers, as sporadically reported in the Mission's survey.

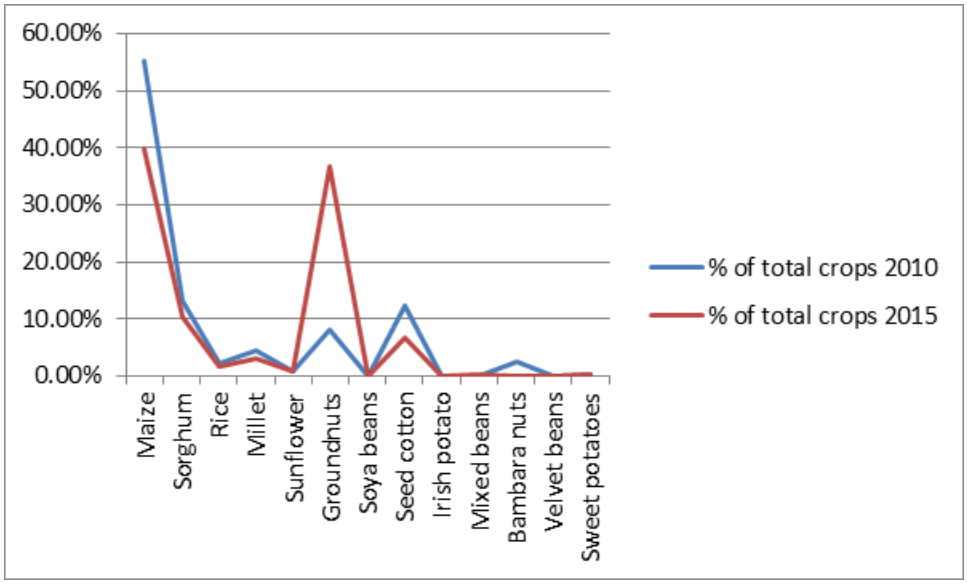
Although there is no yearly cropland estimates available, it is not clear if the significant increase [62%] of cropland from 2010 to 2015 is because of a greater use of drought-resistant varieties. It is remarkable, however, that in the 2015 cropping pattern, there is an increase of a drought-resistant crop, groundnuts. It is evident from the prevailing cropping patterns that the farmers from the sample reviewed in this Mission were the main technology adopters. Even though the most prominent techniques adopted are crop diversification, crop rotation and conservation agriculture [Table 7.4], these have not been captured by the data available either in yield growth or cropping patterns. It seems logical to infer that Mission's sample was biased towards technology adopters, as the Mission's purpose was to learn the process technology uptake, as discussed in section 2.2.1.

Table 7. 9 Changes in Cropping Pattern 2010-2015

Crop	Cropland 2010		Cropland 2015		% Change [2010-2015]
	[ha]	[%]	[ha]	[%]	
Maize	438.5	55.31%	506.01	39.69%	-15.62%
Sorghum	104	13.12%	133.06	10.44%	-2.68%

Rice	18	2.27%	20.77	1.63%	-0.64%
Millet	36.44	4.60%	40.39	3.17%	-1.43%
Sunflower	7.53	0.95%	12.28	0.96%	0.01%
Groundnuts	65.56	8.27%	467.48	36.67%	28.40%
Soya beans	0.44	0.06%	1.44	0.11%	0.06%
Seed cotton	96.94	12.23%	85.54	6.71%	-5.52%
Irish potato	1	0.13%	0.09	0.01%	-0.12%
Mixed beans	0.5	0.06%	2.28	0.18%	0.12%
Bambara nuts	19.9	2.51%	1.31	0.10%	-2.41%
Velvet beans	0.73	0.09%	1.63	0.13%	0.04%
Sweet potatoes	3.26	0.41%	2.63	0.21%	-0.20%
Total	792.8	100%	1274.91	100%	0%

Source: UNDP/MAL Participating household status report for the Climate Change Adaptation Project. 2015: Table 22 [2010]; Table 21 [2015]



Graph 7.3 Change in Cropping Pattern [2010-2015]

Source. Table 7.9

Farm Income Changes

As discussed earlier, estimating the economic repercussions from these changes in crop yields and cropping patterns is exceedingly complex for several reasons. Foremost, preliminary information on income was collected at the project level through the Mission's farm survey. i.e. it targeted those farmers considered as early adopters.. Secondly, there are no official statistics on farm-gate, wholesale and retail prices, the different national markets and for the different crops. Neither is information on marketing and markets available. These sources of information are essential to estimating changes in farm income. However, it is possible to guesstimate farm income changes by triangulating the information available.

The Project logical framework [TOR, Annex A, pp 10-22] targeted a 10% increase in farm income across the outputs associated with outcome 2. Regrettably, the baseline was not established at the beginning of the Project. The proxy farm income without the project was estimated at USD 300 or K 2100 [see section 3.2]. Therefore, in 2015 the targeted farm income expected should be K 2310.

The crop returns per ha are probably the best proxy for farm revenue since both nationally and in the project areas small landholders operate farms of about 1 ha.[143] The Household Survey conducted in 2015 estimated that small landholding farms producing mixed beans [K2333/ha] reached the income target. The rest of the farmers producing other crops did not reach the target. It is important to note that mixed beans command a unitary price almost five times higher than maize and their cultivation is not demanding in labor and water. This is also the case with cowpeas, ground nuts and sunflowers, all of which command higher prices than maize without undue requirements of labor and water; this is with the exception of sunflowers, which require a pressing oil machine to market their oil.

. **Table 7.9 Estimated Farm Production Value from Small Holding Farmers in 2015**

Crop	Cropland [ha]	Total quantity harvested [mt]	Number of Small Holding Farms [#]	Average Production (mt/farm)	Price [K/kg]	Value of Production [K]
Mixed beans	1	1	3	0.36	7	2,333
Rice	18	36	47	0.76	2.6	1,991
Maize	438	688	616	1.12	1.3	1,451
Sorghum	104	58	131	0.44	1.9	841
Cowpeas	20	6	67	0.08	8	716
Millet	36	20	60	0.34	1.9	648
Groundnuts	66	29	235	0.12	5	617
Sunflower	8	2	18	0.12	4	444
Sweet potato	3	7	17	0.39	1	411

Source: Adapted from UNDP/MAL Participating household status report for the Climate Change Adaptation Project. 2015: table 32

The structure of farm income derived from the Mission's sample is consistent with the previous pattern. Using the target income of K 2310, several farmers have reached this target [Table 7.10].

The "winning" crops are rice [K12300/ha] and cowpeas [average K4610/ha] in Kazungula; sorghum [K3384/ha] in Siavonga; and high-yielding maize [K3530/ha] in Chongwe. If a bee honey producer reaches a production of 60 liters/year, he/she can also reach the targeted income of K2400 [cf Table 7.6]

It is logical to infer that drought resistant crops are the winning crops as they command a high market- price and they are not water-demanding or labor intensive. However, these potential advantages are not exploited. This is unusual for a market oriented society, as depicted in the historical pattern outlined in Box 7.1.

[143] See Table 7.2 showing mean farm areas planted by crops and farm size for 2010; also MAL/UNDP Participating household status report for CCAP. 2015, table 23.

Interview data from both male and female farmers, especially those living in Siavonga, showed a glimpse of severe uncertainty concerning the availability of buyers to accommodate surplus production from high-yielding crops. The uncertain commercialization of surplus production from high-yielding crops appears to hinder efforts to exploit the economic potential of the technology introduced.[144]

Thus, the evidence reveals that the economic results of this early uptake of know-how related to climate proofed agriculture is heavily influenced by the commercialization conditions in a given site and time context—and to that extent the level of farm income is also shaped. When the commercialization conditions are unproblematic, as in the Chongwe site, the technology uptake and expected economic results are unfettered.

Table 7.10 Estimated Farm Income from Kazungula, Siavonga and Chogwe Pilot Sites in 2015

[144] In a typical situation subsistence farmers have little or no assets to take risks in uncertain commercialization conditions.

Farmer (M/F)	Crop	Yield [kg/ha]	Farm Gate Price [K/kg]	Farm Net Revenue [K/ha]	Farm Gross Revenue [K/ha]
Kazungula Pilot Site					
Caster Imata [male]	rice	2600	5	11,772	12,300
Case 3 [male]	rice	50	[seed]	[906[	[450]
Martha Ngandu [female]	sorghum	1500	1.2	1300	1800
Samuel Likando [male]	maize	75	1	[315]	[315]
Zeal Mudenda [male]	maize	2000	1.2	1982	2092
Ruth Kalaluka [female]	maize	500	family use	[260]	[140]
Golden Releleko [male]	cowpeas	100	7	[268]	700
Goriat Sikute [male]	cowpeas	600	7	3370	3800
Billy Muleya [male]	cowpeas	500	12	4,604	5,420
Siavonga Pilot Site					
Julius Mufana[male]	maize	615	1.6	90	434
Monica Simulonde [female]	maize	750	1.2	112	340
Burton Sikayamba[male]	maize	1500	1.5	1424	1680
Vincent Chibulo [male]	maize	1200	1.6	1312	1540
Mary Shimakaba [female]	maize	1200	1.8	1105	1327
Robert Muleya [male]	Sorghum	1000	1.8	695	1205
Warred Siame[male]	Sorghum	1050	1.5	948	1160
Ever Siapemo[male]	Sorghum	2000	2	3108	3384
Maggy Chisabi [female]	Sorghum	1200	2	1760	940
Getrude Siangawa [female]	Sorghum	1500	1	1140	1500
Neria Chimuka[female]	Sorghum	1550	1.5	1955	2175
Mary Chazangwe [female]	Groundnuts	1080	1.8	1368	1704
Chongwe Pilot Site					
B. Mukandala [male]	maize	2750	1.3	1535	1685
Mathews Sapao [male]	maize	4000	1.3	3280	3530
Peter Lizimu [male]	maize	300	[seed]	[1240]	[1130]
Leonard like [male]	maize	2120	1.2	1252	1444
Veronica Susu [female]	maize	2250	1.2	816	960
Janet Mwemba [female]	cassava	1200	2	1400	1700
Mirriam Kawina [female]	cassava	900	2	700	1500
Helen Chisha [female]	cassava	900	1	[200]	600
Agness Shakemba [female]	cassava	1500	1	432	1200

5.2 Mainstreaming of Gender Issues

One of the TE's purpose is to determine to what extent this Project has been mainstreaming gender. All evidence points towards a relative empowerment of women's participation in this Project, as nearly half of the participants were women. It must be understood, however, that most female farmers were members of small holding families. There was insufficient time and resources to further analyze if women were single heads of households or married in a monogamous or polygynous union, and if they were cultivating their own land or land allotted to them by their husband. These issues are essential to ensuring women's effective participation in resource management and the benefits derived thereof. These topics should be reviewed thoroughly to ensure the equal access of female farmers to opportunities and benefits.

5.3 Unintended Environmental and Health Consequences in Productivity Growth

Output 2.1. Techniques for soil and water conservation as well as soil improvement tested for their ability to improve the productivity of small-scale agriculture.

Indicative activities under Output 2.1:

2.1.3.Provide farmers with an input pack, which will comprise 5kg of early maturing maize (or cassava/ sweet potato equivalent), 50kg fertilizer, 10kg of legume, a bag of Faidherbia, herbicides and a chaka hoe, after they have successfully completed the workshops. This input pack will be supplied once and will serve as a "starter pack" to assist farmers. In the year following the training workshops and the provision of the input pack, farmers will be linked to local suppliers.
Source: Prodoc. Adaptation to the effects of drought and climate change in Agro-ecological Regions I and II in Zambia PIMS No. 3942, page 34

The Project supply of herbicides have raised moderate concerns in regards to the health of honey bee colonies, especially considering the fact that the Project itself has successfully promoted honey bee production. Recent research[145] shows that since 2006, managed honey bee colonies in the USA have seen sustained and significant annual winter colony losses at around 30%, while Europe has seen smaller but substantial losses (15%). Similarly, for non-managed wild pollinators for which quantitative abundance data is more sparse, numerous studies have documented significant declines in their diversity and range over the past three decades throughout North America, Europe, and Asia, with many species going extinct. Additionally, bird and mammal pollinator species have also experienced increasing scarcity, extinction, and narrowing ranges globally over the past 25 years.

Despite recent investigations, the exact cause of these trends remains poorly understood, although a consensus is forming to attribute decreased insect pollination—the predominant type of animal pollination—to a combination of causes, including pest infestations, disease, increased use of pollinator-harming pesticides, and loss of habitat and forage. To this end, policy makers in countries at risk of pollinator declines have addressed this vulnerability by implementing management strategies. For instance, the US Government has proposed helping pollinators through the expansion of protected habitats for wild pollinators and the increased study of environmental and anthropogenic stressors. The European Union has focused on restricting use of pollinator-harming neonicotinoid pesticides and promoting national apiculture programmes.

[145] Matthew R Smith, Gitanjali M Singh, Dariush Mozaffarian, Samuel S Myers. Effects of decreases of animal pollinators on human nutrition and global health: a modelling analysis. Extracted on 19-08-2015 from. www.thelancet.com.Published online July 16, 2015. http://dx.doi.org/10.1016/S0140-6736(15)61085-6

In the context of Zambian agriculture, it is essential to keep in mind that pollinators contribute to the agricultural yield for an estimated 35% of global food production and are directly responsible for up to 40% of the world's supply of some micronutrients, such as vitamin A. Regions where pollinators contribute most heavily to nutrient production are often also those where populations have the largest burdens of micronutrient deficiency diseases. In addition, insufficient intake of the key foods affected by pollinator species—fruits, vegetables, nuts, and seeds—are each risk factors for non-communicable diseases, including cardiovascular diseases, diabetes, oesophageal cancer, and lung cancer. Micronutrients vital for children and pregnant women—vitamin A and folate—are also affected, and inadequate intake can lead to increased mortality from infectious disease and increased incidence of blindness and neural tube defects. Thus, pollinator declines could lead to substantial new disease burdens from both micronutrient deficiencies and chronic diseases.[146] Therefore, Zambia might benefit from increased monitoring and protection of their local pollinators to preserve economic, agricultural, and public health wellbeing and especially honey production which has the potential of improving the economic wellbeing of small holding farmers.

One effective approach to protect local pollinators is the integrated pest management's [IPM] "push-pull" system, built on the concept of polyculture (agriculture using multiple crops in the same space), that protects crops such as maize, millet and sorghum from two devastating pests: the stem borer insect and the Striga weed.[147]

The push-pull system entails mixing plants that repel insect pests ("push") and planting diversionary trap plants around a crop perimeter that attracts the pests away from the crop ("pull"). In the case of maize, millet and sorghum, the main cereal crop is intercropped with the forage legume *Desmodium. Desmodium* emits volatile chemicals that repel stem borer moths ("push") and attracts a natural enemy of the moths, parasitic wasps ("pull"). In addition, Desmodium secretes chemicals from its roots that cause "suicidal" germination of Striga seeds before they can attach to the maize roots. To ensure further protection, farmers can plant a "trap crop," such as *Pennisetum purpureum* (also known as Napier grass) around the edge of the field, which attracts the moths, pulling them away from the main crop. Adopting a push-pull system allows farmers not only to control pests but also to increase soil fertility, protect against erosion, reduce pesticide use and gain income from marketing *Desmodium* for animal fodder.[148]

In 2014, Greenpeace researchers interviewed three sets of farmers in Kitale and Mbita, Kenya: those practicing push-pull, those using pesticides, and those using neither approach. Although based on only a small number of interviews, average profitability per acre of maize per year was found to be 3 times higher for push-pull farmers than non-push-pull farmers, and this effect was even greater (up to 4 times more profitability) for women. Farmers also reported that maize yields often more than doubled compared to farmers that did not incorporate push-pull practices. In addition, push-pull farmers were also able to reduce their costs of labour and production.[149]

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[146] Matthew R Smith, Gitanjali M Singh, Dariush Mozaffarian, Samuel S Myers. Effects of decreases of animal pollinators on human nutrition and global health: a modelling analysis. Extracted on 19-08-2015 from. www.thelancet.com.Published online July 16, 2015. http://dx.doi.org/10.1016/S0140-6736(15)61085-6 Sub-Saharan Africa, central and eastern Europe, and south and southeast Asia are especially at risk for the health outcomes associated with a potential loss of pollinators. These regions also lack data about the status and trends for local pollinators. Most pollination-dependent foods that contribute to human health are grown locally rather than imported, meaning that greater emphasis should be placed on local pollination and its relationship to agricultural yield.

[147] www.ag4impact.org/database. Extracted on 20-08-15

[148] Cf: Hassanali, A, Herren, H, Khan, ZR, Pickett, JA, Woodcock, CM 2008, 'Integrated pest management: the push-pull approach for controlling insect pests and weeds of cereals, and its potential for other agricultural systems including animal husbandry' *Philosophical Transactions of the Royal Society London,* vol. 363, no. 1491, pp. 611-621.

[149] Cf: Curtis, M 2015, Fostering economic resilience: The financial benefits of ecological farming in Kenya and Malawi, Greenpeace Africa, Johannesburg. The system was developed in collaboration with the International Centre of Insect Physiology and Ecology (ICIPE) and the Kenyan Agricultural Research Institute (KARI) in Kenya, and Rothamsted Research in the United Kingdom. As of 2010, 25,000 smallholders in East Africa are using push-pull systems.

5.4 Unintended Consequences from Cultural Norms and Behavior

As discussed in section 4 , the MSC stories portray farmers' considerable enthusiasm for the benefits of goat-rearing. It is widely acclaimed as a source of milk for children and often their education expenses are covered from the proceeds of selling goats.[150]

However, these benefits were not discussed by the farmers during the crop budget interviews. This behavioral discrepancy could have implications for sustainability. Although there is no definitive evidence to suggest that providing "free goods" to stimulate engagement in an activity is either detrimental or constructive, there may be sustainability implications which are applicable to the livelihood operations of goat-rearing, bee-keeping and agricultural inputs.

It appears that in a typical situation, these "free goods" were provided by the Project on an as needed basis to male and female farmers. It seems logical to infer that if the need disappears, there will be no more "free goods." This may be the reason for under-reporting the actual economic results of goats, bee-keeping and agricultural inputs provided as stimulus. Furthermore, it is reported[151] that the area farmers in earlier projects had loans deducted from the sale of crops or when issued seed they were required to return grain or beans in excess of what they received. This mechanism also led to underreporting of harvests since those who pleaded crop failure or low returns might find the debt cancelled. Therefore, insights to consider in order to understand behavioral adaptation in the context of agricultural technological transformation are as follows.

1-Cultural norms play an important role in sharing information on the results of technology uptake.
2-Although verbal confirmation of the benefits of the proposed technology is openly and enthusiastically expressed, concrete figures about the results from the operations using the proposed technologies are not necessarily shared.

3-Paradoxically, similar cultural norms play an important role in encouraging resourcefulness through risky choices in crop production to derive important benefits. This is illustrated by the choice of rice production in Kazungula, conducted under risky conditions because of the uncertainty of water supplies. However, it is perceived by local farmers that considerable gains can be made from buyers that come from neighboring countries and often purchase the entire crop at on-farm prices set by buyers.

[150] The Household survey indicates that Kazungula has the highest number [9] of livestock per household. MAL/UNDP, 2015, Table 28

[151] Personal communication from Prof E. Colson author of numerous publication on the human ecology of the Tonga people.

APPENDIX 1

Proceedings meeting with the project sites. Manchinchi Bay Lodge; Siavonga: 10th July, 2015

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1. Opening

The meeting started with a prayer from one of the participants. The meeting was facilitated by the National Project Coordinator, Mr. Evaristo Nyanoka, who reminded the participants that each project site was requested to prepare a two-page presentation as follows:

1-What are the best results achieved (in bullet form) and the reasons to explain? [one page]
2-What are the results achieved with limitations (in bullet form) and the reasons to explain? [one page]

The Evaluation Consultant, Dr. Eduardo Quiroga, was requested to shed more light on the presentations that were to be made from the 7 (7) project. The Evaluation Consultant indicated to the project sites that this was an opportunity for everyone to share their views as requested in the above stated objective. The Project Analyst, Mr. Eric Chipeta, emphasized the importance of creating mental pictures from the inputs to the outcomes. He also said that there was a great deal of focus put on the inputs, rather than on the outcomes and impacts that the project had achieved. He added that the interest had to do more with positive things, as well as highlighting negative aspects of the project. He urged participants to be honest and openly share with others in order to help in designing potential solutions and improved plans for future projects.

The facilitator requested participants to make their presentations in 10 minutes; discussions would last 15 minutes.

2. Chama presentation

Mr. Masiwa Ng'ombe presented for Chama district.

- 100 farmers were trained, 50 of which were given goats. The district was now expecting some spill over to other farmers;
- 200 bee hives were procured, 70 of which were occupied by bees;
- Chama was well known for rice production;
- The construction of the resource centre was delayed due to late delivery of materials by farmers.
- The area also experienced floods which delayed the transportation of the procured building materials to the site.

The Project Analyst observed that the presenter should have talked about the targets and in what ways the impacts changed the farmers' lives. Chama district responded that the terminal report had all the information that was being sought by the Project Analyst. A participant observed that Chama district then seemed to be keeping information to themselves, such as the fish pond not being completed due to low water levels. It was suggested that Chama could highlight all activities in the terminal report. The Principal Agricultural Officer for Western Province observed that, indeed, there was need for Chama district to have included all the required information so that the house knew where we were heading. For example, Dr. Eduardo Quiroga also asked the presenter to clarify the Early Warning System.

Due to dissatisfaction at the meeting, it was decided that all districts should put their reports in the right perspective. However, Sioma district insisted that its report had all the required information and was given an opportunity to present it. The districts were then requested to include the required information, after which the districts broke into their respective teams to add this required information using the example given by the Project Officer, Mr. Biston Mbewe.

3. Presentation after inclusion of required information

3.1 Chama Presentation

Chama district made the presentation as per attached Appendix A1. The district clarified that there was no goat-rearing in the initial design of the project. However, 100 goats were bought from Chadiza which were distributed to 50 farmers, which worked out to 2 goats per farmer. A pass on mechanism was put in place. The presenter indicated that Chama district aimed to train 20 farmers, but 27 farmers showed interest and were trained as well. In addition, the 10,000 fingerlings stocked at Chasato dam, constructed with support by the Ministry of Agriculture and Livestock, were all lost due to the breaching of the dam.

The Evaluation Consultant said that it was outstanding for Chama to be able to share the above information in the first year. The consultant advised Chama to be in constant communication with the farmers to share successes and to offer solutions to the challenges faced by farmers. The consultant also wanted to know if there was any environmental impact resulting from the goats. In response, it was observed that there was no environmental impact resulting from goats, as the goats were browsers.

The Program Analyst commended Chama for the improvement in their report, though there was still some information missing, such as what happened to the farmers after getting the goats citing Kazungula district where there was an increase in the goat population. The Project Officer noted that there was some inconsistencies in the way the information was presented. In response to the issue of what happened to the farmers after acquiring the goats, Chama district informed the group that the goats had increased by 12. The district was asked whether there was an effect on the management of the forest as a result of bee keeping. Chama indicated that the farmers were using modern bee keeping methods, as opposed to traditional practices detrimental to the forest. In regards to the crop being planted around the apiaries, Chama district needed to undertake further research.

3.2 Mambwe Presentation

Details of Mambwe district are in Appendix A2. The presenter indicated that Mambwe no longer asks for relief maize as the case was before. The district has seen improvement of farmers' lives. The presenter highlighted that the delay in the goat population increase meant for pass on because they were bought before reaching maturity. However, the goat population gradually increased by 299 goats for pass on.

The members were informed that the dam that was planned to be constructed was not constructed. The Project Officer explained that this was because the bids received from contractors were much higher than the estimate made by the Ministry of Agriculture and Livestock (MAL). The bidders could have over-priced their services or MAL might have underestimated the price. The Evaluation Consultant wanted to know about the expectations of the district. In response, the district informed the group that Mambwe was in a Game Management Area and located in a valley such that the construction of the dam was meant to provide water for irrigation. There was small-scale irrigation of vegetables using buckets supplied to the lodges. The Climate Resilient Infrastructure Development Facility (CRIDF), an organization within the SADC Region, had showed willingness to support the construction of the dam. CRIDF held meetings with the Permanent Secretary. The Program Analyst indicated that Chongwe had adjusted from dam construction to solar powered boreholes for irrigation. The consultant explained that Africa was an expensive place for irrigation investments due to the problems posed by inadequate soils and water resources availability. He added that there were cheaper methods elsewhere in the world where simple irrigation using canals made of bamboo is used to distribute water. There was therefore a need to be innovative, as the biggest challenge was funding.

In the meeting, it was suggested that there was need to explore the possibility of seeking support from the Constituency Development Fund (CDF). This suggestion was challenged, citing that the Members of Parliaments

were only interested in satisfying many so that numbers of people such that they would not spend on infrastructure that was meant to benefit a few people. The Consultant advised that the best approach by the project would be to learn the techniques and acquire the skills including irrigation.

On the issue of high mortality rate of goats suffered by Mambwe, it was disclosed that the situation was now under control.

3.3 Kazungula Presentation

In addition to the details in Appendix A3, the presenter said that Kazungula district was highly loaded with activities. Many farmers who had adopted conservation farming had increased their yield from about 1.3 tons/ha to 3 tons/ha. The district also carried out training in crop diversification which had improved their household food security; in particular from rice by spreading the risk of crop failure to various crops such that when one crop fails due to climate change impact, the others do not. The meeting was also informed that the availability of seed locally gave them opportunity to plant early. Bee keeping was also doing well even in times of drought for household food security and income. In addition, farmers were able to send their children to school. The project interventions made some to stop charcoal production. Further, goat population rose from 96 to about 500 among the 45 farmers engaged in goat.

As regards, the challenges, the presenter indicated that Automatic Weather Station (AWS) was a challenge as well as cattle diseases such as contagious bovine plural pneunium (CBPP).

The Evaluation Consultant wanted to know whether or not there was the afforestation plan by Kazungula which seemed to have potential. The presenter responded that the district had potential for the activity, such as the "mungongo". The district tried to venture into "mungongo" oil extraction, which was readily abundant in the area. However, there was no market for the oil. The meeting felt that there was no need to venture into "mungongo" oil extraction which had no market at the moment.

The group wanted to know whether Kazungula carried out an analysis of income from charcoal or from honey. The presenter clarified that charcoal manufacturing had reduced in the area.

Some farmers in Kazungula plant two crops within one season based on weather information provided by the Zambia Meteorological Department (ZMD).

The Principal Agricultural Officer for Western Province was a bit uncomfortable with the measure of crop diversification impact. The Program Analyst, said that Kazungula had scored some successes. However, the consultant contended that it was more important for now to share knowledge rather than to measure the impact of project interventions.

3.4 Siavonga Presentation

The details of Siavonga presentation are in Appendix A4. The presenter said that Siavonga district managed to achieve the planned activities. And the impact to the achievement was an increase from 0.6 tons/ha to 0.7 tons/ha of maize. The district also raised seedlings of morina in three schools and promotion of green clubs. The presenter indicated that there was improvement in food security as cereals could last much longer unlike previously when food availability lasted for six months per year. In addition livestock no longer walk long distances in search of water due to the construction of Siankapu dam. As a result theft of livestock has reduced. There was regeneration of forest around the dam. Siavonga district has produced a television documentary in order to create awareness on climate change issues.

The Evaluation Consultant wanted to know the dimension of the dam. In response, it was stated that the capacity of the dam was 859,000 m^3 and 20 ha command for irrigation. The consultant asked Siavonga district to justify the benefits of dam construction.

The Project Officer requested Siavonga district to explain to the meeting the involvement of school pupils to plant and take care of trees. In response the district indicated that the involvement of school pupils was meant to ensure environmental sustainability.

3.5 Luangwa presentation

The presenter for Luangwa district informed the meeting that there was increase of yields from 0.7 ton/ha to 1.7 tons/ha which had improved household food security and nutrition. The success raised morale for farmers in Luangwa. The presenter attributed the increase in the goat population to vaccination exercise by veterinary department. However, Luangwa district was disappointed that the dam was not constructed which has made some farmers to practice gardening along the river banks of Luangwa. The Automatic Weather Station (AWS) was able to function according to the original design in 2015. Other details for District are in Appendix A5. Luangwa district was commended for being sincere on AWS issue.

On the issue of the dam, it was observed that there was need to tell the Chief that should the funds become available under the Government of the Republic of Zambia (GRZ) the planned dam would be constructed.

3.6 Senanga presentation

Appendix A6 contains the details of Senanga presentation. The meeting was informed that the lessons learnt were being put to good use. The presenter indicated that despite high demand for cassava in Senanga, the processing of the tuber was still a challenge. The district learnt that individual ownership of fish ponds received total commitment; fingerlings were required.

The Evaluation Consultant wanted to know the kind of fish species that were stocked. The fish species was tilapia (green headed bream, red breasted bream and three spotted bream), but the problem was that the yield of 18 Kg from 20m x 20m pond. According to the Provincial Fisheries Officer for Southern Province, 18 Kg from a 20m x 20m fish pond was acceptable yield, especially taking into account the inadequate soils in Senanga district. The group was also informed that Senanga was not suitable for production of fingerlings, and was advised to acquire fingerlings from Kaoma.

3.7 Sioma presentation

Details of Sioma presentation are in Appendix A7. The presenter informed the group that the beneficiaries were very hopeful of the establishment of Malombe Irrigation Scheme. However, due to training of farmers in conservation farming, crop yields increased despite long dry spells. The presenter indicated that farmers' livelihoods had improved; they were able to have three meals in a day and send their children to school as a result of higher household income. In agro-forestry, farmers were supplied with the musangu trees for soil fertility improvement. The Resource Centre was three quarters complete; all that remained to be done was to fill it with furniture. .

The Evaluation Consultant cautioned the Sioma district on the establishment of the irrigation scheme because an investment of US$ 5,000/ha needs to justified economically. It is difficult to grow food crops anywhere with a net return of US$ 2 000/ha and more. Moreover, for environmental reasons is not advisable to provide free water because this leads to an overuse of water which in turn produces waterlogging with negative effects to the soils.

Presentations made by respective project sites are available in the Project archives.

APPENDIX 2

Most Significant Change Stories.

Mary: Lusitu pilot site.

1. Tell me how you became involved in the climate change project.

Before the project , I was involved with the seed multiplication group under SHAPES project. Upon the coming of the climate change project my fellow farmer Mr Siabusu told me about it. I got interested and that is how I ended up joining.

2. From your point of view, in terms of food security, describe the most significant change that has resulted from your involvement with the project.

Through the technologies that are being taught such as conservation farming and the use of rippers and making of basins, we are able to harvest even in times of prolonged dry spells. This has helped us to have enough food at household level and we even have enough to sell to other farmers. I appeal to the Extension Officers not to let us down after the project is gone. They have to continue supporting us so that what we have learnt can be sustained as it has brought improvements in our livelihoods.

3. Why is the significant change important to you?

This is important to me because I have 3 school going children and from the increase in production im able to sell the excess and use the money to pay for school fees. One is in grade 12, one in grade 11 and the other is in grade 10. Im confident that from what im doing as a result of the project I will be able to take them for further studies. This is very important to me as I want to give my children good education. From the farming I have managed to buy 1 bull, goats and chickens. The money from the livestock is also improving my household income

Siciwela of Lusitu Siavonga

1. Tell me how you became involved in the climate change project.

I was invited for the meeting by the Agriculture Extension Officer and I later got interested and joined. This is the time they introduced the tree planting activity.

2. From your point of view, in terms of food security, describe the most significant change that has resulted from your involvement with the project.

Im able to have food security as im able to have enough food in my storage bin up to the next season and sell the rest. I use the money from the sell of excess maize to pay for school fees for my children. I appreciate what the project has done for me and hope that we can continue being supported with information so that we can be more equipped.

3. Why is the significant change important to you?

It is significant to me because before the project our harvest was not good. Im now able to produce enough food and sell the excess and use the money to take my children to school. Therefore I have learnt that farming is a business. I even bought an ox-cart through farming as a result of the knowledge I gained from the project.

Anna of Lusitu Siavonga

1. Tell me how you became involved in the climate change project.

There was a meeting in the community about the project and that is when I got interested because most of the things they discussed during the meeting were new to me. Therefore I decided to become part of the group so that I can learn more.

2. From your point of view, in terms of food security, describe the most significant change that has resulted from your involvement with the project.

Before the project we used to waste food or the harvested crop. After my involvement in the project im able to determine whether the food will see me through to the next season. If not, I need to find more so that we can be secured as a family in terms of food. Before my involvement in the project I used to exchange my harvested crop with anything that these briefcase buyers would bring to me such as fish, clothes, to mention but a few. But this time I work hard and avoid the wastage of food. I thank the project because I have learnt how to care for food and this has reduced hunger at my homestead.

3. Why is the significant change important to you?

The most important thing is that life has become easy. I have enough food and extra to sell in case of any emergency that requires money. Im able to buy livestock such as cattle and goats and if there is an emergency I sell the livestock to help me solve the problems.

Esther of Lusitu Siavonga

1. Tell me how you became involved in the climate change project.

I was elected Treasurer in the dam committee and in the irrigation project because of my involvement and volunteerism from the time the climate change project started.

2. From your point of view, in terms of food security, describe the most significant change that has resulted from your involvement with the project.
I have learnt a lot of leadership skills and management that is helping me even manage my family better. I have become more hard working than before in order to meet my plans to raise money.
3. Why is the significant change important to you?
The most significant thing is that my family has become better-off. I have become more honest in keeping people's money. I have become a leader who is a model among others.

Dailess of Lusitu Siavonga

1. Tell me how you became involved in the climate change project.
I was invited to the meeting by the Agriculture Extension Officer who were explaining about the project. After ettending the meeting, I got interested and joined the project.

2. From your point of view, in terms of food security, describe the most significant change that has resulted from your involvement with the project.
In terms of food security the most significant change I have seen is that iam able to have food at my household throughout the year. This has happened because of the farming methods that I learnt from the project of conservation farming. Im thankful for the knowledge I gained and will continue to use it.
3. Why is the significant change important to you?
The most significant thing is there is peace at my home because we are able to sustain the livelihoods of our family.

Billy - Kazungula

1. Tell me how you became involved in the climate change project.
The Camp Extension Officer came to inform us that there was a meeting on climate change adaptation. I attended the meeting and that is how I got involved in the project.

2. From your point of view, in terms of food security, describe the most significant change that has resulted from your involvement with the project.
It has helped me because I have learnt the early planting system so that I can still harvest something even when the rains are not good in the season. Iam also able to access cheaper seed locally through the local seed growers within my area who were trained by the project of which I was one of them. Seed Control and Certification Institute trained me to be a seed grower.
3. Why is the significant change important to you?
This is significant because I no longer cover long distances to look for seed. I get it locally and this has reduced the cost of farming. Farming has become more affordable and this is important for me.

Chipupila - Kazungula

1. Tell me how you became involved in the climate change project.
There was a sensitization meeting that took place in our community letting us know about the project and that is how I got involved after attending the meeting.

2. From your point of view, in terms of food security, describe the most significant change that has resulted from your involvement with the project.
Before the onset of the project I used to grow one crop every season (maize) and my yields kept on reducing. When the project came I was taught about crop diversification and the importance of crop rotation to keep my soils fertile. With these new techniques in place, my harvest has improved and yields growing.
3. Why is the significant change important to you?
The most important thing is that I have learnt the importance of crop rotation and crop diversification to keep soils fertile.

Mervis - Kazungula

1. Tell me how you became involved in the climate change project.
I came to hear about the project through other farmers and the Extension Officer, then I became involved in the project.

2. From your point of view, in terms of food security, describe the most significant change that has resulted from your involvement with the project.
Since I became involved in the project food is no longer a problem at my household compared to the previous years when I was not involved. My crop yields have improved.
3. Why is the significant change important to you?

This is significant to me because now I have plenty of food and my family and I can sale some of the food to earn an income which I use to buy clothes for my family.
It is also significant that I have learnt how to grow different crops at different times using different methods that I was taught.

Ireen - Kazungula

1. Tell me how you became involved in the climate change project.
I attended meetings that were held by the Extension Officers from the Ministry of Agriculture and Livestock and that is how I got involved in the project.
2. From your point of view, in terms of food security, describe the most significant change that has resulted from your involvement with the project.
This time I get better crop harvest due to the knowledge that I gained from the trainings received under the climate change project. My family now has some milk from the goats for consumption and this year im planning to sale 10 goats and I will start a business from the money I will make. This will increase my income and enable me buy more requirements for the family.
3. Why is the significant change important to you?
The most significant change is that my food security has improved compared to the previous years when I was not part of the project.

Christine - Kazungula

1. Tell me how you became involved in the climate change project.
I was invited to a meeting by the Extension Officer at the clinic where the objectives of the project were explained. I got interested in the goat rearing project and decided to be part of the project.
2. From your point of view, in terms of food security, describe the most significant change that has resulted from your involvement with the project.
After attending various trainings in goat rearing, I was a recipient of two (2) goats. The goats are now providing me with milk which my family has added to its food nutrition. I also use goat manure for my garden and my vegetable production has improved.
3. Why is the significant change important to you?
The most significant change is that iam able to consume milk every day and my garden is healthy as the manure is readily available to provide nutrients to my vegetables.

Janet - Chongwe

1. Tell me how you became involved in the climate change project.
The Extension Officer called for a meeting where the project was introduced. The benefits of the project were explained and that is how I developed interest and joined.

2. From your point of view, in terms of food security, describe the most significant change that has resulted from your involvement with the project.
I used to experience a lot of problems in the agriculture setup where I was getting less yields for the crops I was growing. From the time I joined the project I have seen a lot of benefits. I have learnt how to grow groundnuts, rice, cassava and cowpeas. I have also learnt how to keep goats. This has brought joy to my family as iam able to sale some of the produce and use the income to support the family.
3. Why is the significant change important to you?
The most significant thing is that the project has helped me gain knowledge and improve my income and food security which has enabled me to take care of the orphans in the family by providing them with food and taking them to school. Iam very pleased with the project and even if it has come to an end I will continue applying the knowledge I gained.

Patrick - Chongwe

1. Tell me how you became involved in the climate change project.
There was a workshop that was conducted by the Ministry of Agriculture and Livestock on the Adaptation to Climate Change Project. After attending the workshop I got interested because really the climate together with the rainfall variability was really seen as changing and my planned farming programmes were also changing.

2. From your point of view, in terms of food security, describe the most significant change that has resulted from your involvement with the project.
Beekeeping has helped me because if I fail to produce maize, honey is compensating what I fail to achieve. Income levels have increased from the honey that I sale. I have also learnt to practice early land preparation, early planting and siting of the fields to reduce on soil erosion. All these technologies have shaped the adaptation concept with my family. My crop yields have increased resulting in food security and high income levels.
3. Why is the significant change important to you?

This is significant because it has helped a lot by providing me with more knowledge which im applying on my farming. I nearly abandoned my farm to look for employment but when the project came, I realized that I had all the resources I needed to make more money by farming.

Dorothy Chongwe

1. Tell me how you became involved in the climate change project.
I was introduced to the project after attending a meeting called by the Ministry of Agriculture and Livestock.

2. From your point of view, in terms of food security, describe the most significant change that has resulted from your involvement with the project.
I have learnt conservation farming techniques which have made farming easier and more practical. It is now easier to rip lines than to plough the whole field. Land preparation is now done timely as I start early. This has increased my yields and the crop stand is always good in the field.
3. Why is the significant change important to you?
My yields have improved than when I was using the conventional way of farming. Farming has become easier and interesting.

Eve - Chongwe

1. Tell me how you became involved in the climate change project.
The Extension Officer called for a meeting where the project was introduced. The objectives of the project were explained and the benefits of the project were also mentioned. I then developed interest to join the project

2. From your point of view, in terms of food security, describe the most significant change that has resulted from your involvement with the project.
This area had a lot of problems in terms of agriculture production. We used to have less harvest in the crops that we grew. From the knowledge I gained from the project I have seen a lot of benefits. I have learnt to grow groundnuts, rice, cassava and cowpeas. I have also learnt how to keep goats. All these interventions have brought joy to my family because im now able to sell surplus yields and raise income for the family. We also have enough food to last the whole year.
Why is the significant change important to you?
The support I have received has improved my farming and im now able to take care of the orphans by providing food and paying for their school fees. Im very pleased with the project and I will continue applying the knowledge even if the project comes to an end.

Elizabeth - Chongwe

1. Tell me how you became involved in the climate change project.
I was informed by the Camp Extension Officer who invited me to the meeting when the project was starting.

2. From your point of view, in terms of food security, describe the most significant change that has resulted from your involvement with the project.
The project has changed my life in that I am able to feed my children adequately. The produce from the harvest is also bringing income to our household. This has reduced hunger and we are now food secure.
3. Why is the significant change important to you?
This is significant to me because my children are not malnourished and school attendance has improved.

ANNEX 8

DIRECTIVES OF IRRIGATION DEVELOPMENT PLANNING AT THE PROJECT LEVEL

1- PREAMBLE[152]

[152] This Annex on irrigation development planning and nutrition planning was requested specifically by the Steering Committee during the debriefing session held at the MAL on 4 August 2015. Given that context, and the fact that there was no field work undertaken on irrigation performance in the project areas as per TOR, this annex is unable to provide specific recommendations. However, it provides directives to conduct irrigation development planning in the context of the agricultural conditions in Zambia. Therefore, this annex is based primarily on the consultant's previous experience on irrigation development for small holding farms in Senegal, Ghana, Cuba, Dominican Republic, Honduras, El Salvador, among others published in the following journals. Quiroga, E. Irrigation planning to transform subsistence agriculture: lessons from El Salvador, Human Ecology, vol. 12, No. 2, New York, 1984. Quiroga, E. Le développement de l'irrigation dans le Sahel; étude de cas au Sénégal. Polythiés, Sénégal, juillet 1986. Quiroga, E. Irrigation Development in the Sahelian countries: The Kirene District in Senegal.

Box 8.1 Zambia: Potential and Constraints for Irrigated Agriculture

"One key objective of the National Agricultural Policy and the National Irrigation Plan is to increase irrigation in order to reduce the reliance on rain fed agriculture. Although this objective is sound, its application faces considerable conceptual and operational problems. Specifically:

- In principle, irrigation appears to be a technically viable option at present due to groundwater and surface potential reserves. This potential for water resources availability must be confirmed before proceeding with the feasibility of irrigation development.
- The effect that climate change is bound to have on underground and surface water reserves is a known unknown, despite the mathematical models available. With increasingly variable rainfall, rising temperatures and a concomitant rise in evapotranspiration, the rate of depletion of groundwater reserves may outstrip the recharge rates and the quantity of surface water could also decrease significantly.
- Similarly, the quantity of land suitable for irrigation could be significantly modified as a result of shifts in landscape and land quality due to changes brought about by biodiversity change, erosion of different types, and other factors associated with global warming.
- Perhaps the most difficult factor to estimate is the economic viability of agricultural systems proposed under climate change conditions. This is aggravated by the socio economic conditions as a result of competition over arable land, which is exacerbated by the prevailing conditions of the land tenure system, currently under communal law. Women may be left out of access to land with water." Source: Prodoc, Part I: Situation analysis

Box 8.2 The Pilot Sites: Issues and Problems in the Design of Irrigation Schemes

- "Kazungula GRZ counterpart funding was provided in 2010 to construct water infrastructure (2 dams). These dams were not completed and did not hold water. A question was raised as to what lessons could be learnt from this undertaking. It was indicated that the site in Kazungula was not suitable for dam construction as the terrain is very flat."
- "Luangwa district counterpart funds were also used to survey the proposed dam in Zalapango. The dam was not constructed and a similar question was raised regarding the lessons learnt. In Luangwa no funds were provided after the survey." Source: Steering Committee Meeting, August 4, 2015

2-OBJECTIVES

As noted in the Preamble, sometimes the complexities of designing and implementing an irrigation scheme in order to address water scarcity are seriously underestimated. An overview of the key factors and potential options available that are involved in the design of irrigation are outlined as follows:

- First, chart the fundamental data requirements for irrigation development in the context of subsistence farming.
- Subsequently, sketch out a planning process customized to the needs of subsistence farming with special reference to the project areas.
- Lastly a framework to review the economic logic of adaptation/mitigation will be outlined. The overarching principle is the intent to allocate resources efficiently between different adaptation/mitigation options to generate agricultural outcomes, specially in the context of important investments that irrigation requires.

Operational Definition of an Irrigation Project

Human Ecology, vol. 18, No.3, New York, 1990. Quiroga, E. Poverty in irrigated settlements. Irrigation Management Network. Participation in discussion paper and replies from network members. Overseas Development Institute. Network paper 27, London, UK, June 1993. Quiroga, E. La transformación de la agricultura de subsistencia mediante el riego en El Salvador. América Indigena, vol. XL, No. 3, Mexico, D.F., 1980. Quiroga, E. El proceso de planificación en el desarrollo de riego para la agricultura de subsistencia." Revista Interamericana de Planificación, No. 53, Mexico, D.F. March 1980. Quiroga, E. La revolución verde en el contexto institucional de Latinoamérica un estudio de caso en El Salvador. Nord-Sud Revue Canadienne des études latinoaméricains. Vol. 6, No. 12, Ottawa, 1981. Quiroga, E. Las instituciones y la transferencia tecnológica a los minifundios salvadoreños; caso de estudio. Desarrollo Rural en las Américas, vol. XIV, No. 1, Costa Rica, 1982.

Irrigation projects are complex undertakings aimed to improve agriculture through the distribution of water on suitable land together with the provision of a number of key complementary means to allow crops or to increase yields . The productivity of irrigated agriculture depends on the symbiotic adjustment between water, land and people. Efficient irrigation systems requires a combination of knowledge and experience from specialized fields such as civil engineering, hydrology, soil science, agronomy, agro-economics, marketing, law, according to site specific issues.[153]

It is difficult to overemphasize the absolute need of basic information for the planning of an irrigation project as outlined below. It is understood that the information required must encompass statistically significant trends. The data needs identified are generic as irrigation planning is location-specific.

3. INFORMATION REQUIRED FOR THE DEVELOPMENT PLANNING OF AN IRRIGATION PROJECT[154]

3.1 Climate

The climate is probably the most important factor in crop production, especially under the current regime of climate variability and global warming. Climate refers to the average conditions prevailing in a region such as temperature precipitation, wind, evaporation, and other atmospheric phenomena. The most commonly identified data on weather are the maximum and minimum temperatures, relative humidity and daily precipitation. The measurement of these factors, or a statistically significant estimate, is essential for the planning and operation of an irrigation project.

3.2 Water

The water comes from precipitation, whether it be surface water or groundwater. Only the detection, development, and supply of sufficient water resources allows for a sustainable irrigated agriculture. Flow measurements provide basic information for the study of surface water. These measures should cover a period of several years and should focus on the typical conditions of maximum and minimum flows to properly design and operate an irrigation system.[155] Low periodic or low annual water level indicates the need to store water to supplement the inflow of direct diversions.

Groundwater is subject to the same laws as surface water. Its use is more complex. Detailed field studies should be undertaken followed by analyzing the collected data in order to determine the location and performance of aquifers. These surveys locate groundwater and determine its extent, capacity, and hydraulic characteristics. (

3.3 Topography

The slope of agricultural land is important for the type of irrigation employed to be effective, and shaping of the land might be required. On steep slopes, the water tends to erode the soils. A topographic map with contour lines of is used for shaping the land and calculating the amount of earth to move. Surface irrigation and sprinkling irrigation have different requirements of land surface shape. Efforts should be made to obtain rectangular shaped fields because irregularly shaped fields are more difficult to cultivate and irrigate with surface or sprinkler irrigation.

3.4 Soil

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[153] FAO. Successful irrigation: planning, development, management. Rome. 1975

[154] FAO. Successful irrigation: planning, development, management. Rome. 1975

[155] What constitutes a statistically significant number of years for the measurement of these factors will not be dealt with here. These are technical issues within the domain of the disciplines concerned.

Soil provides support for plants as well as nutrients and water. Information on soil characteristics such as texture, structure, consistency and thickness are needed to fully exploit soil and associated water resources. We determine these features through field studies and samples of soil analyzed by soil scientists. It is necessary to determine the salinity or alkalinity of soil and water in order to apply proper cultivation methods and to develop sustainable operating programs for both soil and irrigation water. Soils containing salt can be classified into three different groups: saline soils, sodic soils, and saline-sodic soils.

3.5 Drainage

Appropriate drainage ensures the removal of excess water which prevents the accumulation of salt in soil, and allows for earlier seeding. It also provides the opportunity to develop land that could be cultivated but is waterlogged because it is low lying or in the drain field of marshes. The drainage problem usually arises when water is brought in a sector or loss occurs during the supply of water. Drainage systems should be designed at the same time that irrigation system are designed. Both designs must be based on the data collected during the project's planning-stage. Follow-up to assess the adequacy of the designs can be after the first year of operation and then periodic reviews. Although remarkable progress has been made in recent years on the development of research tools and basic principles for drainage, Designing a sound drainage system requires a strong knowledge of local conditions and a detailed knowledge of the basic principles of good drainage.

3.6 Other Relevant Information

Ordinarily irrigation project design focuses on the engineering aspects related to the operation of dams and associated water infrastructure. However, the non-technical aspects of irrigation planning and implementation are the most difficult to assess. These factors turned out to be the most decisive aspects of irrigation performance.

The following is a generic list of critical factors on the performance of an irrigation project. They cannot be ranked as their relative effect is context and situation specific:

- -varieties of crops best suited to the local growing conditions
- -potential pests
- -source and the availability of improved seeds, fertilizers and pesticides
- -methods and associated costs of local production
- -expected crop yields and crop prices
- -existence of people to advise on plant health
- -availability of agricultural machinery and fuel
- -availability of supporting services, i.e. health, education
- -quality and quantity of the local workforce
- -salary scales and practices in the location
- -availability and timeliness of agricultural credit systems
- -existence and the cost of construction equipment and materials
- -land tenure systems in the areas with irrigation potential
- -enforceable water rights ensuring equitable and timely access to water.

Relevant specific questions are: What will be the consequences of a dam construction [or a weir] on the other users of the water resources? Whose land will be used to build the reservoir? These questions arise because of a specific situation as in the following case:

> The Kayuni people started to use water from the Lusitu pipeline to water vegetable gardens in the dry season, selling the produce in the market at Siavonga. This leaves little water, even for drinking, to the people in Mbeza and Musulumba. The latter this year were also unable to water their vegetable gardens from wells dug in the Lusitu River, probably due in part to dams higher up on the Lusitu.

> In consequence, for the first time, the Musulumba people have turned to making charcoal for sale and this in an area already too prone to erosion.[156]

An adequate feasibility report should consider the critical factors and specific questions and consider options that are socially viable, economically profitable for everyone concerned and environmentally sustainable.

4.0 CRITERIA FOR THE PLANNING PROCESS OF IRRIGATION DEVELOPMENT

Past experience of irrigated agriculture, indicates the criteria used in the planning process are an important factor in the delivery of relevant outputs to transform subsistence agriculture. Although generalizations are difficult to make for the lack of comprehensive data, the range of alternatives used in a typical planning process appear narrow. The following patterns emerge based on agricultural development experience of the past decades.[157]

4.1 The Engineering Approach

The planning process often is confined to engineering capabilities. Consequently, the alternatives reviewed are ordinarily limited to those which are technically rather than socially more efficient. [158] For example, Mexico, during the previous decades, almost exclusively used cement to line irrigation canals to reduce transmissions losses. This was justified by project engineers on the grounds that it is more efficient in reducing water losses and requires less maintenance. This argument is questionable considering the relative scarcity of capital in Mexico at that time, and the abundance of unskilled labour in the off-harvest season available for the maintenance of alternative lining materials. [159]

4.2 Project Design as an Input-Output System

Projects are conceived as an input-output system, where the input is constituted by the technology to be introduced i.e. technology or resources, to generate an immediate output, without the explicit intention to induce tangible outcomes to improve the life of targeted beneficiaries. Graph 8.1 illustrates the input-output planning process. As referred in section 4.1 of the Report, the UNDP and other donors used this approach in crisis countries such as Afghanistan and Iraq, moving from humanitarian assistance to economic reconstruction,. The Recovery and Employment Afghanistan Program (REAP), in early 2003, conducted works in Kabul, Kandahar and Jalalabad.[160] More than 260 works were carried out, creating short- term employment for more than 40,000 people. Thus, in total more than 1.66 million man-days of labor were created. However, there was no evidence that aggregation of these realized outputs brought about development outcomes to improve peoples' lives. Clearly, the principal intention of this humanitarian project was to avoid famine or uncontrollable displacement of the population, as is currently taking place in Syria.[161]

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[156] Verbal communication from Prof E. Colson. Also Box 7.1 of Annex 7 contains a brief ethno-historical account of the Kayuni people efforts of agricultural development outcomes since 1940.

[157] Hayami, Y. & Ruttan, V.W. 1971. Agricultural development: an international perspective. Baltimore: The Johns Hopkins University

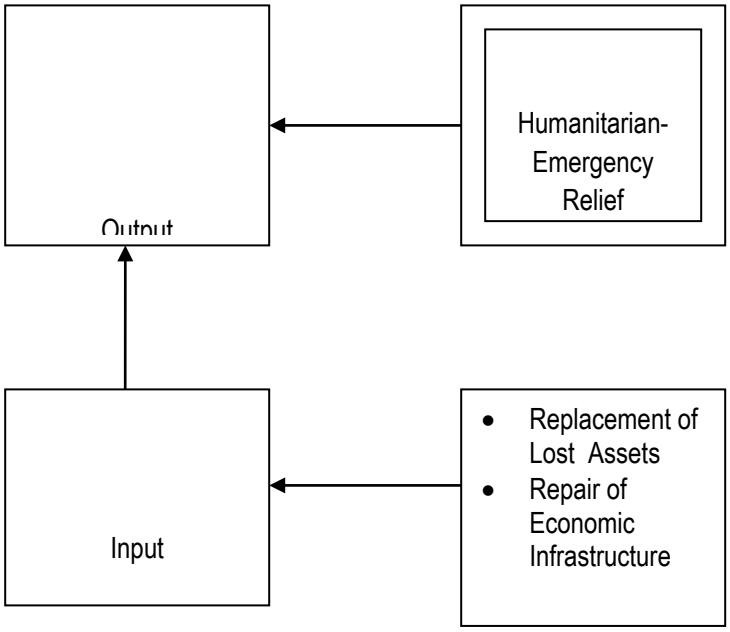
[158] Rondinelli, D., ed. 1977. Planning development projects. Stroudsburg, Penn.: Dowden, Hutchinson, and Ross, Inc.

[159] Crosson, P.R., Cummings, C. & Frederick, K. 1978. Selected water mangement issues in Latin American Agriculture. Baltimore and London: The Johns Hopkins University Press.

[160] UNDP/Afghanistan. Country Programme Review. Mission Report. E.R. Quiroga, team leader, A. Mojaddidi, consultant. Kabul, February 2005

[161] Similarly the Iraq Reconstruction and Employment Programmes (IREP I,II,III) a nation-wide programme created short term employment on projects to rehabilitate village or town infrastructure to the tune of 5.3 million man-days. The material impact might not have been considerable but it was a bold initiative to provide relief to the civil population and avoid faminine and uncontrollable displacement of civil population. Cf. UNDP/ Iraq. Outcome Evaluation of UNDP Governance, Crisis Prevention and Recovery, and Poverty Reduction Initiatives in Iraq. Mission Report. Dr. Jim Freedman, Team Leader, Dr. Eduardo Quiroga, Dr. Amal Shlash, Dr. John Weeks. Amman, June 2009

When the input-output planning process is used in agriculture projects, the shortest distance between a low- and high-productivity agriculture is configured--- disregarding the economic, social and environmental viability of such a shortcut. Hence, these type of projects from the economic standpoint emphasize base levels of resource use rather than locating the optimum level of the resource with widest economic and social returns based on a sustainable environment.



Graph 8.1 AN INPUT-OUTPUT PROJECT :THE HUMANITARIAN-EMERGENCY RELIEF PROJECT Source: UNDP/ Afghanistan graph2, p21

Likewise, the planning process anticipated in the Project where planning and implementation procedures were to be simultaneously executed for the construction water resources works is a planning modality similar to the input-output planning process.

4.3 The Institutional Approach as Criteria for the Planning Process of Irrigation Development

From the experience of agricultural development of the past decade, it is clear that agricultural institutions have a predominant role in transforming subsistence agriculture. Institutions provide the economic incentives needed to

enhance productivity. To this end, the criteria used in the planning process should be oriented towards the adaptation of farmers' behaviour and institutions to the technology requirements.

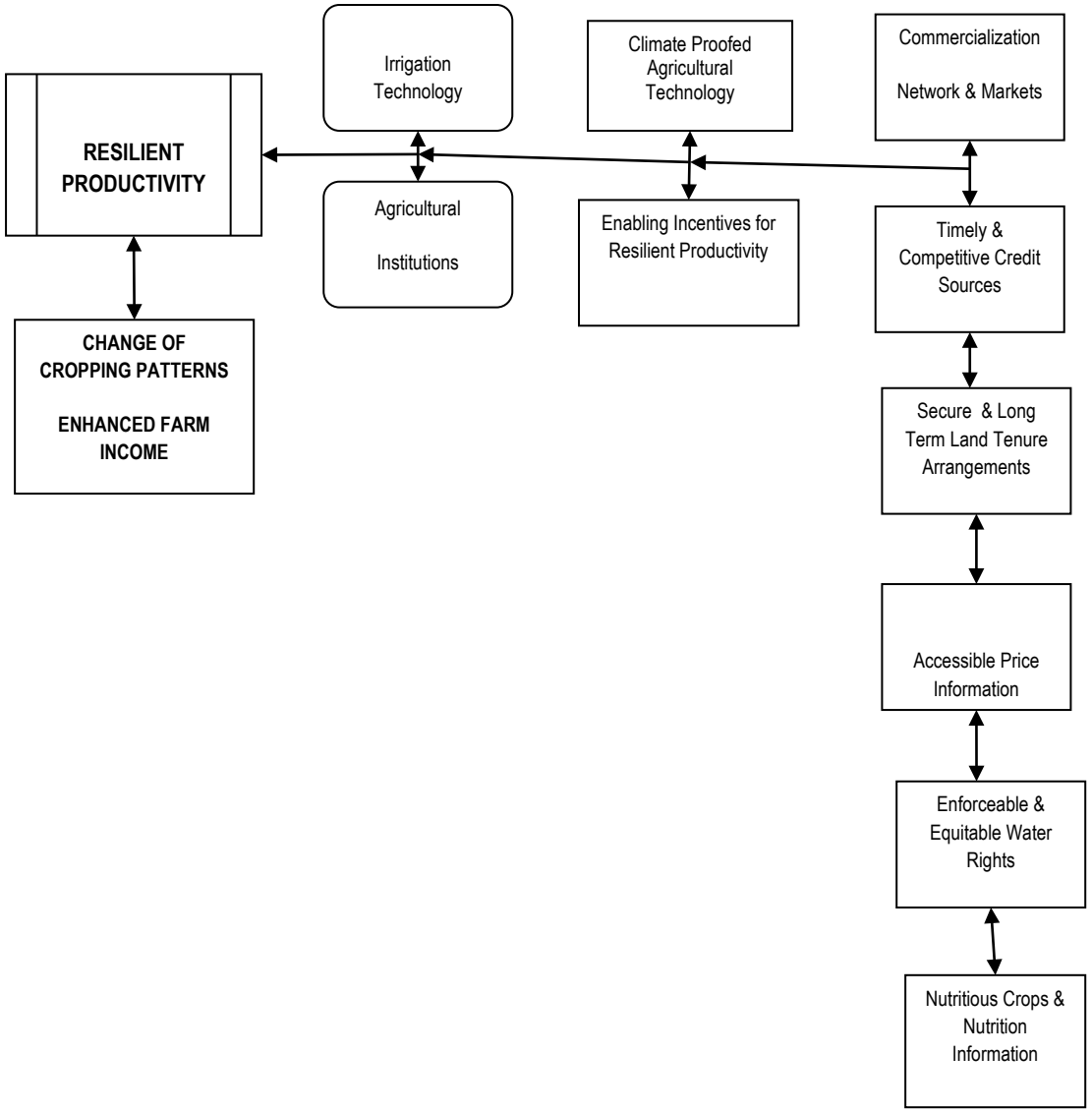
The planning process must underline both [1] the farmers' adaptation to the specific methods through skill enhancement and [2] the servicing institutions must reduce the risks involved in the process so as to enable small farmers a successful uptake of the technology. The services should enable irrigated agriculture to be economically worthwhile for the producer, and to consumers and the overall process to be environmentally sustainable. Figure 8.2 illustrates one planning process for consideration for the design of irrigation schemes among subsistence farmers. The following findings from Terminal Evaluation are consistent with the blueprint proposed.

- The absence of commercialization support in the Project made the fruition of technology transfer with equitable income distribution puzzling. This was linked to the finding indicating that the drivers of the process were free extension advice and inputs. It is therefore uncertain if small holding farmers will find the resources to continue to participate in the plan. Thus, consolidating efforts to expand the resources available to small holding farmers can contribute towards resilient productivity.

- Institutions provide the economic incentives needed to enhance productivity. Specifically, evidence indicates the potential of high-productivity technology is more easily realized by the early-adopters of technology with access to resources either in the form of personal assets or social capital. Although the evidence is anecdotal, the farmer in Kazungula spent his own money to dig approximately one kilometer of canal from the Ngwezi river, a tributary of the Zambezi river, to his field to draw irrigation water for the next rice season is an example. Another example is the group of women whose economic returns were relatively higher than the rest of the farmers because they used their children to scare the birds [the crop loss was decreased] and they paid themselves lower wage rates [lower cost of production]. These differences can be ultimately addressed by institutions ensuring the timely and adequate supply of funds and other resources to help small holders learn to increase the productivity of their farms.

In essence, the factors to be considered in the design of an irrigation system are information about water resources, soil conditions and topography as well as adaptation methods to deal with climate change. Importantly, production must be coordinated with marketing to ensure an economic return necessary to cover operation and maintenance cost to ensure the irrigation scheme is financially sustainable.

Below we will discuss concretely the organizational framework required to enable irrigation development, with particular reference to water management and cost recovery which are the cornerstones of financial sustainability of an irrigation project.



Graph8.2 PLANNING PROCESS FOR IRRIGATED AGRICULTURE IN THE CONTEXT OF SUBSISTENCE AGRICULTURE Source Own elaboration

4.4 Organizational Framework Required for Irrigation Development

The Organization for Water Management as Response to Water Scarcity

Water scarcity is clearly a principal concern in the management of irrigation development. As the scarcity of water increases so, too, does its value and diversity of uses. Consequently, this increases the pressure to achieve efficiency in the design and administration of water management, especially irrigation projects. Furthermore, as water scarcity increases so does the social value of improved practices[162] .

The organization for water management focuses on determining the area of irrigable land, the water availability, and the water needs of selected crops. The supply of water determines the area that can be irrigated and the selection of crops for production. When there is abundance of water, but a limited area of irrigable land, the needs of the crops indicate the water demand. The amount of water to be transported exceeds the amount that crops need to compensate for inevitable losses during distribution and watering. If there is a risk of salinity or alkalinity, additional water is needed to wash the ground and compensate for evaporation. The amount of additional water is learned by experience or by observation of similar projects.

Soil fertility is maintained with fertilizers, or by crop rotations. Pests can be managed with insecticides or preferably by integrated pest management [IPM]. As discussed in Annex 7, IPM is a "push-pull" system, built on the concept of polyculture (agriculture using multiple crops in the same space), that protects crops, i.e. maize, millet and sorghum from two devastating pests: the stem borer insect and the Striga weed.[163] The push-pull system entails mixing plants that repel insect pests ("push") and planting diversionary trap plants around a crop perimeter that attracts the pests away from the crop ("pull"). In the case of maize, millet and sorghum, the main cereal crop is intercropped with the forage legume *Desmodium. Desmodium* emits volatile chemicals that repel stem borer moths ("push") and attracts a natural enemy of the moths, parasitic wasps ("pull").

Another vital function of water management is cost recovery. One recent report conducted with the sole purpose of determining the cost of water under the current regime of climate variability and global warming current regime estimates that water should not be a free good—the laws of demand and supply tell us that under-pricing leads to overuse and undersupply.[164] Water resources are limited and unevenly distributed (over 60 percent of the usable freshwater supply is found in just 10 countries), and some (like fossil fuels) are non-renewable. Further, water use is found to negatively correlate with water cost, suggesting a role for price signals to rationalize water consumption. For example, in the United States, per capita water use in California has declined in recent decades as a result of the implementation of pricing incentives. Moreover, free water leads to what is known as the “tragedy of the commons,” as evidenced by some regions’ rapid depletion of underground aquifers.

Experiences in some countries with naturally limited water resources have shown that sound water management can be achieved and water challenges are not insurmountable. For example, in low-income countries such as Burkina Faso without natural freshwater resources other than rainfall, in response to early recognition of the various constraints that limited water resources can impose on the economy, it has adopted water pricing policies that allow for full or near-full cost recovery and invest aggressively in water infrastructure and innovations. Indeed, the lack of proper management exacerbates water challenges, even in countries with abundant water endowment, such as a the Democratic Republic of the Congo.[165]

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[162] Crosson, P.R., Cummings, C. & Frederick, K. 1978. Selected water mangement issues in Latin American Agriculture. Baltimore and London: The Johns Hopkins University Press.

[163] www.ag4impact.org/database. Extracted on 20-08-15

[164] IMF . Is the Glass Half Empty or Half Full? Issues in Managing Water Challenges and Policy Instruments. SDN 15/11, Washington, DC, 201

[165] Cf IMF op.cit.

Lastly, besides impounding water in dams for multiple use, from the standpoint of sustainable management of natural resources, the use of biological structures for water bodies e.g . regeneration of dambos, must be emphasized in ongoing programs of water resources development.

4.5 Management of Irrigation –Water

As noted, the water for irrigation can come either from surface water or from groundwater. When there are significant seasonal variations in flow, it is necessary to provide important water impounding structures. The design for these structures is established after very thorough geological and hydrological studies so that we avoid material accidents and empty water reservoirs .

When groundwater reserves permit, it is possible to pump water from boreholes. One of the advantages of this method it that water stored underground is not subject to contamination or evaporation. However, the cost of pumping often makes this water very expensive.

On the other hand, when reservoirs are designed the costs of installation of transmission of water-mains are minimal. Where possible, a combination of these two systems may be the most cost effective solution because each has its advantages. The combined use of surface and ground water requires serious prior studies of the watershed. Underground water is used during cycles of dry years. Aquifers are replenished by precipitation that might occur hundreds of miles from where the bore hole is located. The replenishment rate must be determined so the supply of water in the aquifer is sustainable over the long term.

4.6 On-Farm Transportation and Distribution of Irrigation-Water

In general, there are two methods of water distribution for agriculture: by gravity in open canals or by pressure in pipelines. Gravity systems consist of open channels with a sufficient slope so that water flows at a desired speed. Pressurized water supply systems include pipes and pumping stations, where appropriate. Water can be pumped and thus climb hills or go through rugged terrain under pressure in metal pipes, concrete or any other material. Design of both systems must allow for distribution to all potential consumers. One may consider a distribution system on rotation or on demand to match the requirements of the specific crops regardless of the type of irrigation system used.

4.7 On-Farm Irrigation Methods

The three basic methods are surface irrigation (flooding), sprinkler (overhead) and ground (canal). The choice of method should be determined at the planning stage because it affects other factors such as location and size of the distribution system, and the necessary degree of land preparation. In most cases, surface irrigation is less expensive than overhead irrigation. In the relatively few cases where one can practice groundwater irrigation, this is usually the most economical system.

4.8 Organization for Land Development

When it comes to cultivating virgin lands, or temperate lands that have not been cultivated forest clearing is often necessary, especially in tropical regions. This involves cutting down dense forests which requires a very large workforce as well as machinery. Levelling the land is generally necessary everywhere surface irrigation is used, even if the region has already been cultivated. The ground surface must be leveled to allow water to flow and distribute evenly over the entire surface. In the end, improving the profile of the soil by through deep ploughing or by other means may be necessary to ensure adequate percolation and water retention, as well as good root development

4.9 Drainage

The land to be irrigated must have sufficient drainage to remove excess water on the surface from irrigation water and from precipitation.

4.10 Leading Factors to Enable Performance

Table 8.1 is a partial list of enabling factors that must be present if an irrigation project is to be successful. Experience has shown that many of these are often underestimated. Some of these enabling factors unwittingly omitted are linked with the non-technical aspects of irrigation planning discussed above. Consequently, implementation plans are often insufficient to ensure the conditions for successful irrigation. The range of additional factors required varies from case to case. In some instances the cost of providing complementary factors may exceed the cost of civil works; in others it may be minimal. Experience consistently reveals that these enabling elements are often the linchpins of an irrigation project. Since ordinarily these enabling factors are not an integral part of an irrigation engineering design, contingency plans must be configured to meet these unexpected conditions.

Table 8.1 Factors Enabling Irrigation Performance

On-farm irrigation management
-good working knowledge of the irrigation system -timely access to water -continuous training about irrigation-water conduction on-farm
Agronomic inputs
-high quality seeds -fertilizer if required -agricultural machinery when required
Crop production
- agricultural machinery or utensils -methods of transportation -reliable extension services -linkages to research stations for crop-specific advise
Market and marketing of products
- storage and processing facilities -handling and packaging of perishable crops -arrangements for the adequate sale of produce [for farmers and consumers]
Enabling conditions
-a land tenure system that provides long term security and access to inputs -enforceable and equitable water rights -literacy, numeracy and financial literacy -continuous access to training and educational opportunities for farmers and their family members - favorable and timely credit conditions - production incentives through reliable market demand - good working knowledge of irrigation operations and financial literacy
Social infrastructure
- good housing conditions - health services and other community facilities -schools

Source: Own elaboration

5. **The Economic Logic of Adaptation for Agricultural Outcomes**

To allocate resources efficiently during the planning process in order to induce technological transformation in agriculture, a framework where the economic logic of adaptation/mitigation can be deliberated is useful.[166] The overarching principle is the intent to allocate resources efficiently between different adaptation/mitigation options in the context of generating agricultural outcomes.[167]

In simple terms, the monetary impacts of climate change as measured against a baseline that we would expect to occur in the absence of climate change, provides the starting point. Adaptation reduces these impacts, reducing the economic costs of climate change. This provides the economic benefits of adaptation.

These benefits can be compared to the costs of adaptation. In the simplest terms, if the economic benefits of adaptation outweigh the costs, then there are net benefits – if not, then this potentially leads to mal-adaptation. Note that while adaptation reduces impacts, it does not reduce them entirely, and thus there are still residual impacts and economic costs, even with adaptation. In many cases there is also a need to include the effects on current weather variability, and any ancillary costs and benefits within a more complete economic framework. The overarching principle towards the identification of costs and benefits is important because resources need to be allocated efficiently between different adaptation strategies. In practice there are problems applying this simple framework. Foremost is the availability of information on the costs and benefits of adaptation.[168]

The Programmatic Approach

To allocate resources efficiently in the context of the planning process, the planning process should start with an initial screening process focusing on the potential risks of climate change, including economic consequences (where this includes the wider social effects). Initial responses to elucidate climate change risks might be to do nothing (now), or more likely, to adopt a minimum level of risk management. This is likely to be a more economically rational approach, rather than adopting an extreme, and high cost, adaptation response.

This fits with the timeline of adaptation in the decision to adapt early or to wait. One can distinguish three criteria:

- **Criteria 1:** the costs of adaptation always favors waiting;
- **Criteria 2:** the short-term benefits of adaptation may justify early action, if that action has immediate benefits (e.g. with respect to current weather variability) or has strong ancillary benefits (e.g. health, resilience of natural ecosystems);

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166 This section has extracted materials from: UNEP/Stockholm Environment Institute. Adapt Cost Briefing Note 1: Methodology , 2008

167 IPCC has defined adaptation as: Adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities. Three types of adaptation can be distinguished: [1] Anticipatory adaptation – it takes place before impacts of climate change are observed. Also referred to as proactive adaptation. [2] Autonomous adaptation – it does not constitute a conscious response to climatic stimuli but is triggered by ecological changes in natural systems and by market or welfare changes in human systems. Also referred to as spontaneous adaptation. [3] Planned adaptation –it is the result of a deliberate policy decision, based on an awareness that conditions have changed or are about to change and that action is required to return to, maintain, or achieve a desired state.

168 The cost-benefit analysis for adaptation initiatives has been established. Cf. Climate Works Foundation, Global Environment Facility, European Commission, McKinsey & Company, The Rockefeller Foundation, Standard Chartered Bank and Swiss Re. 2009. Report of the Economics of Climate Adaptation Working Group. Shaping Climate-Resilient Development a Report of the Economics of Climate Adaptation Working Group. A Framework for Decision-Making: 156 pages.

- **Criteria 3:** the longer-term effects of early adaptation may justify early adaptation if it locks-in lasting benefits, for example by preventing long-term damage to ecosystems. [169]

From these considerations three corollaries emerge.

- **Corollary 1:** Given the uncertainty of the future climate in any one location, lower cost options, particularly 'no regret' options that improve current climate resilience and have wider ancillary benefits, will be more economically attractive than adaptation options that involve large sunken costs (infrastructure) whose levels of future benefit are difficult to ascertain.
- **Corollary 2**: Activities that build adaptive capacity are especially attractive, as in addition to being less costly than infrastructure solutions, they are a necessary precursor to improving current climate resilience (address the 'adaptation deficit'). Therefore adaptation projects and policies that are effective at addressing climate change impacts - where the type and degree of magnitude is as yet imperfectly understood - will require a sequential approach informed by a gradually improving evidence base linked to gradual changes in weather patterns.
- **Corollary 3:** The following stepwise approach, shown in Table 3, to programmatic adaptation can be considered to optimize economic effectiveness:

Table 8.2. Planning Process: Stepwise Approach to Programmatic Adaptation/Mitigation

Step	Programmatic Action	Continuum
First	Start by building capacity and awareness of climate change.	**Mitigation/ Soft Adaptation**
Second	Plans should initially focus on identifying and testing a range of adaptation actions based on current levels of knowledge, and on building capacity to analyze climate and climate impact trends and projections.	
Third	Activities that build capacity are especially attractive, in addition to being less costly than infrastructure solutions. Moreover, they are a necessary precursor to improving current climate resilience (and address the 'adaptation deficit').	
Fourth	Identify and start implementing early adaptation activities, concentrating on win-win, 'no regrets' or low-cost options, justified by current climate conditions (i.e. improving current climate resilience and addressing the current adaptation deficit), or based on projected climate change, but involving minimal cost or positive opportunities. This includes 'no regret' options that improve current climate resilience and have wider ancillary benefits, e.g. SLM technologies / CSA approaches also post-harvest processing, value chains and market links	
Fifth	Identify long-term issues that require early pro-active investigation (i.e.. areas that might involve irreversibility, major effects, risks of lock-in which significantly increases future vulnerability, loss of option value, etc), even though there might be high uncertainty on specific options. This does not mean that adaptation options need to be implemented immediately, but rather that a framework should be put in place to identify them, and to set out a flexible plan for assessing what to do for these risks.	

[169] In this light, many of the most effective measures to adapt to future climate change coincide with those that can reduce vulnerability to current climate risks. Therefore there is a focus on the integrated management of current climate variability and extremes with adaptation to climate and this climate risk management approach offers immediate benefits to economic development and long term security in the face of changing climate.

Sixth	In the short term, there needs to be a focus on developing options, or combinations of options, that allow flexibility. As and when the evidence of climate change and climate change impacts unfolds, other possible adaptation options, which involve higher costs, can then be considered. These may include technical options (e.g. hard adaptation).	**Hard** **Adaptation**

Source: own elaboration

In conclusion, the preliminary inference emanating from this early framework is inescapable.

- The first step in the process of inducing climate-resilient agriculture is training related to climate change adaptation/mitigation in agricultural production and other low-cost options ["no regret" options].
- When the evidence of climate change impact unfolds, the high-cost options of adaptation can be considered against the hard evidence of climate change impact.

ANNEX 9

THE M&E OF AGRICULTURAL OUTCOMES UNDER A REGIME OF CLIMATE CHANGE ADAPTATION

1. Introduction[170]

In line with the TOR, this terminal evaluation [TE] mandated the assessment of the M&E plan and its implementation. To this end, we start from the principle that climate change is global and adaptation is local, especially in regards to agriculture, and that consequently there is no "one-size-fits-all" approach. Therefore, the M&E plan is reviewed in light of the realities of agricultural development for small holding farms.[171] Although there are many ways of classifying small holding agriculture,[172] the core elements are : 1- the level of production is geared to meet the subsistence needs of the family unit, 2- a partial portion of the production is destined for the market so that the proceeds cover supplementary family needs, and 3- the technology is traditional without necessarily implying that farmers are reticent to learning and using new techniques. On the contrary, there is clear evidence that new techniques are accepted if it is sufficiently clear that it is in their economic interest to take the risk

[170] Although this Annex is based on the following key works, they are not cited every time in the text. Dennis J. Casley & Lury, D.A. Monitoring and evaluation of agricultural and rural development projects. World Bank Publication. John Hopkins University Press, 1984, pp 30-45; IFAD. A guide for project M&E. Rome 2003; IFAD Evaluation Manual Methodology and Processes. Office of Evaluation, Rome, 2009; IDRC The temporal logic model. Ottawa, 2001; CIDA The logical framework. Making it results oriented. Ottawa, 2001; UNDP Programming manual. New York, 2003. SIDA The Use and Abuse of the Logical Framework Approach. Oliver Bakewell & Anne Garbutt Seka – Resultatredovisningsprojekt. 2005; FAO/WB/GDPRD. Tracking Results in Agriculture and Rural Development in Less-Than-Ideal Conditions: A Sourcebook of Indicators for Monitoring and Evaluation. 2008 Extracted from on 10/10/15 from www.fao.org

[171] The Prodoc [pp 22-23] makes it abundantly clear that the Project's lynchpin is outcome 2 which deals exclusively with inducing resilient productivity in crops As well as animal production [goats rearing, bee keeping, and aquaculture].

[172] One report classifies Zambian small holding farmers into sub subsistence, marginal subsistence and viable small holding farmers. Cf. World Bank Zambia Smallholder Agricultural Commercialization Strategy. Washington, DC, 2007 pp iii-vii

of adopting the technology.[173] These farmers now face the challenge of adopting new techniques to cope with climate variability and global warming.

2. **Scope of an Agricultural Project Evaluation**

First, agricultural projects are highly complex interventions. This is because it is critical to synchronize the social system [economy and society] with the biological cycle of crops [trees or animals, including fish] with the hydrological and climate conditions (especially precipitation and temperatures), using production techniques. The process of mitigation/adaptation to climate change has compounded this complexity.[174] This is because the process of synchronization with the social system, with particular reference to climate change parameters, requires additional efforts from the standpoint of capacity building and skills enhancement resource accessibility where the target-populations are located, in order to induce an agricultural system based on resilient productivity. In addition, precipitation and temperatures are in continuous fluctuation, making it difficult to generate parameters for the planning of agricultural production.

Second, although there is an interdependence between planning and implementation, in terms of practical execution, both are mutually exclusive events. Put differently, good practice dictates that one outcome [planning] must occur before the second event occurs [implementation]. It is in the early phase of planning that assumptions are made about proposed technological processes, costs, markets, marketing arrangements, prices and other necessary institutional arrangements. If these assumptions prove faulty or do not eventuate once the project is launched, then the planning process becomes an implementation problem.[175] Simply put, faulty planning of project activities during execution can lead to irreversible problems.

Third, it is an empirically verifiable fact that the implementation process for agricultural infrastructure, and civil works in general, carries out the established schedule of work, which is determined separately during the planning phase. The planning phase is decisive because the decisions made at this phase will largely determine the extent to which a project will be successfully executed. Consequently, the planning process incorporates feasibility studies, scheduling for implementation and detailed designs. The fact that agricultural interventions are complex, especially under climate change adaptation/mitigation conditions, means that outcomes cannot be planned with a high degree of certainty. This means that on the one hand there is the need for flexibility in the implementation process, through monitoring mechanisms; and, on the other hand, contingency plans need to be designed.

Fourth, the agricultural development experience among subsistence farmers reveals that there is one decisive ingredient needed to enhance the success of agricultural development efforts. If subsistence farmers are presented with a technological package that has been tested on-farm in connection with an agricultural station's applied research, the success rate of transferring technological innovations increases considerably.[176] The package must be economically profitable, socially acceptable and environmentally sustainable. Further, the preparation of a technological package with the characteristics identified above is the responsibility of the development agency, be it

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[173] Cf: Box 7.1 of Annex 7 brings forth historical and ethnographical evidence about small holding farmers incorporating agricultural innovations that is consistent with their economic interest as they perceive benefits.

[174] This fact was clearly agreed upon by the practitioners of agricultural production during the Workshop conducted in Siavonga with implementing cadre of the seven pilot sites. Cf Appendix 1 of Annex 7

[175] Underlying these processes is the fact that planning is fallible as it is based on imperfect knowledge.

[176] Hayami, Y & V Ruttan. Agricultural development: An international perspective. 2nd ed. John Hopkins University, 1985; Southworh, H & B. Jonhston [eds] Agricultural development and economic growth. Cornell University Press, 1974

international or national. Subsistence farmers' struggle for survival is a daily affair and so they have little or no time and/or resources to consider the potential benefits of an economic or technological experiment.[177]

Fifth, if the intention is to work jointly with farmers in the technological transformation process, then there is the Farming Systems Research and Extension [FSRE] approach. This methodology is farmer-based and interdisciplinary and is founded on the following principles:

1-the direct participation of a project area's representative farmers selected by a FSRE criteria;

2- seeks ways to exploit a complementary relationship between on-station and on-farm development research;

3- the key challenge is to effectively bring about benefits to the subsistence farmer, in particular female and landless farmers;

4- the methodology reflects the reality that small-scale agriculture is the product of a complex and dynamic interaction of numerous components both within and outside the farm-household; therefore, the proposed innovations have to be location specific and their overall purpose must be to enhance the productivity of the farm unit as a whole, and as a function of the population's resources and time horizon;

5- the rates of adoption and the impact of changes resulting from the dissemination activities should be monitored in order to adjust or facilitate greater adoption and/or a more favorable impact; and

6-last but not least, the methodology is prepared in painstaking detail before implementation. This is because if benefits do not accrue on farmers during the early trials, then farmers may immediately stop their participation.[178]

2. Monitoring and Evaluation Plan

The monitoring and evaluation plan [Prodoc, pp 63-68] outlines a standard approach within the framework of UNDP administrative procedures. In principle, as illustrated in Table 9.1, the roles and responsibilities for tracking progress towards achieving objectives are well articulated, including the standard type of monitoring and evaluation activities that are normally conducted in UNDP projects. It should be underlined that UNDP project- design procedures deal primarily with capacity development for institutional transformation, which is the UNDP's comparative advantage. Although agricultural development does require institutional reform and alignment, the technical elements of output production [crops, trees, animals including fish] cannot be overlooked as there is a close interaction between technological change and institutional transformation, as discussed in sec 2 of Annex 7 and the development literature in general.[179]

The monitoring and evaluation procedures of the Project's lynchpin [outcome-two] were not identified at any of the different levels required. The Participating Household Report [page 12][180] highlights that outcome-two comprised

[177] Subsistence farmers are open to agricultural innovation if they are absolutely certain that the benefits will accrue on those that take the risks. This is exemplified by the ethnographic evidence contained in Box 7.1 of Annex 7, the area peoples because of their limited or no operating capital either in cash or assets are reticent to take risks of any type. Unless the technological innovation offers the certainty of benefits accruing on farmers that take risks.

[178] There is abundant literature to conduct this methodology. FAO Farm system management. Series 1. Rome.1990; FAO (1994) Farming systems development. A participatory approach to helping small-scale farmers. Rome, 1994; Quiroga, E.R. (1992) Irrigation planning to transform subsistence agriculture: lessons from El Salvador. In: A farming systems research bibliography of Kansas State University's vertical file materials. N.H. Donoghue and D.A. Hargett (eds). Paper 4S4. Manhattan, Kansas State University, 1992.

[179] Hayami, Y & V Ruttan. Agricultural development: An international perspective. 2nd ed. John Hopkins University, 1985

[180] UNDP/MAL Participating household report for the Climate Change Adaptation Project. Table 2, 2015

17 interventions, eight [8] of which dealt with agricultural infrastructure development; mainly water resource development and some social investments. The rest of the nine [9] interventions dealt with the extension and diffusion of agricultural techniques to cope with climate variability and global warming. More than half of the total cost of the Project was allocated to outcome-two alone [Prodoc page 76].

Thus, a gap emerged in terms of the effectiveness of instruments and the indicators to measure progress and performance of the agricultural interventions. This gap made the measurement of progress and achievement of expected results difficult. The Inception Report dealt with this gap and proposed a set of tools to measure the results obtained during the execution of the terminal evaluation. These issues are discussed, both conceptually and operationally, in detail in sections 2 and 3 of Annex 7.

The remainder of this section examines the type of information that is normally required during the monitoring and evaluation of agricultural projects. Accordingly, the intent of this section is not to propose monitoring and evaluation procedures for projects which are implementing initiatives to mitigate/adapt to climate change, as this is a significant task requiring considerable resources and experience and is being undertaken elsewhere.[181]

3-The Different Datasets for the M&E of Agricultural Outcomes

It must be kept in mind that agricultural projects are complex undertakings. It is essential to synchronize the biological cycle of crops [trees or animals, including fish] with hydrological and climate conditions especially precipitation and temperatures, using production techniques. This complexity has increased with the process of mitigation/adaptation to climate change.[182] This is because the process of synchronization with the social system, with particular reference to climate change parameters, requires additional efforts from the standpoint of capacity building, skills enhancement resource accessibility where the target-populations are located, in order to induce an agricultural system based on resilient productivity. Therefore, according to the framework used, [183] the datasets essential for monitoring and evaluating agricultural initiatives embraces several levels.

The Fist Dataset Level

It covers monitoring indicators within the administrative framework of UNDP procedures, as shown in Table 9.1 and outlined in the Prodoc [pp. 62-69]. The available evidence indicates that this set of administrative monitoring activities is necessary in the various stages of project implementation. However, it is now clear that this set of monitoring activities alone are insufficient to track changes in the process of technological transformation in agriculture.

This was the case for this particular Project. To begin with, during the project start up phase the baseline situation was not measured—despite the fact that the associated methodology and respective roles and responsibilities were articulated. Consequently, during the implementation of the TE there was no option other than to use proxy

[181] Most donors are conducting research on this subject. This report has used the procedures proposed by OECD. The World Bank and all major regional banks are doing work as well. The GEF is sponsoring the Climate Change Evaluation Community of Practice c/o GEF Evaluation Office Washington D.C.

[182] This fact was clearly agreed upon during the Workshop conducted in Siavonga with implementing cadre of the seven pilot sites. Cf Appendix 1 of Annex 7

[183] In this assignment we have used the comprehensive framework of : Dennis J. Casley & Lury, D.A. Monitoring and evaluation of agricultural and rural development projects. World Bank publication. John Hopkins University Press, 1984. This framework is consistent with the economic assumptions related to the project analysis of agricultural projects which are being used in this exercise. See: section 2.2.1, Annex 7

baseline measures to gauge possible changes in crop yields, cropping patterns and ensuing economic results at the farm level as discussed and designed in sections 2 and 3 of Annex 7.

More concretely, the Project monitoring activities were characterized by an absence of systematic interactions with beneficiaries to measure how they were using the inputs provided; determine what the output in terms of crop yields was; measure the size of the area under production; and above all, determine the destination of the output as well as how much was consumed by the family unit and what portion of the total outputs was directed to the market; and lastly, what the commercialization procedures were at the farm-gate level. To be certain, the Project interviewed farmers about their experiences with the new technologies proposed. This anecdotal testimony is useful as indicative evidence for further in-depth work either through surveys or case studies. There was no in-depth follow up, possibly, for lack of a conceptual framework to monitor agricultural projects.

Table 9.1 M&E Indicative Monitoring Activities

Type of M&E Activity	Responsible Parties	Time Frame
Inception Workshop	• PTC • PS · UNDP	Within two months after the project management unit has been setup.
Inception Report	• PS	A month after the inception workshop.
Measurement of Means of Verification or project results	• PTC • PS · UNDP-CO	Start, mid and end of project (during evaluation cycle) and annually when required.
Measurement of Means of Verification for Project Progress on outputs and implementation	• PTC • PS · UNDP-CO	Annually, prior to APR/PIR and to the definition of annual workplans.
Annual Project Review (APR) and Project Implementation Review (PIR)	• PTC • PS · UNDP-CO	Annually.
Tripartite Review (TPR)	• MACO • UNDP • PTC · PS	Annually.
Terminal Tripartite Review (TTR)	• PS • PTC · MACO	At the end of the Project.
Project Technical Committee Meetings	• PS • PTC · UNDP-CO	Following the Inception workshop, as well as at least once a year.

Periodic Status/Progress Reports	• PM • PS	Quarterly.
Technical Reports/ Publications	• PS • PTC • MACO • Individual Consultants	To be determined during the Inception Report.
Mid-Term External Evaluation	• MACO • PS • PTC • External Consultants (i.e. evaluation team)	Midway during the project Implementation.
Final External Evaluation	• MACO • PS • PTC • External Consultants (i.e. evaluation team)	At least 3 months before the end of project implementation.
Lessons Learned and shared (both local and at the international level)	• PS • UNDP	Every year of the project implementation, starting from year two.
Audit	• CO · PS	Yearly.
Field Visits to the Sites	• PS • PTC · UNDP-CO	Yearly.
Project Terminal Report (PTR)	• MACO · PS	Starting three months before the project ends.

Source: Prodoc: Table 6. Indicative Monitoring and Evaluation Work Plan.

The Second Dataset Level

It consists of an array of information often formatted as national, regional or standard indicators. This information is available among the different national ministries, civil organizations, NGOs (both national and international), and donors' representatives.[184] Concretely, this dataset is related to: 1- technical parameters associated with factors that can contribute to the project's physical performance, i.e. hydrological and environmental parameters linked with watershed management, precipitation and others; and 2- economic parameters reflected in local and regional prices of staple and cash crops, especially those linked to project activities. It is clear that any fluctuation in prices can disturb the performance of projects. Price information from local and national markets make for simple indicators but this information was not available under the Project's monitoring procedures.

[184] It is worth emphasizing that project M&E of any sector is second-tier effort. In other words, project M&E does not generate information. It uses information for national, regional providers. This is a difficult issue to deal with in countries with limited statistical capacity.

In fact, additional information linked with the performance of an agricultural project, which affects the performance of farmers, both male and female, relates to: 1- the prices and fluctuations of direct farm supplies, i.e. seeds, fertilizers, equipment, etc. ; 2- educational, health and social facilities that are of particular concern to women, as mothers, as well as wives and members of extended family networks;[185] and 3- as agricultural production intensifies the need for sources of additional resources, such as credit arises. This requirement is linked to customized advice on technical issues about crop production and commercialization that can have vital repercussions on the project's performance. This was not considered under the Project's monitoring procedures.

Lastly, the Project distributed inputs to farmers. This information if systematically registered provided an opportunity to configure performance indicators related to 1- rates of usage of inputs, i.e. seeds, fertilizers, and goats provided by the Project ; and 2- the usage rate, which can yield information on adoption rates, which in turn can also yield the repayment rate, also known within the project as the "pass on" modality. However, the Project has not produced this kind of monitoring information. The Terminal Evaluation conducted a survey in the three selected pilot sites based on farm budgets to capture some qualitative elements of the inputs distributed by the Project. The structure of the survey is described in detail in sections 4 and 5 of Annex 7/

The Third Dataset Level

This level is critical to conduct evaluations. It relates to output indicators including the disposal of output, i.e. the commercialization of output. More concretely, output indicators are related to the farmers stated estimate of his/her production of a given crop or livestock operation in a given production season. Direct measurements include areas and yields of crops under production per unit areas, both with and without the project. In the case of livestock [animals and fish], direct measurement includes the number of live animals, milk production, and the off take of animals including fish [volumes and weight]. The associated economic indicators reflected in prices at farm-gate, wholesale, and retail are essential to estimating the gross and net revenue of farm income. In the absence of this information, it was not possible to measure farm income. Despite the fact that the Prodoc [page 22] indicated that changes in farm income was the key metric to appraising the performance of this Project. Therefore, the Terminal Evaluation used proxy farm income indicators and conducted a survey in the three pilots sites selected to gauge the gross and net farm revenue among farmers that participated in the Project. This is discussed in detailed in sections 3, 4 and 5 of Annex 7.

Besides meeting their subsistence needs, farmers have demands to meet in terms of health and education requirements for their families. The presence of these services near the project areas contributes to a better overall performance in terms project outcomes. For example, evidence reveals that the level of health and education services available was directly linked to better levels of economic performance in production and vice versa. Regrettably, these indicators were unavailable and it was not possible to gauge the effect of health and education on the overall Project performance, especially for the small holding farmers.

4. The Role of Logframe in the Process of M&E

In the current M&E process the principal tool used to conduct the results-based project preparation is the Logical Framework Analysis (LFA) or logframe. A LFA helps to ensure a project's orientation from managing through inputs and activities to managing for results (outputs and outcomes). According to the UNDP Programme Manual (Ch 4) a

[185] There is compelling evidence showing that when these social facilities are not available and accessible to women, the repercussions on their performance are negative. One must keep in mind that more than half of the food produced in the regions is carried out by women farmers.

logframe (Table 9.2) is a matrix that summarizes the main elements of a project's design. It is used to ensure consistency among outcomes, outputs, activities and inputs; to identify important risks or assumptions; and to ensure that the intervention is likely to achieve measurable results.

Table 9.2 : Standard Logframe

Item	(1)Project summary description	(2)Indicators	(3) Means of verification	(4) External factors: Assumptions and Risks
Outcomes				
Outputs				
Activities				
Inputs				

Therefore, a results-oriented logframe is iterative, as it allows modification regularly to reflect changes in the project as it evolves --- particularly at the output and outcome levels. In reality, however, experience suggests that logframes are seldom updated as a function of the project's modifications during implementation. During implementation, everyone is focused on implementing specific tasks, meaning the task of reconfiguring is unattended.

In the case of projects whose outputs are tangible things, i.e. rural roads, the absence of logframe modifications may matter little in the end, if the road has been completed within the time lapse specified. However, in those projects whose expected outcomes constitute building institutions or attempting to modify institutions to induce technological transformation, the task becomes exceedingly complex, for lack of agreed upon procedures. Also the timeframe is difficult to deal with as in reality it takes at least 10 years to begin modifying institutions.

In a typical situation, a standard logframe cannot move beyond a project's initial design to incorporate ongoing modifications. This is illustrated through one development partner who became conditioned to feel ashamed of deviations from the plan even when the context changed. Ironically, the more participatory the approach, the more effort is invested in reaching a consensus to produce the framework, and the more difficult it is to revise during implementation. The logical framework becomes a straitjacket – or a 'lockframe', as illustrated in Box 9.1

Box 9.1: Logical framework as a 'lockframe'

In one developing country, the LFA said one partner would construct a new building to expand an agribusiness enterprise. . When it became clear that the business was operating at a loss, the partner still felt committed to fulfilling the plan as it was laid out in the logical framework. Fortunately, another partner was eventually given clearance to postpone the construction of additional buildings given the adverse economic context.

All evidence indicates that the standard logframe is unable to capture the dynamic interaction between project implementation and the institutional evolution associated with the technological transformation of agriculture.

It is not suggested to abandon logframes which helps to plan M&E work. There is need to consider more iterative processes, moving from one approximation to another. Also there is need to focus on measurements to gauge local

realities in the context of global issues taking into account in a given sector, i.e. agriculture. Concretely, agriculture is an established discipline based on scientific and engineering principles. The three levels of datasets needed for monitoring and evaluating agricultural projects is one possible example as proposed by several authors and UN specialized agencies who have developed their own manuals to monitor and evaluate agricultural projects.[186]

According to the latest Audit Report,[187] the Project carried out its administrative and financial operations in accordance with the the Project Document financial rules, regulations, practices, and procedures of the Government of Zambia, and in accordance with UNDP rules and regulations. The Project's assets and equipment were properly managed. And project management maintained an appropriate financial management structure, internal control and record-keeping systems.

ANNEX 10

VALUE CHAIN ANALYSIS IN THE CONTEXT OF SUBSISTENCE FARMING [188]

The purposes of this annex are:

- 1- to review the underlying principles of value-chain analysis in the context of the CAP,
- 2- to exemplify how the value-chain analysis would be implemented. The potential contribution of value-chain analysis to combat both poverty and the negative effects of climate change to the wellbeing of smallholders is a central theme.
- 3- to propose an actionable agenda indicating the steps to follow to conduct a scoping exercise leading to the application of the value-chain strategy to develop S&MEs for the purpose of both combatting global warming and alleviating poverty.

Definition: Value Chain

The value chain analysis includes the full range of activities which are required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final consumers, and final disposal after use. In its most simple conception, value chain begins with production, though in itself it is only one of a number of value added links. Moreover, there are a range of activities within each link of the chain. Though value chains are ordinarily depicted as a vertical chain, often there are intra-chain linkages of a two-way-nature. For example, a specialised design agencies not only influence the nature of the production process and marketing, but are in turn influenced by the constraints in these downstream links in the chain.

Cf. Raphael Kaplinsky and Mike Morris. A Handbook for Value Chain Research. International Development Research Centre, Ottawa, Canada, no date. P 15

Why a Value-Chain Analysis?

[186] Dennis J. Casley & Lury, D.A. Monitoring and evaluation of agricultural and rural development projects. World Bank Publication. John Hopkins University Press, 1984, pp 30-45; IFAD. A guide for project M&E. Rome 2003; IFAD Evaluation Manual Methodology and Processes. Office of Evaluation, Rome, 2009.

[187] MKM Solutions. Audit Report on the Statements of Expenses (CDR), Assets and Cash Position. For the year Ended 31 December 2014.

[188] Adapted from: Agricultural Development International & International Development Enterprises. Cambodia SME Development in Selected Agri-Sectors/Value Chains Final Scoping and Design Report Prepared for International Finance Corporation/ Mekong Private Sector Development Facility (IFC/MPDF). July 2008

At the onset of global warming, Zambia's agricultural sector is at a turning point. From the early results of the Project it is evident that farmers and communities have begun adapting specific techniques, crops and livelihood alternatives to cope with global warming, including hydrological disasters.

The Potential

From interviews with farmers in the pilot sites, indigenous knowledge, traditional social support and reciprocity arrangements are prevailing strategies currently used to cope with global warming. These strategies attest to the resourcefulness of the farming communities [Box 7.1 of Annex 7]. In fact, this is social capital; it is the seed for the development of small and medium-sized enterprises [SMEs]. The SMEs can promote the expansion of the value-chain linked to each of the prevailing crops raised by small landholders. The logical outcome from this development effort would be both an increase in net farm income and enhanced on-farm resilience to cope with global warming.

For illustration purposes, the representative crops for value-chain analysis could include as an example, maize, cowpeas, fruits and vegetables.[189] Although there are 'lead buyers' for some of the crops identified, one intuitively asks why there is no more value added within Zambia. Based on the development experience of countries in the SSA, one can postulate that there are many agricultural producers of these crop sectors. However, in spite of the commercial and marketing opportunities for each crop, very few farmers appear able to benefit from value-adding in a meaningful manner. Development experience indicates that to a large degree this is because production is inefficient, or such small areas are devoted to production that there is little marketable surplus. In addition, commercial processors are not efficient and have limited value added markets to sell into.

An estimated 80 percent of the rural population is engaged in agriculture. Almost all households rely on traditional staple crops, livestock, vegetable and seasonal fruit production to meet their food requirements and supplement their diets, but these activities generally add no income. Considerable areas of the country are suitable for both annual and perennial crop production.

The Constraints

There exist other forces at play that exclude most small holding farmers from becoming active players in the value-chain. Each crop has peculiar production and marketplace dynamics which make it difficult to apply a single solution to enhance the overall performance of markets and marketing.

In spite of thousands of farmers producing fresh vegetables and seasonal fruits, they only provide a small percentage of the domestic market's needs. The remainder is made up by cross-border imports. Development experience suggests that the deficiency of structured internal production and marketing chains; incipient contract farming; and processing facilities have led to a situation where foreign products are more competitive in quality and price.

While earlier paragraphs seem to paint a negative picture of the agricultural sector, this is not necessarily the reality on the ground. Zambia contains varied ecosystems in different landscapes that allow crops to be grown year-round. Several thousand hard working people are producing a sufficient amount of maize to create a surplus. Several thousand more produce vegetables, fruit, and harvest some cowpeas or groundnuts. Several thousand traders provide the invaluable link between producers and processors.

What is to be done?

[189] These representative crops have been selected for the purpose of analysis. Selected crops should be modified according to the actual conditions on the ground.

- First, it is critical to scope the existing situation so as to choose a set of interventions in the context of the selected crops identified above.
- Subsequently, based on the scoping exercise design, implementing a set of interventions incorporating all stages of the value- chain, including the overarching policy and business-enabling environment.

Zambia's small-holding farmers are industrious and clever entrepreneurs. One only has to look around the villages and small market towns to see the 'beehive' of activity. In large cities, everyone is engaged in some sort of livelihood initiative. The challenge is not to find willing people, but rather how to provide them with more opportunities. Consequently, a proactive strategy for project intervention is to identify "lead entrepreneurs" who can provide value chain leadership both up and down the chain. Development experience suggests that a narrowly focused set of targeted interventions to a single value chain (within a sector) will provide greater and immediate impact than a broad based (or shotgun) approach to addressing crosscutting value chain constraints.[190]

Towards a Value-Chain Strategy to Develop S&MEs

Before delineating a strategy, it is essential to understand that the intervention should target the whole value chain. Put differently, an integrated set of intervention targeting the whole value chain is needed, not just the end buyer level (as some donors prefers), or just the farmer level (as other donors prefer). This is a vertical approach to project intervention, rather than a horizontal approach. The horizontal approach (targeting large numbers of actors at a specific level of the chain) has been tried before, and has fallen short of expectations. One specific example is the organic rice project in Cambodia, which received donor support. This project reached 1200 farmers in organic rice production, but failed to consider the marketing of that rice. At the conclusion of the project the organic rice associations collapsed.

The value-chain approach ordinarily starts with the markets, both global and national, and works back to the producers. It builds on the fact that all actors along the value chain are linked and that problems at one level have repercussions for all levels.

The value- chain approach is based on the following working assumptions:
- All sectors are global and are linked into the international markets, whether the commodity is exported or not; supporting service markets are critical to growth;
- There are driving forces or institutions that govern the development of the sectors;
- The sectors operate within an enabling framework that is both national and global;

Lastly, the ultimate determinant of a sector's ability to respond to growth potential is the buy-in by the private sector players. The actors themselves must understand the constraints and opportunities, the business environment, the relative roles of each actor, and the forces that are driving the growth along each crop's value chain.

The Value-Chain Strategy

The essential elements of a value-chain are threefold:
- 1-To identify those financial sector issues, overarching policy and enabling environment that could be addressed with donors' assistance in the longer term. In doing so, the potential benefits from donors' support would be to

[190] For instance, addressing Business Enabling Environment (BEE) and especially the financial sector constraints are critical sectors to tackle. But these are longer term impacts that will bear fruit within five years or more.

provide financial resources and complementary services to lead farmers to increase profitability and greater profit margins.

- 2- To identify the most promising development intervention that could be tackled from an individual farm and individual value chain perspective. Helping the largest number of poor to increase their incomes and livelihoods is the fundamental goal of development. This is carried out by national agencies, parastatals, NGOs and donors. Based on previous development experience, one must be aware that a working partnership between these stakeholders is vital in order to avoid duplication of activities. A division of labor articulated around specific comparative advantages has proven useful in this context. Table 10.1 schematically shows one possible division of labour to promote the development of SMEs through the value-chain approach.
- 3-Contract farming has been used successfully in this strategy. Leading firms provide inputs and credit to farmers in return for the right to purchase their harvest. This is one of the few ways in which farmers have been successfully linked into value chains in other countries. Contract farming has different arrangements; there is not a one-size-fits-all approach. If leading firms could provide credit and technical assistance to small holding farmers, this would solve some of the key constraints.

Table 10.1. The Division of Labour to Promote the Development of SMEs through the Value-Chain Analysis.

Value-Chain Stakeholders			
Government	**Donors**	**Private Firms**	**Parastatal**
• Logistics/infrastructure • Legal framework • Policy framework • Training/extension	• Linking smallholders and exporters • Support to government/promoting policy reform • Training/capacity-building • Provision of fixed capital • Sharing/promoting 'good practice'	• Technical support • Market linkages • Access to fixed/working capital • Identification of market opportunities	• Linking/brokering smallholders and exporters • Training/capacity-building • Market identification and assessment • Farmer mobilization and organization

Source: Spencer Henson. Smallholder Participation in Higher-Value Markets: Prospects and Challenges for Donor Interventions. International Food Economy Research Group. Department of Food, Agricultural & Resource Economics University of Guelph, Guelph, Ontario [no date]

Criteria for Selection of Farmers

When selecting farmers to participate in the value-chain process, one of the key considerations is labor absorption. As an example, while supporting 150 smallholder farmers on 75 hectares to link with a vegetable wholesaler is important for poverty alleviation, supporting a single firm to develop greenhouse production on 6 hectares providing employment for 60 people and their families may be more important. In the first instance we have a ratio of 2 per hectare compared with 10 per hectare in the second. This is not to state that large private enterprises are more labor absorbent than smallholder enterprises (in most cases they are not), but rather to point out that supporting private enterprises is not necessarily only supporting a single household.

Another criteria relates to the security and transparency in which the farmer operates. These matters are related to the specific conditions in each site of the project development areas, in terms of land tenure arrangements, transportation network, national policies promoting smallholders' participation in value-chains, extension and training.

To ensure that development results take place on the ground, there is a need to weave community-based arrangements between the traditional authorities, on the one hand, and the relevant community organizations (i.e. individual farmers, farmers' companies, etc) on the other. These arrangements must integrate customary rights so they are congruent with the sustainable management of the resource, together with contract farming, to ensure a resilient exploitation at the farm level.

Criteria for the Selection of Successful Entrepreneurs in Each of the Four Crop Sectors

The following criteria can be considered in selecting these entrepreneurs.

- Does the company have sufficient experience in the proposed business area ?
- Can the company provide real and sustainable linkages for all players in the value chain?
- Does the company have the managerial capacity to absorb additional funding and technical assistance?
- Is the company in the formal sector and legally registered; thus providing a minimum benchmark for governance and transparency?
- Will the suggested intervention result in a profitable outcome for the company?

An Actionable Agenda

From the standpoint of both poverty alleviation and climate change adaptation of subsistence farming, the potential participation of small holders in high-value markets would be a golden opportunity to pull themselves by their own straps from their dire predicament.

There are, however, many institutional constraints which need to be worked out on the ground. Prominent among these is tenure security, as discussed earlier. It would not be rational for a smallholder to commit himself to produce a given crop in the framework of a contract, with the uncertainty of not knowing if he would reap the benefits from his efforts.

Nonetheless, without "reaching for the stars", there are sound possibilities of capturing resources in the context of the division of labor outlined in Table 10.1. The conditions of highly developed countries' agricultural sectors are skewed, with subsidies not necessarily benefitting the common good. Therefore, it is useful to understand the constraints of export markets and the apparent process of inclusion/exclusion of smallholders.

Consider conducting a preliminary scope of the conditions to carry a value-chain analysis in the context of the strategy outlined earlier. To this end, the following check list of issues along the line of the value-chain should be assessed in the context of the four crops identified:

- Identify and assess the available individual producers, companies, and producer associations to increase the efficiency and competitiveness of Zambian agribusinesses; and tenure security for the participating smallholders in the project development area is critical. The step-wise procedures to enhance the land tenure conditions have been spelled out elsewhere.
- Identify market intermediaries and input suppliers—including traders, processors, manufacturers, marketers, and wholesalers—identifying market inefficiencies, disconnects in the value chain, and opportunities for Zambian agribusinesses to capture greater value;
- Policymakers should be identified where the enabling environment can be improved and streamlined to support and facilitate increased sales and value-added production for both domestic and export markets; and

- Identify and assess cross-cutting market issues - including access to credit, market information systems, sustainable infrastructure, environmentally-sound productivity enhancing technologies, and sector-specific supporting institutions.

The results of this scoping exercise would provide the database needed to design an economic feasibility analysis, social acceptance, and environmental resilience linked with the application of the value-chain strategy to develop S&MEs for the purpose of both alleviating poverty and combatting global warming.

ANNEX 11

THE NUTRITION PLANNING AS AN INTERMEDIATE STRATEGY[191]

Box 8.3 Zambia: Nutrition Profile

Zambia is one of the 22 African countries suffering from the high burden of under nutrition and food insecurity. These events predominantly affect pregnant women and children under 5 year's old (UNICEF 2014). In terms of anthropometry, malnutrition practices are visible through the high rates of stunting in children. These rates have shown that half of boys and about 43 percent of girls are considered stunted (FAO 2014). Furthermore, one in every 10 babies are born with a low birth weight. Anemia affects almost 60 percent of children and about 40 percent of pregnant women (FAO 2014). In past years, Vitamin A deficiency was highly prevalent, with over 50 percent of the population affected, but due to recent supplementation programs which have reached over 95 percent of individuals in 2014, the prevalence of Vitamin A deficiency has been greatly reduced. Additionally, other supplementation programs including the iodization of salt has improved other common deficiencies including that of Iodine from 72 percent in 1992 to approximately 4 percent in 2014 (FAO 2009). The education and promotion of certain dietary practices, like exclusive breast feeding in children under 6 months, has created a wider spread trend from a participation of 10 percent to 61 percent (FAO 2014). Although improvement in a few areas of nutrition have been observed, much remains to be done.

Almost three quarters of the typical dietary energy supply in Zambia is comprised predominantly of maize, starchy root vegetables and few fruits and vegetables (FAO 2009). The consumption of animal source proteins remains low at approximately 5 percent of the total caloric intake and the consumption of fruits and vegetables remains below 10 percent.

Although food consumption patterns in urban areas are evolving and incorporating larger variety of foods like sweet potatoes and rice, the exclusive dependence of maize in rural areas contributes to the high vulnerability to food insecurity and malnutrition (FAO 2009).

At this time, the current dietary energy supply is declining and is insufficient to meet the population's caloric requirements. These dietary patterns may not only be considered quantitatively insufficient but also qualitatively insufficient due to a complete lack of diversity and limited consumption of essential micronutrients.

Source: FAO. 2014. *Food and Nutrition in Numbers.* Food and Agriculture Organization of the United Nations. Retrieved on 01/10/15 from : http://www.fao.org/3/a-i4175e.pdf) FAO. 2009. *Zambia Nutrition Profile – Nutrition and Consumer Protection Division.* Food and Agriculture Organization of the United Nations. Rome. Retrieved on 10/10/15 from : ww.fao.org/ag/agn/nutrition/Zmb_en.stm. UNICEF. 2014. *Zambia Fact Sheet: Nutrition.* Retrieved on 10/10/15 from : http://www.unicef.org/zambia/5109_8461.html.

5.1General

In the next few years in the region the greatest pressure on water supplies will come from efforts to at least double food production for a rapidly growing population and dwindling resources under conditions of climate variability and global warming. While land does not seem to be a major constraint to food production, land with

[191] As indicated earlier, this Annex on nutrition planning was requested specifically by the Steering Committee during the debriefing session held at the MAL on 4 August 2015. Given that context, and the fact that there was no field work undertaken on nutrition issues the project areas as per TOR, this annex is unable to provide specific recommendations. However, it provides directives to conduct nutrition planning in the context of the agricultural conditions in Zambia. This Annex is based on the experience of other UNDP projects on nutrition planning in Bangladesh.

adequate and timely water supplies for a high-productivity agriculture is becoming scarce. In the temperate zones of the region, irrigation has become essential for intensive agriculture. The agricultural frontier for expansion now constitute the arid/tropics where flooding and drainage is a constraint to high-productivity agriculture.

Concretely, population growth in Zambia and the sub region is concentrated in the rural areas, where subsistence agriculture predominates. So increasing food production is inevitably linked with increasing the productivity and output levels of the subsistence subsector. Thus, the biggest challenge to policy makers is how to transform subsistence agriculture into a high-productivity subsector under conditions of climate variability and global warming.

5.2 An Intermediate Strategy as Response to the Second-Generation Problem

The Project has activated an embryonic trend of technology transfer from subsistence agriculture towards a farming system based on resilient productivity as evinced by the data gathered in the Terminal Evaluation. So the efforts to transform natural-resource-based agriculture into science-based agriculture has taken the first step.

As rain- fed agriculture is uncertain due climate variability, the next step in terms of -- first needs first--- is to address water scarcity. The success of the early-adopters [the farmers interviewed, men and women] depends on specific quantities of water at specific times during the cropping calendar.

One key finding from the Terminal Evaluation was the efforts of the early-adopters of the technology transfer can be frustrated because of the absence of commercialization arrangements. Technology transfer brings about a boost in productivity. Consequently increased production is available for the market. If marketing arrangements are not in place, the crops cannot be sold and the gains from technology transfer are compromised and the small farmers are disappointed. For lack of better term, this is referred to as second-generation problem.

The solution to this second-generation problem necessarily involves introducing improved marketing arrangements. These arrangements should allow small-holding farmers to take advantage of the market opportunities available either for staple or non-staple crops. This process, also known as institutional calibration, is time consuming. Because a value-chain analysis must be conducted to determine the appropriate crops and required support to enable small-holding farmers to take advantage of the market opportunities. Annex 10 expounds briefly how value-chain analysis could be applied in the context of the project areas.

Given that context, an intermediate strategy should be considered where the cropping patterns introduced to small-holding farmers contain nutritious crops to enhance the nutrition level of the family unit. In brief, as time-consuming arrangements are sorted out so that small-holding farmers can benefit of market opportunities, growing nutritious crops can provide additional opportunities besides improving the nutrition levels of the family units, as will be discussed below.

This intermediate strategy, however, will require greater efforts in post-harvest technology. Especially the promotion of the cottage-industry to process perishable food in order to elongate the shelf- life of food crops either for the consumption of the family unit or the market. However, the biggest economic benefit of this approach is to enhance the nutrition of the family unit

5.3 Intermediate Strategy: the Constraints and Potential

Constraints: Limited Commercialization Outlets

The data shows that with the exception of the Chongwe pilot site, the remainder of the pilots sites have limited market

outlets. Thus, both male and female farmers are reticent to grow high-yielding and drought-resistant crops. Commercialization, therefore, can break or send the process of technological transformation astray. Therefore, alternative options should be considered to continue with the momentum gained, such as it is, in process of climate change adaptation. Specifically continuing the trend of technology transfer from subsistence agriculture towards a more productive farming system based on resilient productivity as evinced by the data gathered in Terminal Evaluation.

The Potential: Food Security and Nutrition Security

Nutrition security is now recognized as an evolved definition of food security, where micronutrient malnutrition is taken into account. The FAO [2004][192] estimates that most of the countries in the region suffer from micronutrient deficiencies. It is thus important to assess dietary diversity within food insecure populations as a means of measuring food security.

Dietary diversity is defined as the number of different foods or food groups consumed over a given reference period.[193]. The nutrients required by a human body cannot be found in one single food item, but must be obtained through the consumption of a variety of foods. Therefore, healthy diets are those that tend to be the most diverse.[194] The literature recommends a diet including animal and plant based foods so as to ensure all essential macro and micro nutrients.[195]

Given that context, food insecure households are characterized by reduced intakes of animal source foods. This is associated with micronutrient deficiencies including protein and iron as well as fruits and vegetables, especially those with highest micronutrient value, i.e. dark leafy greens and vitamin A rich foods.

Negative health outcomes associated with unbalanced plant based diets include anemia, poor growth, rickets, impaired cognitive function, blindness, neuromuscular deficits and death.[196] Since protein-energy-malnutrition and anemia are common in the region,[197] consuming a diet with adequate protein is important especially for child development and maternal health.

Synthesis

Under these circumstances, the concept of national nutritional policy (NNP) as exemplified in Brazil's nutrition policy guidelines[198] may open up a window of opportunity for the Project. Concretely, as the bulk of the rural population nationally, and, especially in the pilot sites, are now producing crops strictly for consumption of the family unit, this provides an strategic entry point to incorporate nutritious crops in the current cropping patterns. The farm family unit's consumption preference should be a starting point for enhancing nutrition.

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[192] FAO The State of Food Insecurity in the World Monitoring progress towards the World Food Summit and Millennium Development Goals. Rome. 2004

[193] Hatloy, A, Torheim, LE, & Oshaug, A. (1998). Food variety a good indicator of nutritional adequacy of the diet? A case study from an urban area in Mali, West Africa. European Journal of Clinical Nutrition, 52, 891-898.

[194] Burlingame, B, Charrondiere, R, & Halwart, M. (2006). Basic human nutrition requirements and dietary diversity in rice-based aquatic ecosystems. Journal of Food Composition and Analysis, 19(6–7), 770. doi: http://dx.doi.org/10.1016/j.jfca.2006.03.009

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[198] Cf. Guia Alimentar Para a População Brasileira. Ministério da Saúde Secretaria de Atenção a Saúde Coordenação-Geral da Política de Alimentação e Nutrição, Brasilia, 2014

5.4 National Nutrition Policy in the Context of Climate Change Adaptation in Agriculture: Potential Framework

There are several key features in Brazil's NNP guidelines which may provide a good fit to Zambia's conditions and challenges.

First, Brazil's NNP guidelines proposes meals which include staples like cassava, plantain, sweet potato, fruits and vegetables, without the need to measure quantities of nutrients in foods available in the market.[199] These staples also prevail in Zambia's food intake.

Second, more importantly, the said NPP enables the programming of community-based initiatives designed to promote the production of a variety of vegetables and fruits for home consumption. This is consistent with Zambian farming as the majority are families that consume all their production and buy little from the market. Thus, these families should have incentives to enhance their quality of living conditions by learning about new varieties of vegetable crops. Especially how to make meals with moderate amounts of sugar, fats and salt as well as to learn about healthy portion sizes.[200]

Third, such an NPP can provide livelihood opportunities for women or men interested in opening up restaurants for urban dwellers and tourists following national guidelines for cooking simple, everyday healthy meals. These restaurants can link up with more enterprising farms that would provide the necessary fresh staple food crops including vegetables, fruits, root crops as well as small livestock, i.e. chicken, pork and fish.

There can be several potential outcomes from a well thought out NPP. To begin with, it will induce a demand-pull of staple crops, vegetables and fruits across all smallholding farmers. This will be generated by [1] virtue of farm families improving their own diets with different varieties of vegetables and fruits and [2] farm families getting involved in livelihood opportunities either as restaurant owners or supplier to restaurants or even both.

Further, a NPP will bring about opportunities, to the youth and women of smallholding farms, for leadership roles in the production and marketing of vegetables under the smart-agriculture guidelines. In this manner, this NPP has the potential to mobilize rural Zambia.. Moreover, development evidence highlights that vegetable production is neutral in terms of equity and gender issues—because it is knowledge-based and extension oriented. Thus, all farmers irrespective of their assets and gender, if they have access to the know-how of vegetable production and supporting services, can improve their living standards. Therefore, it is viable mechanism for poverty alleviation.

Lastly, though there is ordinarily no need of considerable investments on physical infrastructure, i.e. heavy equipment, dams, and the like, the "soft" investments include almost exclusively on capacity development at the national, sub-national and farm levels.

The cornerstone for better nutrition through climate smart agriculture is capacity building through extension work. For example, there is a need to introduce home-economics classes for boys and girls in primary school and

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[199] This approach measures servings of rice by the half-cup, or carve up red meat steak into helpings the size of a deck of cards, or arrange food groups in pie or pyramid shapes, adding up recommended servings listed in grams, or colour-coding nutrients that correspond to sectors of the of the agricultural industry - dairy, meat and grains. Such an approach has had limited results so far—at least in Canada, the EU and the USA. Without mentioning region-specific products like olive oil and others, which may not be easily available in developing countries.

[200] Inculcating healthy eating as a lifestyle choice involves learning how to cook from scratch and taking the time to sit down and eat with others. This urges people to be critical of food-industry advertising and the dietary short comings of fast food.

programs that help parents learn how to cook nutritious meals with vegetables and root crops. Similarly, one can envisage training of trainers in farm management including marketing, and sustainable land management. As Zambia's backbone is agriculture, all these skills knowledge must be taught at several levels including university level.

ANNEX 12

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ANNEX 13

Evaluation Consultant Code of Conduct and Agreement Form

Evaluators:

1. Must present information that is complete and fair in its assessment of strengths and weaknesses so that decisions or actions taken are well founded.
2. Must disclose the full set of evaluation findings along with information on their limitations and have this accessible to all affected by the evaluation with expressed legal rights to receive results.
3. Should protect the anonymity and confidentiality of individual informants. They should provide maximum notice, minimize demands on time, and respect people's right not to engage. Evaluators must respect people's right to provide information in confidence, and must ensure that sensitive information cannot be traced to its source. Evaluators are not expected to evaluate individuals, and must balance an evaluation of management functions with this general principle.
4. Sometimes uncover evidence of wrongdoing while conducting evaluations. Such cases must be reported discreetly to the appropriate investigative body. Evaluators should consult with other relevant oversight entities when there is any doubt about if and how issues should be reported.
5. Should be sensitive to beliefs, manners and customs and act with integrity and honesty in their relations with all stakeholders. In line with the UN Universal Declaration of Human Rights, evaluators must be sensitive to and address issues of discrimination and gender equality. They should avoid offending the dignity and self-respect of those persons with whom they come in contact in the course of the evaluation. Knowing that evaluation might negatively affect the interests of some stakeholders, evaluators should conduct the evaluation and communicate its purpose and results in a way that clearly respects the stakeholders' dignity and self-worth.
6. Are responsible for their performance and their product(s). They are responsible for the clear, accurate and fair written and/or oral presentation of study imitations, findings and recommendations.
7. Should reflect sound accounting procedures and be prudent in using the resources of the evaluation.

Evaluation Consultant Agreement Form[201]

Agreement to abide by the Code of Conduct for Evaluation in the UN System

Name of Consultant: __Eduardo R. Quiroga_____

Name of Consultancy Organization (where relevant)**:** _____

I confirm that I have received and understood and will abide by the United Nations Code of Conduct for Evaluation.

Signed at Kirkland, Quebec, on 13 November 2015

Signature: ___  _____

ANNEX 14

EVALUATION REPORT CLEARANCE FORM

(to be completed by CO and UNDP GEF Technical Adviser based in the region and included in the final document)

Evaluation Report Reviewed and Cleared by

UNDP Country Office

Name: _____

Signature: _____ Date: _____

UNDP GEF RTA

Name: _____

Signature: _____ Date: _____

ANNEX 15

[201] www.unevaluation.org/unegcodeofconduct

UNDP-GEF TE Report Audit 1- Inception Report

To the comments received on (July 15) from the Terminal Evaluation of (CCAP) (UNDP Project ID-*PIMS 3942)*

Author	Para No./ comment location	Comment/Feedback on the draft TE report	TE team response and actions taken
SPECIALIST Stephanie Ulrich	2	Since this TE inception report is over 40 pages long, I suggest you make this into a table of contents and add page numbers. Please note that the final TE report should not exceed 40 pages.	Agreed and noted
	2	See annexes for recommendations	Agreed
	3	Missing from this TE inception report is also a description of the evaluation criteria that the TE will use to examine the project's results, any potential limitations of the TE, and an outline of the evaluation deliverables and the timeframe of the entire TE, beyond just a schedule of activities that will take place during the TE mission.	Agreed. Review the Synthesis in the new version of IR
	16	How do these procedures align with the MSC method as described in Annex 3 of this TE inception report?	Kindly review revised section 2.2 in new version of IR
	17	I generally don't see how the MSC approach as described in detail in Annex 3 fits into the TE mission schedule proposed here in this schedule.	Matter of opinion. The MSC has been used previously in other TE
	20	Suggestion: make this annexed description more specific to the Terminal Evaluation at hand, not just a generic description of the approach/technique that also includes its monitoring functions (which are irrelevant for this TE).	Agreed
	20	Who in the context of this TE will represent "the committee" in this approach	It has been revised
	20	What does this mean?	It has been clarified
	21	Please explain, who is "we"? Or is this the narrative of the extracted approach description	It is the narrative
	21	This is all irrelevant unless the text is tailored to be specific to the TE at hand.	Agreed
	21	Who will be the "leaders" in the TE process? (if any)? Will the short TE mission timeframe provide enough time for this approach?	The consultant is leading the TE.
	24	Please also specify if this TE will address other domains that the project covers, that are not related to the people-centred domain.	The TOR takes predominance and domains will be jointly chosen
	25	Once again, please tailor this annex to the TE at hand and delete irrelevant information.	Agreed
	26	This graphic is not readable.	Matter of opinion
	38	Please clarify what this means or delete if irrelevant.	Matter of opinion
	39	I recommend that these 3 Annex Appendices be made Annexes.	Agreed
	43	Please make it clear if the evaluator will be the facilitator, or if members of the Enumeration Team will be. Also please specify when this facilitation will take place in the period of the TE mission and its overall function in regards to this MSC approach.	Evaluator needs to interact with ET and other key stakeholders. Final decision will be

			taken in the field jointly
	45	Please include the ToR here (excluding the ToR Annexes)	Agreed

UNDP-GEF TE Report Audit 2

To the comments received on (July 15) from the Terminal Evaluation of (*project name*) (UNDP Project ID-*PIMS 3942*)

Author	Para No./ comment location	Comment/Feedback on the draft TE report	TE team response and actions taken
SPECIALIST ANDSON NSUME	A	The project is line with UNDP's mandate which is aimed at building the capacity of the Ministry of Agriculture and Livestock to integrate climate change in policies, procedures and extension systems and this angle needs also needs to be taken into account.	Agreed. The TE framework focuses primarily on agriculture development issues. The underlying strategy must be bottom up. Put differently, it is vital to find out why farmers are up taking know-how to withstand climate change. Without this information policy analysis is limited. However, the TE will definitely review achievements of outcomes 1,3, and 4
	B	The project's targeted numbers may not be sufficient to generate wide scale community level impacts thus the data collection needs to be well targeted and tailored towards providing more insights on household cases across the proposed dimensions but could also be also useful to gain some insights into those left out for purposes of establishing a proxy reference point.	Agreed. The orientation session and additional discussions will be useful to review these issues and come up with options. For example, I have proposed three groups operating under project intervention and one group outside project intervention which can represent the conditions of the rural population **without** the project.
	C	On the infrastructure projects, it has been very challenging and hence the need to drill down further why this was challenging for the Ministry to complete the planned infrastructure projects and the delays also impacted on the higher level results within targeted households	The Limiting Factor Analysis [Annex 7] can be useful in this exercise supported by focused interviews .
	D	I must also commend the development of the Evaluation Design Matrix but noted the need to complete the **ditto** spaces. Most can generally be addressed by methods such as content analysis, document review, Semi-Structured Interviews and Focussed Group Discussions.	Agreed and done.
	E	Overall the inception report has taken care of environmental concerns and to some extent the gender analysis, however it seems there is room to expand on the latter.	I have taken into consideration every action where women were involved. I will be delighted to expand.
	F	When it comes to data collection by enumerators, there is need to clarify the numbers we are targeting in the different	This is a vital issue. We need to review the whole matter in the context of the number of

		beneficiary groups but also indicating the approach for data analysis. This also has implications for the field work duration or the number of enumerators.	days of available for the mission [14 days] and the number of beneficiaries and stakeholders we can reach out in 14 days.
	G	The tools are fine but they may need some adaptation which I believe will be done during the initial phases (during the training of enumerators). The Most Significant Change approach is very interesting but given the time constraints, may have to be built into Focussed Group Discussions and reinforced with observations during household visits.	Agreed and done. MSC registers in a structured manner the responses from informants in the context of focussed group discussions.
	Page 4	Could be useful to consider some agricultural service providers or organisations such as Conservation Farming Unit or related programmes and projects in the areas but also agro-markets firms that provide the markets for agricultural produce.	Agreed. Excellent suggestion
	Page 4	The document refers to these as outcomes	Correct
	Page 5	Overall the focus on Outcome 2, should not overshadow UNDP's mandate in such projects which is to develop the capacity of the Ministry of Agriculture and Livestock. Thus the need for a balance focus on institutions, community structures and targeted beneficiaries	Agreed. The strategy underlining the TE is bottom up. If we do not find why the farmers are not up-taking know-how to withstand climate change, there is little use for policy
	Page 7	On the last step where there is National Agricultural Extension Programmes, there is also need for a link for Policies and Incentives (and scale up which is just part of the extension programmes	Agreed
	Page 8	This is appreciated but also to be looked at in relation to modernisation of farming systems and may be the reason why most of our small-holder farmers have not grown.	Agreed. Modern agriculture needs to be grafted on to the traditional framework.
	Page 8	This one has been rightly identified and measures for incomes may be difficult to come up with a community level baseline but talking a longitudinal approach within the households, it is possible to understand the changes. The sample approach may work provided households targets are randomly selected and make up significant numbers to allow for statistically backed analyses.	A representative sample of small holders' farm budgets currently operating outside the Project intervention can provide a glimpse of farm income without the Project [Group D] See comments on "left out farmers" in p 18
	Page 8	Very good approaches but definitely require time especially if households records are not complete	Enumerators after training can collect farm budgets from farm groups. Group memory replaces household records
	Page 9	This was the intended list but could be good to assess why not of them could be done But also taking note of similar interventions in supported areas done by other partners.	Annex 7 contains a preliminary format of a Limiting Factors Analysis. It could be helpful in providing a glimpse as to why some intended works could not be conducted. If the same format is applied to other partners who actually achieved what they said they would, then we may identified key limiting factors
	Page 12	Is there need to consider having a theory of change for the project to replace or argument some of these	No need to consider a Theory of Change. This graph is navigation chart. Irrigated agriculture is highly complex so we need a chart to navigate and find out where we are.
	Page 13	Semi-Structured Interviews, Focussed Group Discussions, Content Analysis	Agreed
	Page 16	There may be need to swap staff so that they do not collect data in their areas of operation but this may have cost implications.	Agreed
	Page 16	As indicated before, Traders, marketing firms and service providers	Definitely an excellent idea
	Page 16	Consider including those left out to get a proxy control	This is useful idea. This "left out group" can give us the conditions of small holders without project

			intervention. See Group D
	Page 17	Need to clarify and agree on the number to be taken taking into account the method for analysis. The timing of the data also needs to be agreed (one month or three month average given most of the data may be recall data here. This time though is good, because they have just harvested and are in the process of selling their crops.	Agreed. This is an operational issue. We can decide during the orientation sessions. However, the "last harvest" is a sound reference point for interviewing farmers.
	Page 17	This is very commendable but has budget implication	Agreed.
	Page 19	This may need a lot at the annual calendar to select the best time. Given that's its recall, it may be good to focus on the immediate past month through they may not have yet been paid for this year's crops sold to the Food Reserve Agency	The last production season is the best recall date.
	Page 20	This can be applied to Focus Group Discussions to be followed by household visits to save time and complete the data collection within the targeted period.	Agreed. MSC is simple. The new version [Annex 3] has been simplified

Audit 3

To the comments received on (18/11/15) from the Terminal Evaluation of (CCAP) (UNDP Project ID-3942

Author	#	Para No./ comment location	Comment/Feedback on the draft TE report	TE team response and actions taken
Eric Chipeta	1	Financial disbursement. The differences of disbursement [planned/actual] should be explained. Audit report [s] will also be needed.	Owen will provide this	· Have received filled table as indicated by the TR format. However, there is no discussion on the causes/effects of the difference between planned and actual expenses. · Have received Audit report [as of 31/12/14] received.
	2	2- Terminal Report. There are several issues arising from this report.[In its current condition] parenthesis added		As I have noted before the Completion report : 1- lacks evidence to support the growth in yields, farm income changes, among others; 2- the Report lists outputs concluded without establishing if outcome has been attained; 3- Report does not have outcome indicators for any of the outcomes; 4- Report does not establish final expected targets and achieved targets
	2a	Outcome performance. We	Biston provided this information	I have received a table listing the completion of outputs per outcome.

		have been discussed this in detail and even identified the outcome indicators proposed in the Prodoc.		As stated, above, there are no outcome indicators to determine whether outcome has been attained.
	2b	Since evaluations focus on project results, a narrative of management performance should be dealt with in the Terminal Report. Following the issues raised by the Reader is the best way to deal with management issues.	The format for the terminal report does not indicate this. These are issues that you as a consultant should have found out because for the author of the terminal report who was also responsible for implementation would give themselves a biased review	As indicated, UNDP manuals referenced above, management is responsible for the preparation of an account related to performance reporting and internal control, among others. To this end, management determines how to enable the preparation of such an account that is free from material misstatement. This also ensures accountability. If a consultant gathers management information on his own from whatever sources [official, non official and other procedures] then the exercise is no longer an evaluation. It becomes a research project as there is no accountability
	2c	There are several list of persons met that are missing. These are listed in red ink in the pertinent annexes. We need complete this list. Because there has not been time to meet donors. However, from all discussions from national officials that donors were not searching for opportunities to work with UNDP. The Prodoc by listing every project related to agriculture gave the impression that additional resources were available. I would like to hear your comments on these issues.	The list should be with you and Biston who went in the field and discussed with the people during your field visits. Biston and Owen help Quiroga complete the lists. Additional resources were not necessarily available in the project sites as these were undertaken in other sites. The list seen was more to do with the outcome of the scoping on which projects were running at national level that were working towards similar objectives as the CCAP	Biston has sent several times the list of farmers [man and women] that participated in the survey including the name of the enumerators. I already have these lists. The Report is missing the names of [1] representatives of executing agencies from each sites, i.e. PACO, DACO, SAO 2] names of MAL that we have interviewed, and other agencies, if any. [3] complete list of assistants to the Debriefing session in MAL
	2d	[d] We also have discussed and agreed	Biston please avail this information	Biston have sent several time the three [3] MSC that were used as sample in the Debriefing Report.

		that additional MSC would be forwarded. In each site, Biston and Evaristo, chose a half dozen MSC which were considered representative. We need those as well.		We collected in the 3 sites more than 50 MSC of which Biston and Evaristo selected five representative MSC from each site. I have been asking for these 15 [repeat 15] MSC

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To the comments received on (13 Nov 15) from the Terminal Evaluation of (CCAP) (UNDP Project ID-*PIMS3942)*

Author	#	Para No./ comment location	Comment/Feedback on the draft TE report	TE team response and actions taken
Eric Chipeta		1	At 124 pages, the report is quite long (a 57 page report, plus 67 pages of annexes)! The ToR asks for a 40-page report, excluding Annexes. You need to consolidate certain aspects of the report.	Agreed. However, Reader's requests do not allow economy of space. Explanations are asked, sections have to be duplicated at the beginning and the end, etc. The number of pages of main report begins with Executive Summary only. The number of annexes add to the clarity and coherence of report.
		2	There are no ratings in the evaluation yet, so we were unable to see if there was evidence that justified ratings. We assume the next draft of the evaluation will have ratings, and this aspect should be reviewed at that time.	Agreed. Ratings have been included
		3	As mentioned in the report, the project finance discussion is missing. Once you have the financial information, they should conduct an analysis on planned vs. actual levels of finance and co-finance. Owen must have shared this information with already.	Agreed and done. Financial annex has been added and other comments as needed in report
		4	4The TE (and it's annexes) should be a "stand-alone" document, that anybody outside of the GEF can understand. Unless the ProDoc will be annexed to this TE, tables and context within the ProDoc should not be referenced directly in the body of the TE.	Matter of Opinion. The Prodoc is a key document. For stylistic reasons is difficult to disregard a key document. The Prodoc and the TE report are essentially legal documents. They are conceptually linked. I already have extracted tables, and sections from Prodoc when these elements are essential.
		5	5It would be useful if the Table of Contents in the final report included page numbers.	Agreed and done
		6	6It is recommended that you expand the acronyms the first time they are used in the report.	Agreed and done
		7	7Some of the material listed in the "Proposals for future directions" section of the executive summary is not particularly relevant to the topic of proposals for future directions; Its suggested you	Agreed and done. Please review the relevant sections. The sections in

			consolidate some of it to shorten and tighten the executive summary- and expanding on this information later in the report.	red print are a response to this specific query
		8	In addition to proposals for future directions, and best and worst practices, the ToR asks for specific, prioritized recommendations to take the work forward; these should be included in the Executive Summary. As the project has already closed, it is best to gear these recommendations towards the creation of future projects, or a scale-up of this project.	Agreed done. Please review the relevant sections. The sections in red print are a response to this specific query
		9	9In the body of the report, it is referred to a Midterm Review (MTR), but also as a Midterm Evaluation (MTE). The MTR terminology should be used consistently throughout the report, which is the terminology that the GEF uses.	Agreed and done
		10	10The report should expand on the limitations of the evaluation, of the methodology, etc.	Agreed and done.Please review the relevant sections. The sections in red print are a response to this specific query
		11	11While Annex 7 contains an in-depth explanation of the methodology, Section 1.1 Scope and Method (p. 12) should outline the main guiding evaluation principles that guided the methodology creation, e.g. a description of the rationale of the methodological approach taken, the rationale and basis for the selection of field visits and persons interviewed.	Agreed and done Please review the relevant sections. The sections in red print are a response to this specific query
		12	The Scope section all seems quite abstract and it's not entirely clear how this relates to the project at hand.	Disagree. Scope was transferred to Annex 9
		13	13You have concluded that there was no other relevant projects that this project could have drawn lessons learned from in the design phase. This is hard to believe. During design, project relied on information for former projects (e.g. other agriculture projects in the region, in the country.	As discussed in relevant section, the Project design contained a complex set of 19 interventions in four different subject matters, illustrated in Table 1, if one considers individual interventions, each has been done either in Zambia or nearby. But effectively implementing all 19 interventions simultaneously throughout 8 geographically different pilot sites, in just four years, can be an unwieldy implementation task—which has not been successfully undertaken to my knowledge
		14	The Section 3.5 Replication Approach doesn't fully address the opportunities for replication. Beyond an exit/sustainability strategy for the current project, what would a scale-up/replication approach look like?	Agreed and done The replication approach has been expanded and a scale up option has been designed. See the section in red print.
		15	14In section 3.7 Linkages to Other Projects, you should address the extent to which this project learned from these other projects? To what extent did this project use the linkages to the other projects in its design and implementation?	Done. Kindly review the relevant section in red print.
		16	15Section 4.2 Partnership Arrangements and Section 4.6 Implementing Agency require more analysis. What was the overall effectiveness of project arrangements and management (as	Done. Kindly review the relevant section in red print.

			outlined in the Project Document) and in actual implementation? Were responsibilities and reporting lines clear? Was decision-making transparent and undertaken in a timely manner? What was the quality of execution of the Executing Agency/ Implementing Partner(s)? What was the quality of support provided by the UNDP?	
		17	Section 5.2 on Relevance requires more evidence and justification for some of the statements made in this section; see comments in-text in the report attached.	Done. Review relevant sections in red print.
		18	17There is a limited discussion in the TE of co-development benefits or mainstreaming of UNDP principles, other than gender equality. We suggest the your consider any co-development benefits/impact the project may have had on areas such as improved governance, gender inequality, and/or the prevention and recovery from natural disasters (as relevant).	Disagree. As discussed in the relevant section The reality on the ground was that there was no time assigned to these themes [Annex 2], and so there were no interaction with organizations on these themes [Annex 3]. Furthermore, evaluations do not generate information; terminal evaluations are information-users. In many countries, the reality is that the stock and flow of required information is irregular and unreliable. In this context, the TE's pervasive challenge was to understand reality on the basis of partial information. Therefore, the focus of the Inception Report was on a minimum set of priority core themes, i.e. outcome-two which was the Project's cornerstone—rather than on a desired set of themes. As Annex 7 testifies, the data-collection and analysis was labour-intensive and time-consuming.
		19	18There was good use of sex-disaggregated data collection, but there is a limited gender mainstreaming analysis. There are sections about mainstreaming (p. 43, Section 5.6 and p. 100, Section 5.2), where you state that the project did have gender equality benefits, but doesn't conclusively back up this statement with evidence.	The operational definition used in the survey is in footnote 78. The survey's intent was not analyze the different levels encompassing women's empowerment. The survey's intention was to learn about the behavior of early-adopter of the technology- of which women were an essential part. The complex analysis of women's empowerment should be done by the Project with small groups. Women in the field are too busy to review empowerment levels. Our interview took 20 minutes per case.
		20	19Annex 7 states the methodology for field sites data collection: "Through this arrangement many of the data collection tasks were conducted by the project team and the enumerators under the supervision of the consultant" and also "The National Project Coordinator accompanied the implementation of all the Mission activities as an observer". Please note that in the future, to the extent possible, the project team should not be collecting data from the beneficiaries, and the National Project Coordinator should also not be present during data collection, as this can be perceived as a conflict of interest and beneficiaries might not answer questions as honestly as they would if the Project Team and	As discussed in the Limitations to the methodology [in red print], It was jointly agreed with management to conduct the survey, with the participation of the Project Team and National Project Coordinator. **This was due to limited resources**. The TE timeline meant that one consultant could not conduct the survey alone, and the survey was carried out by enumerators trained by the Consultant. On each site, the Consultant conducted as many interviews as possible to ensure data reliability, sometimes with the help of translator. The NPC was not directly or indirectly involved with the data collection and analysis; instead he facilitated

			Coordinator were not present.	the flow of activities since the enumerators were MAL personnel and not involved with the Project.
		21	The figure on pg. 73 is not readable.	Regrettably could not find Figure in p 73
		22	The chart in Annex 4 (Evaluation question matrix) is not entirely readable, so we couldn't see if the evaluation criteria was relevant.	Done
		23	In Appendix 2 of Annex 7: Significant Change Stories (p. 107), the report identifies the respondents by their responses, which does not follow the UNEG Code of Conduct. Individual responses should not be tied to the respondents. It is sufficient to list the individual names of the respondents all together, but it doesn't follow the ethics code to list their associated responses unless you were given explicit permission to do so, and this is well-documented in the report.	Agreed and done. Fully aware of confidentiality matters. Names in SCS and crop budgets were kept in the preliminary version, in case corrections would be needed.
		24	As stated in the report, the following annexes are currently missing: ○ Annex 5: Co-financing table ○ Annex 6: Matrix for Rating the Achievement of Outcomes ○ Annex 11: Directives of preliminary preparation for nutrition planning ○ Annex 13: Evaluation Consultant Agreement Form- this is listed in the table of contents, but also missing from the report (see template attached)	Annexes have been incorporated in report
		25	In addition to the annexes already included, the following annexes should be added: ○ Report Clearance Form: signed by the RTA and CO and included in the final report (see template attached)which we will do as UNDP once the issues raised have been addressed. UNDP will also fill in the attached management response. ○ Annexed in a separate file: TE audit trail, where the evaluator addressed all the comments received on the draft report (see template attached)	These forms have become Annex 14 and 15
			Conclusions, recommendations & Lessons „„ Corrective actions for the design, implementation, monitoring and evaluation of the project „„ Actions to follow up or reinforce initial benefits from the project „„ Proposals for future directions underlining main objectives „„ Best and worst practices in addressing issues relating to relevance, performance and success	NB: Section 4 and its components [page 37 of Guidance] are not defined. It causes misunderstanding because they are not mutually exclusive. The criteria to decide what goes where becomes subjective