GHANA

PROJECT IDEAS REPORT

February 2013

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GHANA PROJECT IDEAS REPORT

TNA Project Team

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February 2013

This document is an output of the Technology Needs Assessment project, funded by the Global Environment Facility (GEF) and implemented by the United Nations Environment Programme (UNEP) and the UNEP-Risoe Centre (URC) in collaboration with the Regional Centre ENDA for the benefit of the participating countries. The present report is the output of a fully country-led process and the views and information contained herein are a product of the National TNA team, led by the Ministry of Environment, Science and Technology.

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Dr. George Owusu Essegbey

Lead Expert

February 2013

FOREWORD

Over the years, the challenges of adoption, transfer and application of technology to enhance agriculture and natural resource development have been evident in the area of climate change. In providing solutions to the technology needs of developing countries, the UNEP, promoted the Technology Needs Assessment (TNA) programmes in various countries in 2011. The TNA project identifies barriers to the use of technologies and enabling environment for the preparation of Technology Action Plans (TAP) as well as Project Ideas Report (PIR) for implementation.

The PIR presents planned activities for four prioritized adaptation technologies in water and agriculture sectors which were presented in the TAP. The ideas were developed through a participatory process involving national stakeholders, the project team, government ministries, departments and agencies (MDAs), development partners, private sector and civil society. The team studied and held series of consultations and discussions over the TAP for elaborated actions which generated to the project ideas.

The report describes technologies which are required for the future, given present climate change impacts on agriculture and water sectors and present technological solutions to ensure sustainable development for managers and decision makers.

For the water sector, the two selected technologies were:

i. Rainwater collection from the ground surfaces; and

ii. Post construction support for community managed water systems

Two project ideas were formulated for the transfer and diffusion of the above using the technologies.

With regard to the agricultural sector the two technologies selected were:

(i) Integrated Nutrient Management (INM)
(ii) Community Based Extension Agents (CBEA)

The PIR elaborates the key areas of project design and implementation in respect of each of the two technologies.

All the four technologies are in line with national policy and priorities and directed towards reducing vulnerability and empowering rural communities to effectively adapt to climate variability and change in the agriculture and water sectors.

It is expected that the project ideas will provide some groundwork and possible action to effectively adapt to climate change impacts through project implementation.

Daniel .S. Amlalo
Executive Director
Environmental Protection Agency
March 20th, 2013.

List of acronyms

CBEA	Community Based Extension Agent
CWSA	Community Water and Sanitation Agency
EPA	Environmental Protection Agency
GIDA	Ghana Irrigation Development Authority
GSGDA	Ghana Shared Growth and Development Agenda
IFAD	International Fund for Agricultural Development
INM	Integrated Nutrient Management
INM-PCO	Integrated Nutrient Management Project Coordination Office
LACOSREP	Land Conservation and Smallholder Rehabilitation Project
MEST	Ministry of Environment, Science and Technology
MESTI	Ministry of Environment, Science, Technology and Innovation
MLGRD	Ministry of Local Government and Rural Development
MoFA	Ministry of Food and Agriculture
MoFEP	Minstry of Finance and Economic Planning
MWRWH	Ministry of Water Resources, Works and Housing
NCCAS	National Climate Change Adaptation Strategy
NGO	Non-Governmental Organisation
NWP	National Water Policy
PCS	Post Construction Support
SADA	Savannah Accelerated Development Authority
TAP	Technology Action Plan

TNA	Technology Needs Assessment
UER	Upper East Region
UWADEP	Upper West Agricultural Development Project
UWR	Upper West Region
WATSAN	Water and Sanitation Committee
WRC	Water Resources Commission
WUA	Water User Association

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EXECUTIVE SUMMARY

Project ideas for four prioritized adaptation technologies in the water and agriculture sectors are presented in this report. Two technologies for each sector were selected through a stakeholder and expert group consultation process and action plans developed for them. These plans were presented in the Technology Action Plan (TAP) report. Selected actions from the TAP for the four technologies are considered in more detail in this Project Ideas Report (PIR). A similar consultation process as for the TAP was followed in the selection and elaboration of actions for the formulation of project ideas.

For the water sector, the two selected technologies were:

(i) Rainwater collection from ground surfaces and

(ii) Post construction support for community managed water systems.

From the action plans in the TAP, the following two project ideas for the transfer and diffusion of the above technologies have been identified.

a) Rainwater collection from ground surfaces: This technology aims at the provision of 100 run-off storage facilities (dug-outs/small reservoirs) each of 1 million m^3 maximum storage capacity for 100 rural communities to provide water for multiple uses such as for domestic, livestock watering, vegetable irrigation, fish production and other income generating activities in the communities. This is the main and most important action required for the transfer and diffusion of the rainwater collection from ground surfaces technology; all other actions as indicated in the TAP support this one to ensure sustainability.

b) Post construction support for community managed water systems: This involves capacity building through technical training in financial and water systems management at the district and community levels to empower rural communities to properly manage, operate and maintain their water systems. This action is critical to a successful deployment and diffusion of the post construction support to community-managed water systems technology. Before the provision of financial and material resources to communities as part of the diffusion of this technology, it is important to first empower them by building their capacities to properly manage the resources.

The implementation of the first project is proposed mainly for the Savannah communities in Ghana (Northern Ghana and the savannah areas in coastal regions) at an estimated total cost of US$22.2 million. It is envisaged that the project will take five (5) years to complete ï by which time the last of the 100 facilities would have been fully developed and ready for use by the communities. The second project will also take five (5) years to complete and cost US $9.0 million. It is targeted to rural communities of mainly farmers and fisher folks across the entire country in all the ten regions of the country with access to active water resource systems. While the first project aims at providing new water storage systems to buffer water shortage during the dry season, the second is intended to provide the necessary knowhow, both technical and financial, to beneficiary communities to enable them properly manage, operate and maintain their existing water resource systems designed for multi-purpose use.

Both projects are in line with national developmental goals and priorities and the technologies being diffused are appropriate to decreasing vulnerabilities of targeted communities to the adverse impacts of climate change on the countryôs water resources.

For successful implementation of these projects co-ordination, monitoring and evaluation would be required at the national and also at the district assembly and community levels. For both projects, the Ministry of Local Government and Rural Development (MLGRD), which is the ministry supervising the district assemblies, has been proposed as the coordination agency at the national and regional levels while the Ministry of Water Resources, Works and Housing (MWRWH) will lead the monitoring and evaluation teams. The district assemblies will co-ordinate, supervise, monitor project activities and carry out training programs in the beneficiary communities. Sourcing funding for the water projects will target the relevant climate change adaptation funding facilities such as the Adaptation Fund, the Strategic Climate Fund and the Nordic Development Fund. Other multilateral and bilateral agencies could provide funding whilst the Government of Ghana provides some supplementary funding.

As in the case of the water sector, a participatory process was adopted for the identification and prioritization of the technologies for the agriculture sector in line with the TNA process. The stakeholders including the Ministry of Food and Agriculture (MOFA), the Ghana Irrigation Development Authority and representatives of farmers took the decision to focus on two technologies for the agriculture sector. The two prioritised technologies for diffusion are:

(i) Integrated Nutrient Management (INM)

(ii) Community Based Extension Agents (CBEA)

These are deemed fundamental and critical technologies which are vital for enhancing the resilience of end-users and their dependent communities to climate change. The action plan for the diffusion is outlined in the TAP. This PIR elaborates the key areas of project design and implementation in respect of each of the two technologies.

The Integrated Nutrient Management (INM) is also referred to as Integrated Soil Fertility Management (ISFM). The technology aims at making efficient use of both synthetic and natural plant nutrient (organic) sources to enhance soil fertility towards improving and preserving soil productivity. The success of INM relies on the appropriate application and conservation of nutrients and transfer of knowledge to farmers. It is proposed that INM is transferred and diffused as a project nationwide with an estimated budget of $9.3 million to enhance soil fertility management in response to climate change adaptation.

This project targets the dissemination of the INM technology to farmers in all the agro-ecological zones in Ghana given that soil fertility management is a fundamental challenge for all farmers. The project generally aims at having about 100,000 farmers nationwide adopt the technology and utilize it intensively. The successful adoption of the technology by the beneficiary farmers leading to increased yields and productivity will have a demonstrable impact on the other farmers. It is intended that the transfer and diffusion of the technology will be done within a five-year period beginning from 2013 (to 2017).

The Community Based Extension Agents (CBEA) is a rural agricultural extension model based on the idea of providing specialised and intensive technical training to identified people in rural communities to promote a variety of technologies and offer technical services with support and review from an extension organization. The CBEA is a demand-driven model, which provides opportunity for farmersô groups or communities to contact the service provider for specific information and related services. The overall goal of the project is to enhance agricultural extension services in all the regions of Ghana. The project targets the enhancement of extension service to 500 communities in selected districts across the country. It is intended that the transfer and diffusion of the technology will be done within a five-year period beginning from 2013 (to 2017). This project proposes the diffusion of CBEA in selected communities with an estimated budget of $13 million.

All in all, the sustainability of these projects will depend to a large extent on mainstreaming the project activities in the national budget and in the relevant institutional programmes. The relevant sector ministries such as MOFA and MLGRD as well as the district assemblies will need to mainstream these project activities and ensure that the national budgetary allocations support their implementation after the project durations.

Introduction

The water and agriculture sectors of Ghana have been identified as the two most vulnerable sectors to the impact of climate change, through both climate impact studies and multi-criteria analysis by expert groups and national stakeholders (NCCAS, 2010). Through similar processes and a national stakeholder consultation at the beginning of the TNA project, adaptation was selected over mitigation for the TNA process. Subsequently adaptation technologies in both sectors were identified and prioritized using Multi Criteria Analysiis (MCA) at a national stakeholder workshop. At another such workshop, barrier and measures to the transfer, diffusion and deployment of four technologies each in the two sectors were analyzed. Action plans for two technologies each were subsequently developed and presented in the Technology Action Plan Report. Following this, project ideas for the diffusion of the two technologies in each of the two sectors were identified and further development. These ideas are presented in this report.

1. Project Ideas for Water Sector

1.1. Brief summary of the Project Ideas for the Water Sector:

The water sector is critical to climate change adaptation in Ghana. The capacity to address the challenges related to climate change depends a great deal on successful transfer and diffusion of technologies, which will enhance resilience to climate change impacts. Through the stakeholder engagement process, four prioritized adaptation technologies in the water sector were selected for barrier, measures and enabling framework analyses for the transfer, diffusion and deployment of these technologies in Ghana. The first two prioritized technologies were then selected through the same process and action plans for their diffusion in the country elaborated in the TAP. The TAP builds on some projects which have been executed in the past in line with the national aspirations for adaptation to climate change. The two prioritized technologies selected for the TAP for the water sector are:

(i) Rainwater collection from ground surfaces and

(ii) Post construction support for community managed water systems.

From the action plans in the TAP, the following two project ideas for the transfer and diffusion of the above technologies have been determined through a participatory process.

a) Rainwater collection from ground surfaces: The project aims at the provision of 100 run-off storage facilities (dug-outs and small reservoirs) each of 1 million m^3 maximum storage capacity for 100 rural communities to provide water for multiple

uses such as for domestic, livestock watering, vegetable irrigation, fish production and other income generating activities in the communities. This is the main and most important action required for the transfer and diffusion of the rainwater collection from ground surfaces technology; all other actions as indicated in the TAP support this one to ensure sustainability.

b) Post construction support for community managed water systems: The project involves empowering rural communities through capacity building to properly manage, operate and maintain their water systems through technical training and capacity building in financial and water systems management at the district and community levels. This project action is critical to a successful deployment and diffusion of the post construction support to community- managed water systems technology. Before the provision of financial and material resources to communities as part of the diffusion of this technology, it is important to first empower them by building their capacities to properly manage the resources.

1.2. Specific Project Ideas

1.2.1. Project Ideas for Rainwater Collection from Ground Surface

1.2.1.1. Project Overview

The technology of the Rainwater Collection from Ground Surfaces covers collection, storage and use of rainfall that lands on the ground as opposed to collection from roofs with the intention for multi-purpose use in rural communities. In many water-poor areas such as the Savannah regions of Ghana, small-scale runoff collection infrastructure can contribute greatly to the volume of freshwater available for human and other uses. Rainwater collection from ground surfaces contributes to climate change adaptation at the community level by providing a convenient and reliable water supply during seasonal dry periods and droughts. The project idea presented in this report is the provision of 100 run-off storage facilities (dug-outs/small reservoirs) each of 1 million m^3 maximum storage capacity for 100 rural communities to provide water for multiple uses such as for domestic, livestock watering, vegetable irrigation, fish production and other income generating activities in the communities. The requisite training of beneficiaries in the proper operations and management of the systems is included in the project. Small reservoirs are created by impounding water behind embankments while dugouts are formed by scooping to create more depth and to impound more surface runoff.

The implementation of the project is envisaged for the Savannah communities in Ghana (Northern Ghana and the savannah areas in coastal regions) at an estimated total cost of US$22.2 million. It is envisaged that the project will take five years to complete ï by which time the last of the 100 facilities would have been fully developed and ready for use by the communities.

Dugouts and small reservoirs for runoff collection have been life lines for rural communities in the Savannah regions of the country, particularly the northern parts where the dry season can last as long as five months and more than 70 per cent of the total annual rainfall occurs in just the three months of July-September (Amisigo, 2005). These storage systems have been recommended as important adaptation options to the impact of climate change on the water resources of Ghana (CSIR-WRI, 2000).

1.2.1.2. Objectives

The main goal of the project is to provide beneficiary communities with enough water particularly in the long dry season to support their livelihoods. Other objectives are to contribute to poverty reduction and improve the health of rural communities. A successful implementation of the project will also free the women and children from the drudgery of spending long hours looking for water thereby allowing the women to have more time to engage in other socio-economic activities to improve their lives and those of their families. The children will also have enough time to attend school. Therefore, the project will contribute to the general well-being of the communities.

1.2.1.3. Project Justification

The Savannah regions of the country already suffer from water unavailability during the long dry season. Studies on the impacts of climate change on the water resources of these regions indicate that these resources are very vulnerable to such impacts and that there would be reduced availability of these resources in the future (CSIR-WRI, 2000; NCCAS, 2010). The studies advocate prudent water resources management, conservation and use efficiency for the country as a whole. In addition the National Climate Change Adaption Strategy (NCCAS, 2010) calls for increasing water availability for domestic, industrial, agricultural, and energy production in the country. For the Savannah regions, in particular, provision of water storage systems, including surface storage and artificial groundwater recharge, have been recommended as an appropriate adaptation measure to reduce the vulnerability of communities in these regions during the long dry season. The National Water Policy (NWP,

2007) recognizes the need to provide water to all communities in Ghana for multiple uses. Also, poverty reduction is a priority of the national development agenda (GSGDA, 2010) and it identifies provision of water, particularly for irrigated agriculture, as a major intervention in poverty reduction in rural communities.

This project aims at making water available to rural communities during the prolonged dry season. This would enable affected communities continue to have access to water during this critical period to support their livelihoods and would contribute to poverty reduction in the communities. Thus, the project is very much in line with the countryôs development agenda and priorities and is in consonance with recommended adaptation options made for coping with the impacts of climate change on the water resources of the country, especially for the Savannah regions.

1.2.1.4. Deliverables

The main deliverables of the project are 100 dugouts/small reservoirs of 1 million m^3 maximum storage capacity for 100 rural communities (of about 500 households per community) in the Savannah regions (the three Northern regions and the Coastal Savannah regions) of the country. Other deliverables are 100 community management committees trained in the water systems management and maintenance and five artisans per community (500 in all) trained in construction/installation of components of the water facilities and maintenance of these facilities.

1.2.1.5. Project scope and possible implementation

The project targets rural communities in the Savannah regions (the three northern regions and the Coastal Savannah regions) of the country. Majority of the population in these regions would be farmers (crop and livestock) and fisher-folk. However, a few would be artisans (mason, carpenters, mechanics, etc). Many of the womenfolk would also be small traders mainly in foodstuff but where access to water is good they could be engaged in other income-generating activities such as tie-and-dye fabric production.

There are many dugouts and small reservoirs already existing in the target areas for community use. Many of these have been initiated and financed by NGOs and donors such as International Fund for Agricultural Development (IFAD), Plan Ghana and Action Aid.

These have usually been designed by the Ghana Irrigation Development Authority (GIDA) and constructed by the GIDA or private contractors (Regassa et al., 2011). Others, particularly dugouts, have been provided by district assemblies. Often the numbers planned to be provided are not achieved in full. For example, Starting from the 1990s, the Land Conservation and Smallholder Rehabilitation Projects (LACOSREP I and II) and Upper West Agricultural Development Project (UWADEP) planned to operationalize a total of 106 small reservoirs in the Upper East Region (UER) and Upper West Region (UWR) of the country for dry season irrigation, fishing, livestock watering and other purposes and targeting more than 100,000 households. However, only 90 small reservoirs have so far been constructed or rehabilitated and put into operation, benefiting about 50,000 households only (Regassa et al., 2011).

In addition, many of these reservoirs are often beset with significant physical, social, and institutional problems including delays in providing the reservoirs. For example, the systems are not properly maintained and managed resulting in dilapidated reservoir banks and canals choked with weeds. Most of the systems lack the organizations for managing and sustaining the schemes. Regassa et al., (2011) report that out of a total of 126 small reservoirs visited in the UER, Water User Associations (WUA) could be identified for only 31 of the systems and even for these 31 reservoirs with a WUA, the participation of the communities in the design, construction and management of the infrastructure was limited.

This project seeks to provide more dugouts and small reservoirs in the target areas to benefit many more communities and households, particularly those that lack all this important facility. It also seeks to address some of the management problems identified for the existing facilities by incorporating mechanisms to ensure the active participation of beneficiary communities in the design and diffusion of the technology from the outset. In addition the project seeks to reduce costs by emphasizing on the use of highly qualified local consultants for proper feasibility studies to avoid costly designs and design changes, use of labour-intensive construction techniques as much as possible and use of local (Ghanaian) as opposed to foreign contractors as much as possible. Local knowledge would also be used to avoid costly over designs.

The project is essentially the provision of water facilities and so will not involve construction of canals and development of irrigable lands. However, there would be provisions for separate access by people and livestock. Filtration galleries would also be included to

provide relatively good quality water for domestic purposes. These systems are not usually provided in existing dugouts and small reservoirs.

1.2.1.6. Project Activities

A number of activities will go into the construction and management of the Rainwater Collection from Ground Surfaces. There is the actual construction which follows designing appropriate systems for the localities. There is the training of the local management teams to ensure proper maintenance culture and sustainability. There are the monitoring and evaluation activities that need to be carried out for the successful implementation of the project. Thus the specific project activities involve the following:

i. Recruitment and/or training of local consultants to undertake selection of sites, carry out feasibility studies and produce the necessary facility designs.
ii. Selection of sites incorporating local knowledge
iii. Animation and education of beneficiary communities to raise their awareness and get them to actively participate in all aspects of the project ï from feasibility studies to operation and management of the reservoirs.
iv. Undertaking feasibility studies using local expertise and involving communities as much as possible.
v. Conduct an Environmental Impact Assessment of the project and obtain certification from the Environmental Protection Agency, EPA.
vi. Reservoir designs with active participation of beneficiary communities
vii. Selection and training of local artisans to undertake various aspects of the construction, operation and maintenance of the reservoirs.
viii. Selection of contractors for construction of reservoirs
ix. Construction reservoirs
x. Training of communities in reservoir operations and management
xi. Training of district level personnel for monitoring and supervision of reservoir operations and management

1.2.1.7. Institutional framework and Sustainability

Since the target areas are rural communities under the jurisdiction of district assemblies, the Ministry of Local Government and Rural Development (MLGRD) will be the lead agency for

project implementation. MLGRD will co-ordinate all activities with technical support from the Ministry of Water Resources, Works and Housing (MWRWH) and its water resources management arm, the Water Resources Commission (WRC). The Community Water and Sanitation Agency (CWSA) of the MWRWH has very good experience with dealing with and training small town and rural communities in the management of their borehole and piped water systems and could provide technical support in community animation and formation of management teams for the project. GIDA of the Ministry of Food and Agriculture (MoFA) will also provide technical support in undertaking feasibilities, reservoir design and construction. GIDA has wide experience in the design and construction of various types of reservoir based irrigation projects in the country. The Ministry of Environment, Science, Technology and Innovation (MESTI) and the EPA will ensure that all facilities are designed and constructed to meet the countryôs environmental standards. The Ministry of Finance and Economic Planning (MoFEP) will be in charge of fund disbursement from government at the national level while the district assembles will disburse funds at the district level. The district assemblies will work directly with technical teams and the communities and would also be responsible for community animation, education and supervision. Development partners and the Savannah Accelerated Development Authority (SADA), a government agency responsible for the overall development of the Savannah regions in the north of the country will also be funding sources to the project.

The project activities all have the potential of being mainstreamed into the mandatory activities of the relevant stakeholder organisations especially for the public organisations. For example, the Ministry of Finance and the MLGRD should by the end of the project duration, institutionalize their activities in the national budget and in their programmes at the national, regional and district levels. The EPA should continue to be involved in and monitor the designs and construction of the rainwater collection systems with particular emphasis on environmental sustainability. The awareness creation and public education programmes can continue long after the project for the beneficiary and other communities to continue with and sustain the project activities.

1.2.1.8. Timelines

ACTIVITY	YEAR																					
	1				2				3				4				5					
				M1*			M2			M3		M4						M5		M6		
i. Recruitment and/or training of local consultants to undertake selection of sites, carry out feasibility studies and produce the necessary facility designs.																						
ii. Selection of sites incorporating local knowledge																						
iii. Animation and education of beneficiary communities to raise their awareness and get them to actively participate in all aspects of the project ï from feasibility studies to operation and management of the reservoirs																						
iv. Undertaking feasibility studies for all 100 facilities using local expertise and involving communities as much as possible.																						
v. Conduct an Environmental Impact Assessment of the project and obtain certification from the Environmental Protection Agency, EPA.																						

ACTIVITY	YEAR																			
	1				2				3				4				5			
				M1*			M2			M3		M4						M5		M6
vi. Reservoir designs including filtration galleries with active participation of beneficiary communities																				
vii. Selection and training of local artisans to undertake various aspects of the construction, operation and maintenance of the reservoirs.																				
viii. Selection of contractors for construction of reservoirs																				
ix. Construction reservoirs and filtration galleries																				
x. Training of communities in reservoir operations and management																				
xi. Training of district level personnel for monitoring and supervision of reservoir operations and management																				

*** Milestones (M1 = Milestone 1, etc.)**

M1 - All activities leading to feasibility studies completed. Feasibility studies starts

M2 - Construction of reservoirs starts with first 50 reservoirs

M3 - Training of first 50 communities on reservoir operations and management completed

M4 - First batch of 50 reservoirs completed. Construction of second batch starts

M5 - Training of 2nd set of 50 communities on reservoir operation and management completed

M6 - Second batch of 50 reservoirs completed

1.2.1.9. Budget and Resources Requirement

Activity	*Period*	*Cost (USD)*	*Source of Funding*
- Selection of sites, feasibility studies and design of the 100 runoff collection systems	2013 ï 2015	Average cost of $10,000 per facility Total: $1,000, 000	Mainly climate change adaptation funding sources e.g. Adaptation Fund, Strategic Climate Fund and Nordic Development Fund; development partners e.g. DANIDA; Government of Ghana
- Construction of 100 Run-off storage facilities and filtration galleries for the selected communities.	2013 ï 2017	Average construction cost of $200,000 per facility and gallery. Total: $20,000,000	
- Ensuring post-construction management system ï sensitization, awareness creation, community training, monitoring and coordination. Training of artisans	2013 ï 2017	Average cost per facility of $22,000 for the 100 facilities. Total: $2,200,000	
Total		**$22,200,000**	

1.2.1.10. Risks and their mitigation

Risk	Mitigation
1. Lack of enthusiasm of communities to participate in all aspects of the project and assume ownership	Undertake vigorous awareness and education programs in the communities. Use experienced community development specialists
2. Poor site selection resulting in costly over designs	Make use of local/indigenous knowledge to assist in selection good sites.

3. Inadequate local consultants with expertise in planning and construction of dugouts and small reservoirs	Use expertise at GIDA extensively
4. Not enough personnel at the district assemblies to provide the needed services including monitoring and supervision in the communities	Impress on the MLGRD the need to recruit the necessary personel at the assemblies to facilitate implementation of the project
5. Conflicting interests and roles among the various stakeholders during project implementation	Identify any such conflicts at the outset and deal with them before project implementation
6. Untimely release of funds	Ensure all needed funds and secured and fully allocated to the project before project take-off
7. High duties and taxes on equipment and materials used for the project that could cause costs to be much higher than budgeted for.	Get government commitment to reduce these taxes and levies or at least not raise these levies for the duration of the project.

1.2.1.11. Monitoring and Evaluation

There will be monitoring of activities for which resources have been allocated to ensure that timelines are kept and, in particular, that milestones are achieved in a timely manner. Project evaluation will also be undertaken periodically (for example every quarter) to determine whether activities undertaken and procedures followed in project implementation are having the envisaged impacts with the expected quality. A national project monitoring and evaluation technical team would be formed at the start of the project to undertake these tasks. The team will be led by the MWRWH and will include representatives from the MLGRD, MESTI, WRC, GIDA and EPA. Monitoring and evaluation teams will also be formed at the district assemblies to assist the national team in its assignment. Monitoring indicators and evaluation criteria (such as the level of patronage of the systems or how many people are using the systems, how many women are in the management team, how often the systems are maintained,) will be established based on project baselines and core targets and used in the monitoring and evaluation process. It will be the responsibility of the national monitoring team to specify and establish these indicators and criteria. The national monitoring and evaluation team can recommend any adjustments in project activities and other procedures to

ensure that project deliverables are achieved in a timely manner and with the expected quality.

1.2.1.12. Stakeholder mapping

As indicated in the institutional framework, the MLGRD will be the lead actor with overall project co-ordination role. The MLGRD will have technical support from the MWRWH, WRC, CWSA and GIDA. The district assemblies and beneficiary communities will be major stakeholders. The assemblies interact directly with the communities providing the necessary technical and financial expertise to enable them manage the facilities. They would also directly supervise the communities and monitor the management and maintenance of the facilities to ensure sustainability. The assemblies in turn will require technical, logistical and material support from the MLGRD. The MESTI and EPA will ensure that all facilities are constructed and operated in an environmentally friendly manner while the MoFEP will ensure the timely release of funds from government sources. The main funding sources for the project are expected to be the climate change adaptation funding facilities set up under the auspices of the UN and other multi-lateral agencies. Bilateral agencies such as DANIDA are also potential funding sources. The Government of Ghana will provide supplementary budgets. However, to address the challenge of sustainability, the relevant ministries and government agencies will be engaged to mainstream the project activities in their budgets and institutionalize the project.

1.2.1.13. Summary sheet for Rainwater Collection from Ground surfaces

Name of Project Idea	Rainwater Collection from Ground surfaces
Project overview	Provision of 100 run-off storage facilities (dug-outs and small reservoirs) each of 1 million m^3 maximum storage capacity for 100 rural communities to provide water for multiple uses such as for domestic, livestock watering, vegetable irrigation, fish production and other income generating activities in the communities.
Objectives	Main goal is to provide beneficiary communities with enough water particularly in the long dry season to support their livelihoods. Other objectives are to contribute to poverty reduction and improve the health of rural communities.
Targets / Beneficiaries	Rural communities
Relationship to the country's sustainable development priorities	Highest priority for national development; policy enacted on rainwater harvesting.
Project Deliverables	100 dugouts/small reservoirs; 100 community management committees trained in the water systems management and maintenance; and 5 artisans per community (500 in all) trained in maintenance works.
Project Scope	Project aimed at the Savannah regions of Ghana; three Northern regions and the Coastal Savannah
Project activities	Recruitment and/or training of local consultants to undertake selection of sites; carry out feasibility studies and produce the necessary facility designs. Selection of sites incorporating local knowledge Animation and education of beneficiary communities to raise their awareness and get them to actively participate in all aspects of the project ï from feasibility studies to operation and management of the reservoirs. Undertaking feasibility studies using local expertise and involving communities as much as possible. Conduct an Environmental Impact Assessment of the project and obtain certification from the Environmental Protection Agency, EPA. Reservoir designs with active participation of beneficiary communities Selection and training of local artisans to undertake various aspects of the construction, operation and maintenance of the reservoirs. Selection of contractors for construction of reservoirs Construction reservoirs Training of communities in reservoir operations and management Training of district level personnel for monitoring and supervision of reservoir operations and management

Duration	5 years
Timelines	Yr.1 - All activities leading to feasibility studies completed. Yr.2 - Construction of 50 reservoirs Yr.3 - Training of first 50 communities on reservoir operations and management completed Yr.3 - First batch of 50 reservoirs completed. Construction of second batch starts Yr.4 - Training of 2nd set of 50 communities on reservoir operation and management completed Yr. 5 - Second batch of 50 reservoirs completed
Budget	US $ 22.2 million
Proposed funding sources	Development partners and Government of Ghana
Monitoring/Evaluation	Monitoring and evaluation to be performed along the activity chains.
Possible complications/challenges	Lack of enthusiasm of communities to participate in all aspects of the project and assume ownership; Poor site selection resulting in costly designs; Not enough personnel at the district assemblies to provide the needed services including monitoring and supervision in the communities; Inadequate local consultants with expertise in planning and construction of dugouts and small reservoirs.
Assumptions	Communitiesô utmost cooperation; collaborating partners working in harmony.
Responsibilities	MLGRD ï Project coordination MWRWH ï Lead in project monitoring and evaluation District Assemblies ï project implementation in the districts; training, supervision of community activities and monitoring Beneficiary communities ï direct operation, management and maintenance of the water systems
Sustainability	Communities sensitized to maintain water systems by themselves with support of district assemblies; mainstreaming of project activities in national, regional and district programmes and budget.

1.2.2. Project Ideas for Diffusing Post-Construction Support (PCS) for Community Managed Water Systems Technology

1.2.2.1. Project Overview

The community that can adequately manage its own water supply system over the long term without any form of external assistance is the exception rather than the rule. The Post-Construction Support (PCS) technology is aimed at increasing the success and sustainability of community-managed water systems. This is even true for those systems that are implemented according to all the currently recognized best practices of the ñdemand-driven, community-managed model. PCS is typically carried out through government programs, municipalities and other bodies that provide community-managed water systems. Types of PCS include, but are not limited to (Elliot et. al, 2011):

- Technical training for water system operators
- Technical and engineering support, including provision of technical manuals
- Financial and accounting assistance (e.g. setting tariffs)
- Help with settling disputes (e.g. bill payment or water sources)
- Help with maintenance, repairs and finding spare parts
- Assistance in finding external funding for O&M, expansion or repairs
- Assistance in assessing the sufficiency of supply for expansion or in the case of drought
- Start-up capital for emergency system repairs
- Household visits to residents to discuss water system use.

PCS contributes to climate change adaptation at the community level through:

- Diversification of community water supply
- Promotion of water conservation, and
- Increased resilience to water quality degradation.

PCS can empower community water committees and operators to access the financial, management and technical resources that enable utility-managed supplies to prepare for and adapt to adverse precipitation conditions.

PCS facilitates community ownership, management and maintenance of water systems, promotes women participation in their management and improves system performance and sustainability. The project idea proposed in this report is capacity building through technical training and training in financial and systems management at the district and community levels to empower rural communities to properly manage, operate and maintain their water systems. . This action is critical to a successful deployment and diffusion of the post construction support to community- managed water systems technology. Before the provision of financial and material resources to communities as part of the diffusion of this technology, it is important to first empower them by building their capacities to properly manage the resource

The project is intended for implementation in a sample of some 500 communities (of about 500 households per community) in all 10 regions of the country at an estimated cost of US $9.0 million over 5 years. It targets mainly water systems created for multiple uses such as dugouts and small reservoir systems for domestic, livestock watering, irrigation, fish production and other uses. Management for borehole and piped water systems in rural communities for domestic purposes only is currently being effectively handled by the Community Water and Sanitation Agency (CWSA) of the Ministry of Water Resources, Works and Housing (MWRWH).

1.2.2.2. Objectives

The main goal of the project is to

- provide beneficiary communities with the necessary skills and expertise to manage, operate and maintain existing community water systems in a sustainable and cost effective manner.
- to strengthen community ownership of the water systems and
- encourage active participation of women in their management and conservation.

Thus, the project seeks to reduce the incidence of water shortages and also reduce maintenance costs of the systems thereby making water available to the communities at affordable user fees for their livelihoods. Therefore, the project will contribute to poverty reduction and improve the health and general well-being of rural communities.

1.2.2.3. Project Justification

Studies on the impacts of climate change on the water resources of Ghana show that these resources are very vulnerable to such impacts and that there would be reduced availability of these resources in the future (CSIR-WRI, 2000; NCCAS, 2010). A key adaptation measure recommended from these studies to cope with the adverse impacts of climate change on water resources is prudent water resources management, conservation and use efficiency for the country. The National Water Policy (NWP, 2007), the National Climate Change Adaptation Strategy (NCCAS, 2010) and the national development agenda (GSGDA, 2010) recognize the need for capacity building at all levels in the country, including at the district and community levels, in water resources management. Throughout the country, community ownership and management of water resource systems is vigorously promoted for rural communities. This is seen in the formation of Water and Sanitation Committees (WATSANs) at the district assemblies, small towns and rural communities for domestic water supply systems and Water User Associations (WUAs) for water systems for other purposes such as irrigation, livestock watering and fish production. However, as pointed out by Regassa et al., (2011), the WUAs are non-functional in most cases and the few that are active are not meaningfully involved in the creation and management of the water systems. As a result, many such water systems are dilapidated, in various states of disrepair and do not function as designed. The lesson is to institutionalize a process whereby the functionality of the management teams of water resources can be sustainable such as through this project.

This project aims at supporting rural communities to manage, operate and maintain their multi-use water resources systems in a sustainable and cost effective manner. It will promote water conservation and efficient use of water and will be contributing to poverty reduction and community general well-being. Thus, the project is very much in line with the countryôs development agenda and priorities and is in consonance with recommended adaptation options made for coping with the impacts of climate change on the water resources of the country.

1.2.2.4. Deliverables

The deliverables are:

- 500 rural communities trained in the technical and financial aspects of management, operation and maintenance of multi-use community water resource systems
- Start-up capital provided to 500 rural communities for emergency water systems repairs

- Monitoring and supervisory teams setup at the district assemblies to monitor and supervise communities in the use and management of their water systems.

1.2.2.5. Project scope and possible implementation

The project is intended to be implemented in 500 rural communities across the country in all 10 regions. Targeted communities would be mainly farmers and fisher folks who have multi-use water systems available to them. These systems would have been provided by government agencies, NGOs, development partners and other donors, etc, but not have effective or functional community management systems in place.

1.2.2.6. Project activities

The project activities involve the following (assuming adequate funding has been secured):

i. Identification and selection of 500 communities with functioning multi-use water resource systems by the district assemblies. This will be a country-wide activity undertaken across all 10 regions.
ii. Identification of the training needs of the assemblies with jurisdiction of the selected communities ï training that will enable them provide the necessary technical and financial management training to the communities.
iii. Animation and education of beneficiary communities to raise their awareness and get them to actively participate in all aspects of the project ï from the identification of their capacity needs to their active involvement in the formation of community management teams that be trained in the water systemôs operation and management.
iv. Formation community water systems management committees to be directly in charge of the day-to-day operations, management and timely maintenance of the water facilities with emphasis on women participation.
v. Developing technical procedures for water system operation, management and maintenance including preparation of operations manuals and maintenance schedules for each water facility.
vi. Developing book-keeping and financial management procedures for the communities

vii. Undertaking training of relevant personnel of district assemblies to enable them carry out the technical and financial management training and supervision of the communities.

viii. Undertaking technical and financial training of the community management committees including how they can generate the necessary funds and/or access financial credits to undertake regular maintenance of the systems.

ix. Establishment of monitoring teams with emphasis on women membership at the district assemblies and the communities to monitor the operations, management and maintenance of the system.

x. Setting up starter capital for each water system for emergency repairs and maintenance.

1.2.2.7. Institutional framework and Sustainability

The Ministry of Local Government and Rural Development (MLGRD) will be the lead agency for project implementation. It is the responsible ministry for district assemblies and will be engaged specifically to endorse the project. MLGRD will co-ordinate all activities with technical support from the MWRWH, including the WRC and the CWSA. The CWSA has very good experience with dealing with and training small town and rural communities in the management of their borehole and piped water systems and could provide technical support in community animation and formation of management teams for the project. GIDA will also provide technical support in systems management and operation, particularly for the dugouts and small reservoirs. GIDA has been the agency that has provided the technical support in terms of feasibility, design and construction of most of reservoir based irrigation projects in the country. The Ministry of Finance and Economic Planning (MoFEP) will be in charge of fund disbursement from government at the national level while the district assembles will disburse funds at the district level. The district assemblies will work directly with technical teams and the communities and would also be responsible for community animation, education and supervision. Development partners and international funding agencies especially in climate change will be approached to fund the project. The Government of Ghana will provide supplementary funding.

The sustainability of the project depends a great deal in mainstreaming the project activities in the national budget and in the relevant institutional activities. The responsible ministries

especially the MLGRD and the District Assemblies have important roles to play. It is possible to ensure sustainability. The District Assemblies should make post-construction public education in the communities a regular activity.

1.2.2.8. Timelines

ACTIVITY	YEAR									
	1		2		3		4		5	
		M1*		M2		M3		M4		M5
i. Identification and selection of 500 communities with functioning multi-use water resource systems by the district assemblies. This will be a country-wide activity undertaken across all 10 regions.	▬									
ii. Identification of the training needs of the assemblies with jurisdiction of the selected communities ï training that will enable them provide the necessary technical and financial management training to the communities.		▬								
iii. Animation and education of beneficiary communities to raise their awareness and get them to actively participate in all aspects of the project ï from the identification of their capacity needs to their active involvement in the formation of community management teams that be trained in the water systemôs operation and management.		▬								
iv. Formation community water systems management committees to be directly in charge of the day-to-day operations, management and timely maintenance of the water facilities.			▬	▬	▬	▬	▬	▬	▬	

ACTIVITY	YEAR									
	1		2		3		4		5	
		M1*		M2		M3		M4		M5
v. Developing technical procedures for water system operation, management and maintenance including preparation of operations manuals and maintenance schedules for each water facility.										
vi. Developing book-keeping and financial management procedures for the communities										
vii. Undertaking training of relevant personnel of district assemblies to enable them carry out the technical and financial management training and supervision of the communities.										
viii. Undertaking technical and financial training of the community management committees including how they can generate the necessary funds and/or access financial credits to undertake regular maintenance of the systems (to be done throughout the project period as needed).										
ix. Establishment of monitoring teams at the district assemblies and the communities to monitor the operations, management and maintenance of the system (will take place throughout project period as necessary to take care of replacements due deaths, migrations, leaving of jobs, etc).										
x. Setting up starter capital for each water system for emergency repairs and										

ACTIVITY	YEAR									
	1		2		3		4		5	
		M1*		M2		M3		M4		M5
maintenance (will take place throughout project period as communities get trained)										

*** Milestones (M1 = Milestone 1, etc.)**

M1 - All activities leading to start of trainings completed;

M2 - At least 30% of the district assemblies trained including women;

M3 - At least 60% of district assemblies and 200 communities with women representatives given training and starter capital

M4 - At least 90% of district assemblies and 350 communities with women representatives given training and starter capital

M5 - All of district assemblies and all communities with women representatives given training. All starter capital provided

1.2.2.9. Budget and resources requirement

Activity	*Period*	*Cost (USD)*	*Source of Funding*
- Selection of communities and water systems, identification of training needs of district assemblies, developing technical procedures for water facility operations and management, developing book-keeping and financial procedures	2013 ï 2014	Average cost of $1,000 per facility Total: $500, 000	Mainly climate change adaptation funding sources e.g. Adaptation Fund, Strategic Climate Fund and Nordic Development Fund; development partners e.g. DANIDA; Government of Ghana
- Training for district assemblies and communities	2014 ï 2017	$5,000 per community Total $2,500,000	
- Management systems including co-ordination, monitoring and evaluation at all levels ï community, district, regional and national	2014 ï 2017	$2,000 per community Total - $1,000,000	
- Provision of starter capital for the 500 communities	2014 ï 2017	$10,000 per community Total $5,000,000	
Total		**$9,000,000**	

1.2.2.10. Risks and their mitigation

Risk	Mitigation

1. Lack of enthusiasm of communities to participate in all aspects of the project and assume ownership	Undertake vigorous awareness and education programs in the communities.
2. Inadequate local community development specialists for community animation, formation and education	Use expertise at CWSA
3. Not enough personnel at the district assemblies to provide the needed services including monitoring and supervision in the communities	Impress on the MLGRD the need to recruit the necessary personel at the assemblies to benefit from the training being offered in the project
4. Conflicting interests and roles among the various stakeholders during project implementation	Identify any such conflicts at the outset and deal with them before project implementation
5. Untimely release of funds	Ensure all needed funds are secured and fully allocated to the project before project take-off
6. Some communities have dilapidated or disfunctional water systems.	Ensure only communities with fairly good systems are selected.

1.2.2.11. Monitoring and Evaluation

Monitoring and evaluation will be important for this project as it will provide the needed information on the response of the communities to the capacity building process and help in the assessment of the level and quality of information uptake by trainees. A national project monitoring and evaluation technical team would be formed at the start of the project to undertake these tasks. The team will be led by the MWRWH and will include representatives from the MLGRD, MESTI, WRC, CWSA and GIDA. It is proposed that this team specify and establish monitoring indicators and evaluation criteria based on project baselines and core targets to be used in the monitoring and evaluation process. Monitoring and evaluation teams will also be formed at the district assemblies to assist the National team in its assignment. The National monitoring and evaluation team could recommend any adjustments in project activities and other procedures it would deem fit to ensure that project deliverables are achieved in a timely manner and with the expected quality.

1.2.2.12. Stakeholder mapping

As indicated in the institutional framework, the MLGRD will be the lead actor with overall project co-ordination role. The MLGRD will have technical support from the MWRWH, WRC, CWSA and GIDA. The district assemblies and beneficiary communities will be major stakeholders. The assemblies will interact directly with the communities, providing the necessary technical and financial expertise to enable them manage the facilities. They would also directly supervise the communities and monitor the management and maintenance of the facilities to ensure sustainability. The assemblies will also be trained as part of the activities of this project but will require logistical and material support from the MLGRD. The MoFEP will ensure the timely release of funds from government sources. SADA and development partners will also be sources of funding for the projects.

1.2.2.13. Summary sheet for Post-Construction Support (PCS) for Community Managed Water Systems

Name of Project Idea	Post-Construction Support (PCS) for Community Managed Water Systems
Project overview	Capacity building through technical training in financial and water systems management at the district and community levels to empower rural communities to properly manage, operate and maintain their water systems.
Objectives	The PCS technology is aimed at increasing the success and sustainability of community-managed water systems through improved management of the systems by the communities.
Targets / Beneficiaries	Rural communities with water systems for multi-purpose
Relationship to the country's sustainable development priorities	Access to reliable water sources is highest priority for Ghana as elaborated in the National Water Policy. It is also an important MDG target.
Project Deliverables	500 rural communities trained in the technical and financial aspects of management, operation and maintenance of multi-use community water systems; start-up capital provided to 500 rural communities for emergency water systems repairs; monitoring and supervisory teams setup at the district assemblies to monitor and supervise communities in the use and management of their water systems.
Project Scope	Project aimed at the communities in all the 10 regions of Ghana with water resources systems.
Project activities	Selection of communities and water systems, identification of training needs of district assemblies, developing technical procedures/manuals for water facility operations and management, developing book-keeping and financial procedures/manuals; training district assemblies and communities; setup of management systems including co-ordination, monitoring and evaluation at all levels ï community, district, regional and national; provision of starter capital for the 500 communities.
Duration	5 years
Timelines	Yr1 - All activities leading to start of trainings completed. Yr2 - At least 30% of the district assemblies trained including women representatives; Yr3 - At least 60% of district assemblies/ 200 communities given training and starter capital; Yr4 - At least 90% of district assemblies/ 350 communities given training and starter capital; Yr5 - All of district assemblies and communities given training. All starter capital provided.

Budget	US $ 9 million
Proposed funding sources	Development partners and Government of Ghana
Monitoring/Evaluation	Monitoring and evaluation to be performed along the activity chains by project coordination unite and district assemblies.
Possible complications/challenges	Lack of commitment on part of communities and district assemblies; In adequate human and material resources; Ineffective monitoring of the community management systems; Lack of cooperation among project implementing partners.
Assumptions	All partnersô total commitment to the project concept, goals and objectives ; communitiesô utmost cooperation; availability of funds.
Responsibilities	MWRWH collaborating with MLGRD, MESTI, WRC, GIDA and CWSA ï Project coordination, monitoring and evaluation; Beneficiary communities - for direct management, operation and maintenance of the systems; District Assemblies ï for training, monitoring and supervision of communities
Sustainability	Successful capacity-building of community management teams and effective management of the water systems; effective monitoring at community and district levels.

2. Project Ideas for the Agriculture Sector

Ghanaôs economy is agriculture-based given the 37% contribution to the GDP and the employment opportunities it offers for about 60% of the population. The Food and Agriculture Sector Development Policy (FASDEP) is designed to achieve the transformation of Ghanaôs agricultural activities for food security and self-sufficiency and for strengthening the base for industrialization through the production of industrial agro raw materials (MOFA, 2007). The Medium Term Agricultural Sector Investment Plan (METASIP) also provides a broad investment framework with detailed cost projections to facilitate investment mobilization from public, donor and private sources (MOFA, 2010). The agriculture sector growth averaging about 8% annually in the last five years suggests a positive impact of the agricultural policies. The production of the staple foods e.g. maize, cassava, yam and plantain has enhanced national food sufficiency. However, there are major challenges especially in relation to on-farm productivity and environmental sustainability. Climate change has become a major source of the agricultural problems as it intensifies the challenges of environmental sustainability.

Indeed for Ghana, the major sector vulnerable to climate change is agriculture. Based on a 20-year baseline climate observation, it is projected that yields of maize and other cereal crops, for example will reduce by 7% by 2050 (EPA, 2012). The impact of climate change on agriculture for Ghana is potentially damaging socio-economically. It is likely to jeopardize the employment of about 60% of the active population, the majority who are small scale rural farmers, resulting in unsustainable livelihoods (EPA, 2012). In the specific areas of soil fertility and water management, the challenge calls for holistic strategies especially as relate to technological solutions.

2.1. Brief summary of the Project Ideas for the Agriculture Sector

In the strategy for technological solutions, there should be identified technologies of strategic importance to agricultural production. More importantly, there should be strategies developed for the transfer and diffusion of the technological solutions. As in the case of the water sector, a participatory process was adopted for the identification and prioritization of the technologies for the agriculture sector in line with the TNA process. The stakeholders including the Ministry of Food and Agriculture (MOFA), the Irrigations Development Authority and representatives of farmers took the decision to focus on two technologies for the agriculture sector. The two prioritised technologies for diffusion are:

(i) Integrated Nutrient Management (INM)

(ii) Community Based Extension Agents (CBEA)

These are deemed fundamental and critical technologies which are vital for enhancing the resilience of end-users and their dependent communities to climate change. The action plan for the diffusion is outlined in the TAP. This PIR elaborates the key areas of project design and implementation in respect of each of the two technologies.

2.2. Specific Project Ideas

2.2.1. Project Ideas for The Integrated Nutrient Management (INM) Technology

The Integrated Nutrient Management (INM) is also referred to as Integrated Soil Fertility Management (ISFM). The technology aims at making efficient use of both synthetic and natural plant nutrient (organic) sources to enhance soil fertility towards improving and preserving soil productivity. The success of INM relies on the appropriate application and conservation of nutrients and transfer of knowledge to farmers. It is proposed that INM is transferred and diffused as a project nationwide with an estimated budget of $9.3 million to enhance soil fertility management in response to climate change adaptation.

The National Fertiliser Policy for Ghana which is in the process of adoption states objectives for the policy as among other things, promoting and facilitating balanced application of fertiliser consistent with the agronomic requirements of the different cropping systems in the various agro-ecological zones of the country and encouraging best management practices that do not undermine the environment in the course of fertiliser use. In line with the general agriculture policy, the use of fertiliser is being promoted including the integrated soil fertility management in Ghana. There is already an availability of capacity for effective transfer of the INM technology to farmers. However the use of the technology is low compared to use of single nutrient sources. In this regard, there is need for a specific project to ensure effective transfer of the INM technology to farmers.

2.2.1.1. Project Overview

This project targets the dissemination of the INM technology to farmers in all the agro-ecological zones in Ghana given that soil fertility management is a fundamental challenge for all farmers. The project generally aims at having about 100,000 farmers nationwide adopt the technology and utilize it intensively. It implies a range of between 2,000 farmers in the Upper East Region to 20,000 farmers in the Ashanti Region, which is the region with the highest

population. The successful adoption of the technology by the beneficiary farmers leading to increased yields and productivity will have a demonstrable impact on the other farmers. It is intended that the transfer and diffusion of the technology will be done within a five-year period beginning from 2013 to 2017.

2.2.1.2. Objectives

The specific objectives of the INM project are to:

i) promote the adoption of INM technology as a primary technology for soil fertilization and the practice of farming;
ii) facilitate farmer learning of the use of INM;
iii) support research and development in ensuring a sustainable supply and demand for INM;
iv) enable district assemblies and local authorities to mainstream INM extension in their programmes.

2.2.1.3. Project Justification

One of the most singly destructive factors in farming is the loss of soil fertility. Once the fertility of the soil is lost, farmers suffer extreme losses in very low yields on their farms. Such losses are anticipated in an environment sensitive to climate change. Obviously, urgent steps are needed to avert this. The agricultural revolution Ghana is desirous of effective solutions which are fundamental to agricultural practices. Fertilizer use is crucial for successful agricultural practices. Unfortunately, fertilizer adoption is very low in Ghana. In the 1970s, fertilizer consumption reached its peak of 31,000 tonnes nutrient in 1977 stimulated by the FAO Fertilizer Programme. There was a decline in consumption however in the 1980s with the economic difficulties and the Structural Adjustment Programme (FAO, 2005; Brandful, 2009). Consumption has risen in the 2000s. Yet, the current consumption is estimated at only 5 kg per head and it is still about half the consumption level of Sub Saharan Africa. Almost all the crop balances in Ghana show a nutrient deficit representing a loss of yield and progressive soil improvement. In fact, the major staple, cassava and yam take 20% of the cropped land and still accounts for 37% of the nutrient deficit (FAO, 2005). The bedrock of any agricultural success story is the fertility of the soil. Ghanaôs agricultural vision as enunciated in the FASDEP and METASIP underscores the relationship between a project to improve soil fertility and enhancing agricultural productivity as a national priority.

2.2.1.4. Deliverables

The deliverables are as follows:

- 100,000 farmers adopting INM technology on their farms;
- Extension officers trained in INM promotion;
- Selected districts in Ghana mainstreaming INM technology;
- Improved INM technologies as outputs of the R&D component of the project;
- Publications on the INM technology.

2.2.1.5. Project scope and possible implementation

The project is designed for nationwide implementation. This is because the challenge of soil infertility is a challenge that has to be dealt with in all parts of the country.

2.2.1.6. Project activities

The first step in undertaking the project activities is the organization of the institutional framework for project implementation. The Ministry of Food and Agriculture (MOFA) will be the responsible establishment to oversee the implementation of the project. An INM Project will be set up in MOFA with a Project Coordinator and the relevant staff and offices. The project office will engage and create the necessary linkages with stakeholder organizations.

All the 10 regional authorities will be engaged for selection of districts in the regions where the implementation of the project is vital. From the selected districts, the beneficiary farmers will be selected.

Another important activity is the training of agricultural extension officers. With the decentralization of MOFA, oversight responsibility for agricultural extension services has been assigned to the regional and district authorities. In collaboration with the relevant authorities, the extension officers will be selected and trained in appropriate workshops.

Workshops will also be organized for the stakeholders to appreciate the importance of the project. There will be workshops in the regions bringing together the district authorities.

The INM technology needs an effective R&D back-up for sustainability. A team of soil scientists and relevant researchers will be formed to work on the technology for improvement. Research is vital for the sustained improvement and application of the INM technology. New techniques for producing soil nutrients and for specific crop farming need to be developed. New formulations for on-farm application and even for industrial production

need to be researched into. In the same way as technologies are improved overtime, INM technology must be scientifically improved to enhance value overtime. To achieve this, the project on INM needs an in-built R&D component that will produce and sustain innovation for INM diffusion and transfer.

All these activities require appropriate logistical support. The key purchasing activities will include the purchase of vehicles, motor bikes and bicycles to support the extension of the technology. Computers and office equipment will be procured for the management of the coordination offices.

2.2.1.7. Institutional framework and Sustainability

The INM Project Coordination Office (INM-PCO) will be located at MOFA. The INM-PCO will have linkages with the respective regional agricultural officers who will have some responsibility for the implementation of the project in the districts. The INM-PCO will also have linkages with the research team backing up the project.

The responsible ministry, MOFA, will mainstream the project activities in the relevant divisional activities of the ministry. The Project Coordination Office can be maintained in the ministry even after the project to sustain the linkages with the relevant organisations in particular the district assemblies, to carry on with the INM project activities

2.2.1.8. Timelines

ACTIVITY	YEAR																			
	1				2				3				4				5			
				M1*				M2		M3				M4				M5		M6
i. Setting up the institutional framework for the INM Project e.g. meeting with relevant institutions, appointment of project officers, etc.; selection of the beneficiary districts																				
ii. Strengthening the relevant project institutions to reach out to the target 100,000 farmers (purchase vehicles, motorbikes, computers, and lab equipment for the institutions)																				
iii. Capacity building for extension officers and other staff mainly in the districts of the project																				
iv. Training of farmers in the respective districts in INM application																				
v. Research and development on INM																				

ACTIVITY	YEAR																			
	1				2				3				4				5			
				M1*				M2		M3				M4				M5		M6
vi. Monitoring and evaluation of the INM project at all levels of operation (national, regional and district)				▬																

*** Milestones (M1 = Milestone 1, etc)**

M1 - All activities leading to setting up the INM-PCO completed including selection of beneficiary communities.

M2 - The relevant project stakeholder organisations strengthened with sensitisation of the project and supply of logistics.

M3 - Training of agricultural extensions officers completed.

M4 - Training of farmers in INM completed.

M5 - Research and development done leading to some improved INM technologies.

M6 - Overall project activities completed

2.2.1.9. Budget and resources requirement

Activity	*Period*	*Cost (USD)*	*Source of Funding*
- Setting up of the INM-PCO (recruitment of 4 staff and purchasing logistical facilities)	2013 ï 2017	Staffing costs for 5yrs; purchase of vehicles, motorbikes and bicycles; computers and office equipment; Average annual budget of 1,000,000. Total ï 5,000,000	Mainly climate change adaptation funding sources e.g. Adaptation Fund, Strategic Climate Fund and Nordic Development Fund; development partners e.g. DANIDA; Government of Ghana
- Establish linkages with the stakeholders and set up INM committees	2013 ï 2017	Annual budget of 200,000 supporting also INM committees for 5 yrs. Total ï 1,000.000	
- Sensitization, awareness creation, monitoring and coordination.	2013 ï 2017	Annual budget of 200,000 for 5 yrs. Total ï 1,000,000	
- Training of the extension officers and relevant staff	2013 ï 2014	Annual budget of 250,000 to engage consultants and train Total ï 500,000	
- Training of farmers (of 100,000)	2013 ï 2016	Annual budget of 200,000 for 4 yrs. Total ï 800,000	
- Research and development	2013 - 2017	R&D annual budget of 200,000 for 5 yrs. Total ï 1,000,000	
Total		**$9,300,000**	

2.2.1.10. Risks and their mitigation

This project is on the assumption that the Government of Ghana continues to prioritise agricultural development as central to Ghanaôs socio-economic advancement. Government funding resources can then be expected to be allocated from the national budget and to the sector ministry ï MOFA. However, government funding resources notwithstanding, there is need for external funding sources complement and support government funding. With Ghana attaining middle-income status, development partners are becoming less generous in their funding support for projects in Ghana. Efforts will be made to use all available means to engage bilateral and multilateral agencies to secure the needed funding for this project especially from the funding facilities dedicated to climate change projects In particular, sourcing funding for the projects will target the relevant climate change adaptation funding facilities. There is the Adaptation Fund which is an important funding source for parties to the Kyoto Protocol. There is the Strategic Climate Fund and other funds set up under the auspices of the UNFCCC. There is the Africa Adaptation Fund sponsored by the African Development Bank (AfDB). There are funding sources of multilateral and bilateral agencies e.g. the Nordic Development Fund with its Nordic Climate Facility, DANIDA and EU funding sources. All these funding sources will be explored. The Government of Ghana can provide some supplementary funding.

2.2.1.11. Monitoring and Evaluation

The INM Project Coordination Office will be responsible for the monitoring and evaluation of the project across the country. This will be done in liaison with the regional authorities and the responsible district officers. There will be assessment of farmersô adoption of the INM technology on their farms and the extent of the role of the agricultural extension officers and other relevant staff.

2.2.1.12. Stakeholder mapping

MOFA is the key stakeholder in this project given that it is the oversight ministry for agriculture in Ghana. It has the responsibility for engaging the relevant stakeholders to achieve the goals and objectives of the INM project. Ultimately, the farmers as the end-users of the technology are the target of the diffusion efforts. Farmers have to learn and use the technology effectively. The project team must develop the needed indicators for M&E. The regional authorities and district assemblies will have the responsibility of liaising with the INM-PCO to ensure successful delivery of the expected outputs.

2.2.1.13. Summary sheet for Integrated Nutrient Management (INM)

Name of Project Idea	Integrated Nutrient Management (INM) Technology
Project overview	This project focuses on the dissemination of the INM technology to farmers in all the agro-ecological zones in Ghana given that soil fertility management is a fundamental challenge for all farmers. The project generally targets about 100,000 farmers nationwide adopting the technology and utilize it intensively. The successful adoption of the technology by the beneficiary farmers leading to increased yields and productivity will have a demonstrable impact on the other farmers.
Objectives	The goal and the objectives of the INM project are to promote the adoption of INM technology as a primary technology for soil fertilization and the practice of farming; facilitate farmer learning of the use of INM; support R&D in ensuring a sustainable supply and demand for INM; enable district assemblies and local authorities to mainstream INM extension in their programmes.
Targets / Beneficiaries	About 100,000 farmers in all regions of the country in the farming communities.
Relationship to the country's sustainable development priorities	Ensuring soil fertility is a national priority for Ghana; there is a policy document in preparation apart from the emphasis in the FASDEP.
Project Deliverables	i. 100,000 farmers adopting INM technology on their farms; ii. Extension officers trained in INM promotion; iii. Selected districts in Ghana mainstreaming INM technology; iv. Improved INM technologies as outputs of the R&D component of the project; v. Publications on the INM technologies.
Project Scope	The project is designed for nationwide implementation.
Project activities	Setting up of Project Coordination Office at MOFA; Selection of farming communities in the districts; Sensitisation and awareness creation on INM technology; Training of agricultural extension officers; Training of farmers on INM technology; R&D to improve INM technology and application; Monitoring and evaluation
Duration	5 years
Timelines	Yr.1 - All activities leading to setting up the INM-PCO completed including selection of beneficiary communities. Yr.2 - Relevant stakeholder organisations strengthened with sensitisation of the project and supply of logistics. Yr.3 - Training of agricultural extensions officers

	completed. Yr.4 - Training of farmers in INM completed. Yr. 5 - Research and development done leading to some improved INM technologies; overall project activities completed
Budget	US$ 9.3 million
Proposed funding sources	Development partners and Government of Ghana
Monitoring/Evaluation	The PCO will conduct monitoring and evaluation at all levels in collaboration with the relevant stakeholders.
Possible complications/challenges	The lowering of priority on INM by national, regional and local authorities; apathy on the part of the agricultural extension officers and farmers; inadequate funding for the project; ineffective coordination and management of the project.
Assumptions	There will be sustained priority on INM; commitment to the project by all stakeholders; adequate funding from the identifiable funding sources.
Responsibilities	MOFA ï coordination and project management; District assemblies ï responsibility for project implementation in the districts; Farmers ï adopting the INM technology; R&D agencies ï conduct of R&D to improve INM.
Sustainability	The mainstreaming of the project activities in national budgets by MOFA, regional authorities and district assemblies will ensure funds are available to sustain activities.

2.2.2. Project Ideas for the Community Based Extension Agents (CBEA) Technology

The Community Based Extension Agents (CBEA) is a rural agricultural extension model based on the idea of providing specialised and intensive technical training to identified people in rural communities to promote a variety of technologies and offer technical services with support and review from an extension organization. The CBEA is a demand-driven model, which provides opportunity for farmersô groups or communities to contact the service provider for specific information and related services. The community based extension model can contribute to climate change adaptation through the training of service providers in climate data collection; analysis and dissemination within their areas of operation to enable communities select appropriate response strategies.

2.2.2.1. Project Overview

The overall goal of the project is to enhance agricultural extension services in all the regions of Ghana. The project targets the enhancement of extension service to 500 communities in selected districts across the country. It is intended that the transfer and diffusion of the technology will be done within a five-year period beginning from 2013 (to 2018). This project proposes the diffusion of CBEA in selected communities with an estimated budget of $4.2 million.

2.2.2.2. Objectives

The adoption of the CBEA model is broadly aimed at enhancing agricultural extension services in the areas of crop and livestock agriculture and promoting environmental sustainability and community resilience to climate change impact. Specifically, the project objectives are to:

i) Identify 500 communities for CBEA application for crop and livestock agriculture;
ii) Select farmers/ members of the respective communities for training in agricultural innovations and extension to farmers; the criteria would include at least basic school education , at least five-year experience in farming and ownership of farm or means of agricultural practice.
iii) Facilitate the community extension by the trained community based extension agents to extend knowledge and innovation for enhanced agricultural practices.
iv) Monitor and evaluate the use of the CBEA model.

2.2.2.3. Project Justification

The improvement in agricultural practices comes with the infusion of knowledge and innovation in farming generally. How this knowledge should be extended has come under various models and concepts. There is probably no all-sufficient concept or model to adequately provide for agricultural extension. However, the CBEA model provides for a relatively sustainable option for agricultural extension services going down to the marginalized areas of agricultural practice. In this model, practicing agriculturists in given

communities ï crop farmers, fishermen, livestock farmers, bee keepers, etc. ï are given training and assisted to provide extension services to others in their agricultural practice.

Ghana, like most other African countries, has a low ratio of 1 agricultural extension officer to 1,500 farmers. The formal extension service system cannot cope with the challenge of extension service delivery to facilitate technology and innovation uptake. There also the general problems of limited technology, poor incentives and weak linkages within the research-extension-farming system (Directorate of Agricultural Extension Services, 2013). The community based extension system is therefore an important complement to the formal extension system. It is a system already in use in Ghana and has been found to be effective given the linkage to indigenous knowledge and the socio-cultural organisation of the people (Bonye, Kpieta and Jasaw, 2012). For crop agriculture, livestock rearing and environmental management, the CBEA model has been found to be useful and worth sustaining nationwide.

Ghanaôs agricultural policies all point to a vision to modernize agriculture and enhance productivity. This can only be done on the basis of good knowledge and improved innovation. It is therefore very vital to adopt strategies or models to enhance the infusion of knowledge and innovation in agricultural practices.

2.2.2.4. Deliverables

The deliverables for this project are:

- Trained CBEAs for 500 communities in Ghana;
- Farmers benefiting from the trained 5,000 CBEAs in all regions with at least 40% being women;
- Publications on the experiences with the CBEA model in Ghana

2.2.2.5. Project scope and possible implementation

The project is designed for nationwide application. The 500 communities will be selected from all the 10 regions in Ghana. From each of the communities an average of 10 CBEAs will be selected ensuring that by the end of the project 5,000 CBEAs are trained and practicing in the country in all regions. At least 40% of the CBEAs will be women. The project is designed for a five-year period with an estimated budget of $13 million.

2.2.2.6. Project activities

Implementing the CBEA model requires a multiplicity of activities which are coordinated and synergized to impact on the selected communities. The project begins with the setting up of the institutional framework for the implementation of the model.

The Directorate for Agricultural Extensions Services of MOFA will set up the office for the CBEA project. This office will be responsible for the finalization of the project documents, the engagement with the national authorities and development partners to ensure that the expected funding resources are secured. The office will oversee the implementation of the project as detailed in the final document.

The project office will select 500 communities across the country especially from the northern regions which are most vulnerable to climate change impacts. From these communities, an average of 10 community members will be trained as CBEAs. It would be a diversified type of training e.g. for crop agriculture, livestock rearing, fish farming and other agricultural practices such as snail farming, grasscutter rearing and bee-keeping. Community members who are active in these agricultural activities and are well-known in their communities will be selected for training.

Given that the agricultural activities intended for training are diverse, the project office may have to engage experts in the respective activities and task them to conduct the training. The project needs to engage a team of experts comprising agricultural extensionists, Integrated Pest Management specialists, and specialists on crop and livestock agriculture, fisheries and environmental management. The training will be conducted in the regions and districts of the selected communities. The training will be towards enhancing the particular agricultural practice of the CBEA as well as equipping for extension skills to transfer the knowledge on the agricultural practices to others.

After the training, the project office will facilitate the extension activities of the CBEAs in the respective communities. In this connection, the regional authorities and District Assemblies will be engaged to play appropriate roles in the facilitation process. The District Assemblies will be sensitized to have ownership of the project in order that at the end of the project life, they can continue with the CBEA model to improve agricultural practices in the districts.

2.2.2.7. Institutional framework and Sustainability

The coordinating point of the project will be in the DAES of MOFA. Being a national project, the project activities will extend into districts in all the ten regions of Ghana. It means that the regional and district offices of MOFA based in the Regional Administration and Municipal/ District Assemblies have important roles to play. They make key inputs in the selection of the communities and in the training of the CBEAs. The agricultural extension officers at the regional and district levels will be trained for their roles in training the CBEAs. The project linkages will therefore descend from the national office down to the communities in the districts and laterally at the regional and district levels linking the respective districts in the programme. In each of the communities, there will be committees set up for the implementation of the CBEA model in the community, promoting awareness of the model, contributing to the monitoring and evaluation, among other things.

On the issue of sustainability, it is important to note that the DAES of MOFA already has a mandate in ensuring that agricultural extension services are optimally provided to enhance agricultural production in the country. DAES will mainstream the CBEA activities in its programmes. The national budgetary allocations, when mainstreamed will support the project activities beyond the project lifespan.

2.2.2.8. Timelines

ACTIVITY	YEAR																			
	1				2				3				4				5			
			M1*				M2			M3		M4						M5		M6
i. Setting up of the Project Office (recruitment of 4 staff and purchasing logistical facilities)																				
ii. Capacity building at all levels ï DAES, regional and district agricultural extension officers and others																				
iii. Sensitization, awareness creation, monitoring and coordination.																				
iv. Training of the selected CBEA (average 10 CBEA per community)																				
v. Training of farmers in respective communities by CBEA																				
vi. Research and development																				

*** Milestones (M1 = Milestone 1, etc)**

M1 - Project Office set up at the DAES of MOFA ï staff recruited and logistics for the project procured.

M2 - Capacity building at all levels completed ï DAES/ MOFA, regional and district levels

M3 - Training of agricultural extension officers completed

M4 - Training of various agricultural producers as CBEAs completed.

M5 - Training of agricultural producers in the respective communities completed;

Research and development done leading to some agricultural innovations.

M6 - Overall project activities completed

2.2.2.9. Budget and resources requirement

Activity	*Period*	*Cost (USD)*	*Source of Funding*
- Setting up of the Project Office (recruitment of 4 staff and purchasing logistical facilities)	2013 ï 2014	Staffing costs for 5yrs; purchase of vehicles, motorbikes and bicycles; computers and office equipment; Average annual budget of 1,000,000. Total ï 5,000,000	Mainly climate change adaptation funding sources e.g. Adaptation Fund, Strategic Climate Fund and Nordic Development Fund; development partners e.g. DANIDA; Government of Ghana
- Capacity building at all levels ï DAES, regional and district extension officers and others	2013 ï 2014	Annual budget of 250,000 2 yrs. Total ï 500.000	
- Sensitization, awareness creation, monitoring and coordination.	2013 ï 2017	Annual budget of 200,000 for 5 yrs. Total ï 1,000,000	
- Training of the selected CBEA (average 10 CBEA per community)	2013 ï 2014	Average cost of 1,000 per CBEA for 5,000 all districts Total ï 5,000,000	
- Training of farmers in respective communities	2013 ï 2016	Annual budget of 200,000 for 5 yrs. Total ï 1,000,000	
- Research and development support	2013 - 2017	R&D annual budget of 100,000 for 5 yrs. Total ï 500,000	
Total		**$13,000,000**	

2.2.2.10. Risks and their mitigation

It is assumed that receptive communities to the concept of the CBEA model will be identified. More importantly, there will be willing community members to train. Even though the training will be done in short-term modalities such as one-week workshops, farmers may

decide that it is not worth their while to participate. Besides, the trained CBEAs should be ready to share their enhanced knowledge with others to ensure the success of the project.

2.2.2.11. Monitoring and Evaluation

The project office in DAES would perform the M&E functions. Monitoring will demand the formulation of benchmarks and indicators such as the number of CBEA trained, the farmers engaged in the community extension programme, the on-farm yields, the income levels of the farmers involved, etc.

2.2.2.12. Stakeholder mapping

The DAES of MOFA has the primary responsibility for ensuring the success of the project. It will coordinate the project activities and have oversight responsibility for project implementation.

The District Assemblies will have responsibility for or contribute to identifying the communities for selecting the CBEAs. Agricultural extension officers in the regions and districts will be selected for the training on the model with liaison with the regional and district authorities.

The CBEAs being drawn from the 500 communities will apply the new knowledge and innovations on their respective farms and commit to a programme to extend to the others.

2.2.2.13. Summary sheet for Community Based Extension Agents (CBEA)

Name of Project Idea	Community Based Extension Agents (CBEA)
Project overview	The project is to implement the CBEA model in Ghana nationwide, training community-based extension agents for transfer of knowledge and innovation into agricultural practices such as crop and livestock farming and fishing.
Objectives	The CBEA model is broadly aimed at enhancing agricultural extension services in crop farming, livestock rearing, fishing and other agricultural practices; and promoting environmental sustainability and community resilience to climate change impact. The specific project objectives are to identify community agents to train in extension services to train others in their respective communities.
Targets / Beneficiaries	Crop and livestock farmers, fisher folks and other agricultural producers in rural communities
Relationship to the country's sustainable development priorities	Extension services constitute a high priority for the nation with the current strategies being the decentralization of the services to the districts. It is emphasized in the FASDEP.
Project Deliverables	500 rural communities participating in the CBEA project; 5,000 CBEA trained in their respective agricultural practices and providing extension services to other farmers in their communities; Farmers in the project communities benefiting from the community based extension services; Publications on the CBEA project.
Project Scope	Project aimed at all the regions of Ghana
Project activities	Selection of 500 communities in all the 10 regions of Ghana to participate in the project; Identification and selection of CBEAs to be trained for the various communities; Training of agricultural extension officers in the regions and respective districts; Training of CBEAs for the communities; Facilitating the extension service provision of the CBEAs in their communities; Setting up of project office for co-ordination, monitoring and evaluation at all levels ï community, district, regional and national; R&D to support the extension services.
Duration	5 years
Timelines	Yr.1 - Project Office set up at the DAES of MOFA; staff recruited and logistics for the project procured; Yr.2 - Capacity building at all levels completed ï DAES/ MOFA, regional and district levels Yr.3 - Training of agricultural extension officers completed; training of various agricultural producers as CBEAs completed; Yr. 4 - Training of agricultural producers in the respective

	communities completed; R&D done leading to some agricultural innovations. Yr.5 - Overall project activities completed.
Budget	US$ 13 million
Proposed funding sources	Development partners and Government of Ghana
Monitoring/Evaluation	Monitoring and evaluation to be performed along the activity chains.
Possible complications/challenges	The commitment and interest of the community agents wane overtime; funds for implementing the project are no more available; the agricultural producers e.g. farmers and fisher folks no more cooperating; government policies and priorities change to the detriment of extension services.
Assumptions	Agricultural producers in the communities showing cooperation with the CBEAs and project implementation parties; collaboration among the project partners. Expected funding resources made available.
Responsibilities	MOFA (DAES) ï Project co-ordination, monitoring and evaluation; District Assemblies ï Oversee implementation of the project in communities; Research and development ï Research team from research institutes and universities Beneficiary Communities ï Provision of extension services to targeted agricultural producers e.g. farmers and fisher folks.
Sustainability	Agricultural producers in the communities benefiting from the extension services from their peers; an equilibrium between supply and demand of extension services created in the communities.

3. Conclusion

The project ideas presented in this report are feasible and critical to the diffusion of the four technologies selected in the water and agriculture sectors. All are community based requiring extensive involvement of government and development partners. The willingness is to not only provide the hardware that would make water available and accessible to vulnerable communities but also the orgware that would empower them to use and manage their water and land resources in a sustainable manner. The emphasis on the community empowerment through capacity building is well placed as studies and observations have shown that the collapse of numerous land and water resources development projects have been largely due to the limited technical, organisational and financial management capacities of the beneficiary communities and their limited involvement in the planning, design, creation, management and maintenance of their natural resources systems. The project ideas presented here seek to fill some of these gaps.

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