CGIAR Challenge Program on
WATER & FOOD

Submission Document – Nile Project 4

On assessing and anticipating consequences of innovation

Basin Development Challenges of the CPWF

To improve rural livelihoods and their resilience through a landscape approach to rainwater management

March 2010

1. Basin Development Challenge:

Nile: *To improve rural livelihoods and their resilience through a landscape approach to rainwater management*[i]

2. Project:

Nile Project 4: *On assessing and anticipating consequences of innovation*

3. Project Data

Duration: 4 years
Target start date: January 01, 2010
Finish date: December 31, 2013
Maximum budget requested from CPWF: 1Million USD
Any matching funds offered (provide brief explanation): 500,000 USD mainly from 2 projects related to Agricultural Water Management (AWM) Solutions funded by Bill and Melinda Gates Foundation (BMGF) and Re-thinking Storage for Climate Change Adaptation in Sub-Saharan Africa (SSA), funded by German Development Cooperation (GTZ). Matching funds will only be provided through ongoing and planned activities of these projects. Furthermore, IWMI Nile Basin and East Africa Office and ILRI principal campus are based in Addis Ababa, where this project is to be hosted.

4. Project Deliverables

- Information on the likely cross-scale consequences for water flow, siltation, livelihoods, risk and other factors if improved RMS were to be adopted over large areas of the Ethiopian highlands
- An analysis of the best land use systems for different parts of the basin, in terms of water productivity, livelihoods and economic benefits (with project 3)
- An analysis of water productivity savings that would result if recommended RMS were adopted across the Nile basin
- *Innovation capacity building for universities, local and regional actors (added)*

Note also that we have rearranged the order of output in section 10 to much the same flow of the deliverables as in above

5. BDC Goals to which the Project will contribute

If this Development Challenge is successfully met, innovative RWM systems will have been developed and implemented at landscape scales across agroecosystems in the Ethiopian Highlands. These will address the exploitation of rainwater across landscapes, and appropriate rainwater harvesting technologies will be deployed, maintained and monitored. These technologies will have been identified, and matched to local rainfall conditions, soil types and topography. At research sites, associated small-scale irrigation techniques that allow farmers to draw on their rainwater to irrigate crops during the dry season will have

been identified and implemented. The management system will enable farmers to exploit rainwater for multiple uses, including livestock, to complement crop-based incomes. Overall landscape water productivity will improve, and soil damage minimized. Policy and administrative changes as a result of project findings, which yield greater focus on RWM in the Nile River Basin, in part through the Nile Basin Initiative, will have occurred. In low rainfall areas, economically useful trees, for commercial, food or fodder purposes, will have been identified and adopted. The RWM system will be have been developed with local (formal and communal) institutions, which will in turn work to implement and maintain it. The success of the management system, and the clear impact that will have resulted, will prompt its uptake by government and development agencies leading to the widespread implementation of the system across the Nile River Basin.

6. Links with other projects in the Basin Development Challenge[ii]:

The project will need to work with other projects in the BDC to contribute to a coherent research program that is lead by a Basin Leader.

7. Project Summary

This project is about showing whether RMSs are effective. It will seek to quantify the consequences of improved RMS for community livelihoods, resource productivity, land quality, and downstream water quality and siltation. It will specifically measure the downstream, cross-scale consequences of successful innovation in the Ethiopian highlands. To what extent are Sudan and Egypt affected by improved RMS in Ethiopia?

This project will develop methods to anticipate ex ante the likely consequences of introducing improved RMS as well as monitoring and measuring these consequences ex post. Finally, it will introduce methods for adaptive management, so that RMS can continue to benefit from lessons already learned.

Assessing and anticipating the consequences of improved RMS will cover a range of variables, among them water allocation, land and water use practices, community infrastructure, water productivity, farm income, livelihoods resilience and ecosystem services.

8. Links to previous and ongoing work

8.1 Previous and on-going work

IWMI with local partners and other CGIAR centers has implemented projects such as CP19, CP59, CP36 and CP37. The experience and foundations provided (knowledge, innovations, strong partnerships, cross disciplinary engagements and capacity building) create conducive

conditions for effective implementation of the new project. The CP59 for example highlighted the fact that there are opportunities to better manage water for agriculture, thereby improving productivity, food security, and livelihoods; and significant gains can be made through improved water management in rainfed systems (Molden et al.,2009).

IWM's current projects include: i)'Rethinking Water Storage for Climate Change Adaptation', on assessing a variety of storage options for AWM as a way of adapting to climate change; ii)'Improving Water Productivity of Crop-Livestock Systems' on developing and promoting options for enhancing water productivity based on improved livestock management; iii)'AWM Landscape Analysis', on providing investors, policymakers and implementers with concrete knowledge and tools to facilitate decision making to ensure AWM benefits the greatest number of poor women and men at the least social and environmental cost iv)'Groundwater Management for Food Security and Livelihoods' on strategy of groundwater use in SSA; These projects, as well as the other CPWF projects will provide synergy with this one.

ILRI's experience in CPWF Phase 1, the Comprehensive Assessment of Water Management in Agriculture, and the Investment Study on Agricultural Water for Poverty Reduction and Economic Growth in SSA confirmed the importance of livestock-water interactions in irrigated, rainfed, mixed crop-livestock, and pastoral systems in Africa, particularly in the Nile Basin.

NBI and Eastern Nile Technical Regional Organization (ENTRO) are also working on various synergetic projects. Efficient Water Use for Agriculture; Eastern Nile Watershed Management Project(ENWSM), Joint Multipurpose Projects, and the Nile Decision Support System are a few examples. For details see www.nilebasin.org and http://ensap.nilebasin.org/

Government, donors and NGOs are also implementing various projects in Ethiopian Highlands. Examples: Sustainable Land Management program is a multi-sectoral, multi-stakeholder and multi-donor financed program brings communities, government, donors and private sectors on common platform; sustainable water harvesting and institutional strengthening project in Amhara (SWHISA) supported by CIDA, sustainable utilization of natural resources supported by GTZ.

Our project will create strong synergies with these, enhancing identification, implementation and evaluation of consequences and impacts of these interventions in the Ethiopian highlands and downstream, and support informed decision and choices for out scaling of best practices by various actors.

8.2 Lessons learned

Most people in the Nile basin depend on agriculture for their livelihoods, and agriculture plays an important role in the economies of all countries. In spite of its importance for poverty alleviation, water for agriculture and its potential, is not well understood (Molden et al.,2009). While there is much focus by governments on the scarce river water resource, other opportunities can be found when rainfall is considered as the main water resource in

the Nile (ibid). Over 14 million people live in the uplands of the Blue Nile and about two-thirds of the area the basin fall in the highlands receiving rainfall of up to 2,200 mm/yr. However, rainfall, runoff and sediment are erratic, with dry spells significantly reducing crop yields or total crop failure (Awulachew et a.,2008).

Improved water management can be an important part of increasing land and labour productivity, producing more food at a lower cost, generating employment and, fostering equitable economic growth (Harrington et a., 2009). In the Ethiopian highlands, the level of agricultural productivity per unit of resources (land/water), labour and capital is very low. Use of agricultural water management interventions can significantly reduce poverty(Hagos et al.2009). Water risks such as droughts and short term dry spells, and lack of capacity to deal with them, add to the vulnerability of rural poor in the region, and interventions to address these risks will build resilience (Molden et al, 2009)

Anderson and Burton (2009) identified best practices based on a two pronged approach involving upgrading rainfed agriculture through enhancement in land quality, drought management; and support for water harvesting with a long term commitment to ensure proper construction, utilization and management of appropriate infrastructure.

Models such as the widely used Soil and Water Assessment Tool(SWAT) developed for US conditions has been modified to suit conditions in the Ethiopian Highlands (White et al., 2008; Steenhuis et al, 2009). Other models have been configured to simulate the water resource impacts of current and planned large scale water resource development in the basin (Awulachew et al. 2008, McCartney et al. 2009). Related studies have also highlighted the difficult decisions (related to equity) that need to be made when developing water resources and the importance of incorporating all stakeholders (including local people) in decision-making processes. Knowledge from CP59 and CP19 reported in Awulachew et al. (2009) & Molden et al.(2009) provide a good basis on which to build methods and tools for identifying intervention options, drivers of change and analyzing consequences of innovations.

9. Research questions

Research questions include:

- How can the consequences of improved RMS be anticipated (ex-ante) and measured (ex-post)? What methods are appropriate under different circumstances?
- How can the contribution of improved RMS be assessed relative to the contributions of other factors?
- How can research on RMS performance be used to further improve RMS design? (Adaptive management)

How will your research address these research questions? What other research questions should be added?

In addressing the research questions and the basin development challenge, as a first step project implementers and stakeholders will be brought together (especially next users of the

results) to develop the project impact pathways and develop a common understanding of the project.

Consequences of improved RMS will be anticipated (ex-ante) based on theoretical frameworks; experience of other countries and measured (ex-post) employing approaches that include modeling, with and with out intervention, before and after intervention scenarios, analysis of on-site and offsite impacts, upstream and downstream interactions, current and future scenarios etc. Parameters and problems related to productivity, poverty, degradation-regeneration, socio-economic gains, policies and institutions including incentive systems, actors and knowledge flows, access to markets and livelihoods will be investigated. Obviously, these parameters are inter-linked and related to a range of intrinsic factors. Consequently, attributing changes to the impact of RMS is a big challenge. These complex problems will be addressed through multi-disciplinary research using a broad range of tools and approaches in a way that enables disaggregation of impacts and integration of study findings and learning by doing. For example, in the CPWF phase 1 projects (CP59 and CP19), we have used the model AquaCrop to study specific impact of water availability to crops and the implications for productivity considering or ignoring presence of fertilizers or seeds. We have also looked at the impact of various uses of grass strips as a soil and water conservation measure and its impact on soil loss. Similarly, we have established methods to evaluate the impacts on poverty and implications for food security of various types of small scale water management technologies such as water harvesting ponds, shallow wells, etc. In this project we will extend the same approaches at an ex-ante level to anticipate likely impacts, and with support of N2, measure the impact of adoption of these and other RMS to produce evidence and establish ex-post resuls. Finally, we will extrapolate the consequences to the basin scale through modeling.

The findings of CP37 reveal that poverty is a cause, as well as a consequence, of low WP. Farmers need to have access to a minimum level of resources in order to invest in WP enhancing strategies, such as water harvesting. The impact of improved rain water management on production, poverty and livelihood will be determined through farm level analysis and consideration of schemes with and without interventions. Poverty and gender implications will be determined using well tested survey and participatory techniques that facilitate both quantitative and qualitative analyses. This farm level analysis will be supported by institutional analysis, actor and knowledge flow analysis, as well as analysis of incentive systems and how access to markets influences the adoption of RMS. These analyses are to be covered in N2. Basin level consequences related to productivity and livelihood, poverty, will be evaluated by extending the farming system analysis of N2 in combination with targeting analysis of N3 as well as the modeling experience of previous work of CP59, CP19. In addition new modeling tools will be used to evaluate the likely biophysical and socio-economic implications of scaling-up interventions. . The use of such tools and models will be enable the regional and transnational implications to be assessed. .

The consequences of RMS for water availability, access and allocation as well as upstream downstream relationships will be investigated using tools and models such as Water Evaluation and Planning (WEAP), SWAT, CropWAT and Multi-Criteria-Analysis (MCA) tools. WEAP and SWAT models are already configured to address large scale interventions and these can be modified to include the aggregated impact of small scale interventions. The

influence of diversity in trans-boundary and upstream-downstream institutional frameworks, gender and policy environments will be assessed and used to anticipate various scenarios and the necessary changes. This will inform assessment of the feasibility of new thinking such as Payment for Environmental Services (PES) and equity in Benefit Sharing.

Particular emphasis will be given to evaluate what additional water will be used or saved under various RMS interventions. We will base this evaluation on insights gained into the decomposition of the rainfall in to rainfall-runoff components; green and blue water; water application and drainage. Of particular interest, the new innovation identified in CP19 project in relation to drainage of vertisols for water saving will be further investigated in the analysis of water allocation, water saving, improving rain fed productivity and enabling supplementary irrigation as linked to basin water resources. We will utilize data of existing experimental sites, in conjunction with that obtained from the action research sites established in N2, to assess results of adaptive trials at basin scales. The results we develop and communicate will help to improve the performance of RMS interventions and identify the best options under different biophysical/socio-economic conditions in the transnational contexts.

The consequences of soil erosion and siltation and benefits of interventions will be evaluated using erosion risk mapping and modified SWAT modeling. The downstream offsite impacts, both within watershed and across international boundaries, will be evaluated using ex-ante methods and scenario modeling. Models will be validated using past measured data and information. For this we will extend the methods and tools developed under the Watershed Management component of the CP19 project. For example, we have already developed a nested approach for understanding erosion processes, sediment yield, sediment transport and siltation across a range of scales from local to basin scale, and the impact of interventions in affecting sediment dynamics. Through economic and institutional/policy analyses we will improve understanding of the economics of degradation & conservation and the influence of institutional and policy factors.

In addition to the research questions given above we will also address key issues related to rainfall variability and its likely aggravation as a consequence of climate change in the basin, impacts of RWH systems on groundwater recharge, possible consequences for RMS (e.g. related to decision-making processes and planning RMS interventions) will be deduced. Where, it is relevant, this project will address the issues with N2, N3 and in collaboration with other projects described in section 8 such as re-thinking storage for climate change adoption.

10. Research Outputs, Methods and Uptake Pathways

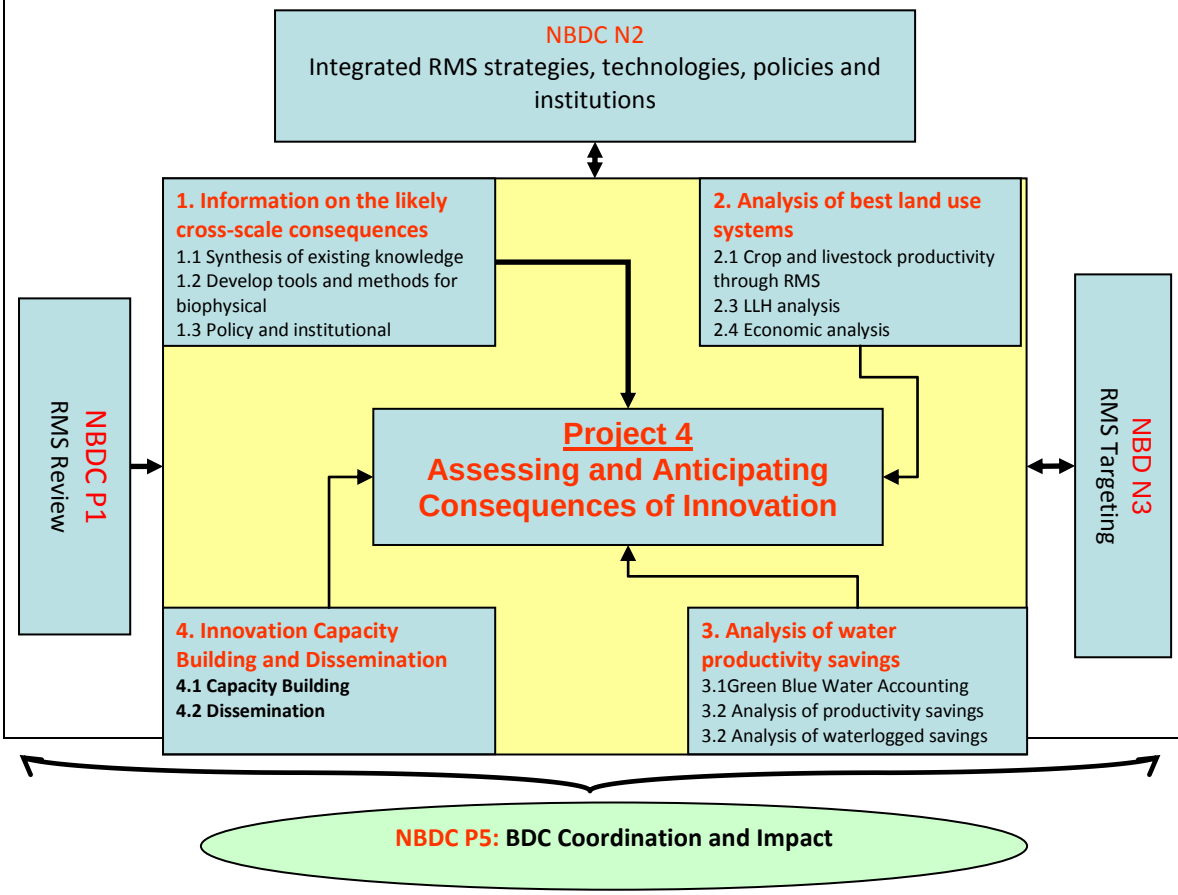
10.1 Project research outputs

- Information on the likely cross-scale consequences for water flow, siltation, livelihoods, risk and other factors if improved RMS were to be adopted over large areas of the Ethiopian highlands

- An analysis of the best land use systems for different parts of the basin, in terms of water productivity, livelihoods and economic benefits (with project 3)
- An analysis of water productivity savings that would result if recommended RMS were adopted across the Nile basin

What additional research outputs should the project produce, if any? What does the output(s) add to the BDC?

Innovation Capacity Building and Dissemination: The project will aim to improve innovation capacity (ability to harness knowledge to respond to emerging opportunities and challenges), so that the innovation is continuous. This will include skill building of local actors including young researchers through training to access and utilize relevant knowledge and employ the models and tools that will be developed . The additional output helps to streamline resources to the capacity building effort, develop critical masses that will use the tools and methods in the region, and obtain motivated researchers who can tackle broad range of issues. The following figure shows project 4 outputs and interlinking with other N-BDC projects. Major linkage with other NBDC project is provided in the Figure of section 14.



10.2 Project partners

The project team comprises a number of national and international research and development actors, bringing a broad range of relevant skills to the project.

Output 1: Led by IWMI and ENTRO with contributions of ILRI, SEI and others including Cornell University, WorldFish and NARES.

Output 2: Led by ILRI and IWMI, implemented with contributions of others from Regional Agricultural Research Institutes (ARARI/ORARI) and Ethiopian Rain Water harvesting Associations (ERHA). Particularly, N3 and N4 will work together to develop common database, GIS and information systems

Output 3: Led by IWMI with contributions of NBI-ENTRO, SEI and NARES. N4 establishes strong linkage to NBI-ENTRO ENWSM and N2

Output 4: IWMI coordinates NARES, universities for engaging actors and students and their supervisors. NBI-ENTRO engages Ethiopian, Sudan & Egypt ministries and Sub-basin and Basin level institutions for policy level dissemination. SEI provides training on modeling. The project partners with IMAWESA-II for broader regional dissemination in SSA. Further engagement of local radio, regional and global media can be identified and engaged for broader dissemination

10.3 Next users

Output 1: Information on the likely cross-scale consequences will be useful for land use-, agricultural development-, water resources- and environmental-planners, designers and managers working at local, national and cross-national levels. Governments (federal, regional and local) for adjusting their policies and development strategies. Basin institutions (e.g NBI and the planned River Basin Authorities (RBA) in Ethiopia) will benefit from the tools and methods emerging from the project, which would assist them in facilitating decision making and effective planning.

Output 2: Governments (federal and regional) will learn consequences of various land use systems on productivity, livelihood and economic benefits. They will be able to look at various policies and strategy options to use the best scenario. Donors (e.g. GTZ, DFID, CIDA, AGRA, BMGF etc.) will know where and on what to invest for high impact. NGOs working in the regions (e.g. ORDA, SWHISA, WFP, CARE, etc) and extension agents will be able to utilize the knowledge to work with the communities in a more effective manner. Basin Institutions (e.g. NBI, ENTRO) will be able to use the knowledge to improve investment planning that affects productivity and livelihoods of the broader communities both upstream and downstream.

Output 3: Basin and sub-basin authorities and countries will have a better understanding of the role of rainfall in water resources. This will contribute to conflict avoidance and enable better water allocation and improved collaboration in relation to water resource management. Regional institutions such as ASARECA, FAO, IFAD and AGRA will know which intervention result in water productivity savings and will utilize the information for out-scaling.

Output 4: Local, national and transboundary actors, universities and research institutions will link research to fundamental problems of the basin and align research more towards problem solving. They will learn new tools and methods for research and education. Scientific communities will benefit from the knowledge generated and disseminated. Local

and regional media, global scientific forums could access broader issues related to Nile waters, with thinking extending beyond blue to green water. .

10.4 Learning required by next users

Output 1: Governments and planners need to learn new tools and accordingly modify planning and decision-making processes to best incorporate the findings. They will utilize effective tools and methods such as scenario analysis, MCA, etc to identify priority interventions in their respective organizations. NBI and RBA will adopt the findings in their policy, institutional reform and strategies and will learn the benefit of strategies beyond their traditional boundaries.

Output 2: Attitudinal and behavioral change is required at all levels of governments, basin authorities and planners in order to promote and adopt appropriate decision-making processes that result in effective and suitable RMS and the best interventions through objective based decision and adaptive management instead of blanket recommendations. Donors and governments should use the results to identify high impact interventions for their investments. NGOs should learn to adopt high impact intervention beyond their own agenda

Output 3: Communities will learn the implication of their resource use such as water, beyond their individual farms. They will establish rules and guidelines to uptake recommendation of best practices, improve their collective actions in managing land, water and agricultural enterprises for best outcomes of theirs and other users. Governments and institutions should learn the importance of improved practice and management will provide a win-win opportunity beyond their political and legal boundaries. NBI will learn significant water savings strategies and gaining of 'new water" are possible and has positive consequences in allocation of scarce water.

Output 4: Local and regional actors, universities will effectively utilize available opportunities in capacity building from the project. They will be able to generate applied research outputs linking to development. They will link university education to fundamental problems of the country and the region and become proactive in transboundary dialogues and research oriented teaching. Policy makers will appreciate the policy implication of the synthesized knowledge and adjust policies and strategies as required. Media will provide sufficient air time to innovation and development issues.

10.5 Research methods

Output 1: A large amount of information is expected to be available through projects mentioned in section 8. N4 partners with N1 to extract relevant information and lessons of this past work. N4 will primarily build on the work CP19 and CP59 projects, which have already used models such as SWAT, WEAP, MikeBasin, etc. Building on these, models and tools that enable analyses of likely consequences of planned interventions (ex-ante) will be established. The same tools will be used using actual data (ex-post) in the subsequent outputs 2 and 3. This output is important to address the first research question in section 9. Specifically, the following tools and methods will be used:

1.1 Synthesis of existing knowledge: with N1, review literature that relates to the basin, to the concept of RMS, consequences and synthesize to produce comprehensive lessons and references.

1.2 Tools and methods for assessing the biophysical impacts of interventions: Models such as WEAP, Modified SWAT, AquaCrop, etc have been used in the Blue Nile and Nile for CP19 and CP59 respectively. These will be modified to enable evaluation of the impacts of RMS interventions. Examples: WEAP model will be extended and used to look at water harvesting implication on water availability. Erosion risks and consequences for sedimentation will be studied using the modified SWAT on ex-ante level. The same set up of models will be calibrated and validated using actual data measured at existing (ENTRO- ENWSM project) and other new sites (see 10.8). Models will be utilized for scenario analyses. We will use participatory scenario development with stakeholders and N2 to analyze implications from the landscape to basin level..

1.3 Policy and institutional consequences: The Policy Systems Analysis and Mediation (PSAM) tool will be employed to provide insights into sources of agreement or disagreement regarding transboundary policy systems. This analytical tool will enable key institutional issues to be identified, areas of alignment and misalignment will be highlighted and opportunities for change identified. Strategies for change requiring collective action will be identified. This process will employ a modified version of the Rapid Analysis of Agricultural Knowledge Systems (RAAKS) method. This will involve a workshop, interviews, case studies, qualitative data analysis and quantitative questionnaire.

Output 2:

In this output, in collaboration with N3, available RWM interventions by production systems, agro-ecology, topography, soil etc will be inventorized and a GIS platform established. In collaboration with N2, land use systems that could match improved gains in productivity considering various agricultural enterprises (crop, livestock and trees) and improved rain management interventions including their alternatives and related consequences will be analyzed. Results will be aggregated to understand the various spatial scales, but N4 focuses on offsite impacts, transboundary and upstream-downstream dimensions. Specifically, the following sub-outputs are considered

2.1 Productivity: We will analyze the crop and livestock water productivity considering with and without intervention scenarios. A water productivity modeling framework according to Molden et al (2003) and Peden et al (2009) will be used at landscape for N2 and basin levels in N4. AquaCrop, for example, will be used to understand specific productivity gains due to interventions. Combinations of models will be used to extend implications from the t farm level to evaluate the aggregated consequences at the basin level.

2.2 Livelihoods: To determine livelihood gains, impacts of interventions on household food security, productivity gains, gender equity and poverty impacts are useful. The local level results and principle will be extrapolated in N4 to understand the basin wide livelihood impacts of interventions.

2.3 The economic benefit component, particularly focusing on transnational context, will be studied using extrapolation of micro and macro economic modeling, GDP and GINI coefficient analysis taking basin wide parameters and local understandings gained from N2.

These sub-outputs help us to address second research question of section 9

Output 3:
Water productivity analysis of output 2, combined with partitioning of rainfall to its components and understanding the impact of the priority interventions at basin level will provide the conceptual approach. Furthermore, through developing indicators guidance for decisions making will be developed to assist investment prioritizations. The following are sub-outputs

3.1 Green-blue water Accounting: SEI's green-blue water concept, which enables accounting of the full green and blue water resource, will be used. We will combine the concept with the models and tools identified in output 1 and 2, to separate and quantify the components at different locations in the basin.

3.2. *Analysis of productivity savings: Crop and livestock water productivity savings resulting from different interventions across a range of scales will be deduced. Combinations of interventions will be analyzed and scenarios developed. These will be used to assess downstream, cumulative and cross-scale effects and tradeoffs of interventions.*

3.3 Water Logged Productivity and Runoff Gains: Not only water application, but also productivity and runoff gains from drainage need to be considered. Water balance modelling and similar approaches to those described for output 3.1 will be employed to assess the gains in water and consequences for downstream hydrology.

3.4 Provide biophysical, ecological and socio-economic indicators for improved investment planning: This sub-output is focusing on investment guide through summarizing indicators for prioritization and identifying key enablers for sustaining such interventions at basin level. The sub-output is mainly synthesizing the results of outputs 1 to 3.

Output 4:
4.1 Capacity Building: Skill and knowledge gaps of local and meso-level actors will be identified through rapid assessment, and the identified actors will be engaged in skill building activities and training of various tools and models. At the start of the project, with partners from the universities, synopses of short projects that can be addressed by students at M.Sc. thesis levels will be prepared. These will be advertised and students will develop proposals. The various tools and models adapted or used by project will be set in the partner universities as a learning tools
4.2 Dissemination: various dissemination mechanisms, including specific workshop, publication products, and communication tools are planned as discussed in section 12 below.

10.6 Participatory research approaches

This project is based on participatory research that engages wide stakeholder involving planners, policy makers, decision makers, politicians, investors, researchers, students etc at various stages. The approach to be followed proceeds through a series of steps, in which researchers and primary stakeholders start with the identification of major issues, concerns and problems, understand the research project and establish ownership; and co-originate/co-investigate the research problem; co-develop and mutually learn the outcomes

and anticipated/real impacts of proposed interventions. In order to understand the various steps and ascertain participatory approaches to our research we will develop project impact pathways, establish an M&E of our work, including process monitoring. Information from M&E can help us manage our activities, improve the chances of developmental impact and provide insight to researchers and others on what is working and what not.

The mechanisms for effective stakeholders' involvement in dissemination will be founded with P5 on the creation of a stakeholders forum, workshops, seminars, training, web-site and media. Joint planning, co-development and increased knowledge on current water and land use practices and learning/understanding their consequences will be the basis for participatory approach. Research capacity through deliberate engagement of graduate students and their supervisors in our research and publication will enhance participation. Policy synthesis and recommendations through engaging our key stakeholders and building on our experience of the AWM steering committee in Ethiopia will be one of the mechanisms to engage stakeholders in policy dialogue. At transboundary level, existing platforms and mechanisms through NBI will be used to continuously inform the broader Nile community and beyond.

10.7 Change in user practice

Output 1: Information on the likely cross-scale consequences will provide ample evidence for decision makers and assist them to engage in identifying win-win solutions. Users often use the tools to understand the consequences of scenarios. Through using the research outputs, governments (local, regional, and federal) will have access to improved understanding of consequences will be able to make informed decision thus facilitating the design of appropriate policies and strategies. Farmers and communities in upstream will reduce livelihood risks associated with rainfall variability, poor water management practices that are not sustainable basin wide. Downstream communities will support endeavors and appreciate the benefit of improving upstream landscape and environment for improved water quality and water security with the possibility adopting new innovations such as PES and benefit sharing.

Output 2: End users, particularly farmers and communities supported by Das through the planners will ultimately adopt interventions and experiment with interventions that are currently beyond their traditional comfort zones. Communities will strengthen their negotiating power; enhance their bylaws, traditional rules and customs to facilitate the implementation of innovations; they will strengthen collective actions that improve management of communal resources such as water, land, forest, infrastructure and the overall environment with less negative consequences to others. Policy makers will create policy, strategies and interventions based on consultation and informed decision to avoid blanket recommendations. Donors will understand the needs and variations depending on agro-ecology, land use, farming system, traditional values and priorities of the end users and more effectively allocate their resources in large scale with due considerations of for the concern for upstream-downstream linkages.

Output 3: Governments (local, federal, trans-national), sectors (agriculture, water, environment, finance, etc), basin and sub-basin organizations will appreciate the fact that

significant economic, productivity, poverty reduction, equity and water saving gains can be achieved through appropriate RMS interventions. They will consider the importance of RMS in their intervention strategies and water resource analyses at basin scales. Communities will improve the management of common goods such as watersheds, water sources and environmentally sensitive and marginal areas. Communities and nations adopt practices that increase their land, water and labor productivity through engaging in second and third productions with consequences to national and transnational economic gains.

Output 4: Scientific communities will have increased access to knowledge and will actively be involved in adaptive research in RMS. Students working on their theses will focus on problem oriented research that will have direct application and use. Governments will have access and utilize extensive knowledge and practice to improve understanding of issues in rain fed managed agricultural systems at large scales.

10.8 Suggested sites

This project will work at two levels in the Blue Nile part of Ethiopian highlands (local and basin-wide). All fieldwork will be coordinated with the other BDC projects. The following provides a brief description of the two scales of analysis. ***1) Local scale -*** *Currently, N2 has identified 3 districts representing diverse agro-ecologies and variation in RWM challenges; and ENTRO-ENWSM and other previous projects have other complementary sites that can provide data for model calibrations. 2****)Basin scale -*** *the entire Ethiopian part of the Blue Nile Basin provides a basis for analyzing larger scale impacts arising from scaling-up intervention and provides a basis for consideration of cross-border and up stream-downstream issues. Key sites such as large lakes and reservoirs at Tana and Roseries will provide good data and learning sites to test the developed tools and understand the consequences at large scales. Overall, our sites at various steps will created a nested approach from micro watershed to trans-boundary levels to understand consequences.*

These are highlights of approaches, but final decision will be made during initial phase of the project and with adequate consultation/validation with stakeholders and other Nile BDC projects.

11. Activities and Implementation Plan

In the form of a ***Gantt chart****, constructed as an Excel spreadsheet, which is part of the project workbook.*

12. Communications and alignment with CPWF Culture

12.1 Communications

The project, along with other BDC projects in the Nile, is expected to contribute to the following communications products:

- A series of relationships established with decision makers and development agents in key institutions to ensure innovation up-take.
- A synthesis of what has been learned from past experience in developing and disseminating improved RMS.
- A series of innovatively-designed output products that communicate the findings of the project to a range of stakeholders with a diversity of competencies.
- Peer reviewed journal articles, books and book chapters, particularly in Nile-based journals and edited volumes, that describe what technologies might work best where; the likely impacts of technological adoption on hydrological flows for the basin as a whole; the methodologies applied to identify local institutional development and strengthening, in support of RMS; on the types and combinations of ground and water conservation strategies that need to be applied in order to maximise water productivity and livelihoods resilience; given rainfall variability across the basin, analyses of what land use works best where, in terms of livelihoods and water productivity potential.
- A report series providing guidelines on the likely benefits of these technologies in the Ethiopian Highlands and elsewhere in the basin; support to policy and administration by describing and analysing what rainwater harvesting technologies work best where; the identification of suitable, small-scale and local institutions to manage and maintain these technologies, and how these might be strengthened and/or improved.
- An open access website, hosted on the CPWF Nile web page, and contributed to by all partners of the project.

Briefly describe how your project will contribute to BDC communications plans

In collaboration with the other BDC project outcome logic model and impact pathway of the project will be developed involving stakeholders during the inception workshop. Our communication strategy will combine continuity with the existing partnership, communication channels and creating new ones. We will also develop mechanism of internal communication (among project implementers) and external communications with the users of the research results.

The communication strategies and mechanisms we have developed and proved that have been successful in past projects operating within the basin (and in particular projects CP 19 and CP 59) such as dissemination of results on NBI organized national and basin Nile forums, will continue. We will build further on the information and communication networks that already exist. The CPWF community of practice, partnership developed with NBI by the Nile Basin Focal Project, National Irrigation steering committee provide valuable networks which may be used to identify important partners and stakeholders, as well as to facilitate communication and dissemination of project outputs. Tools for both internal and external project communication and information sharing will be developed, including i) a central document repository, and ii) an open access, interactive website. The latter will include contributions from both CPWF partners and project stakeholders.

The project delivers a literature review based synthesis working paper and 4 research reports related to various outputs and will be with stakeholders. The project will disseminate scientific results through local journals such as Ethiopian Development Journal, Agricultural Water Management journal to publish journal articles. Together with the other NBDC projects we will deliver special issue of a journal on commonly selected outlet. With other

NBDC projects, it is envisaged to conduct annual and final workshops. N4 uses regional platform such as the Nile Basin Forum, where previous projects have been already participating to disseminate past scientific results of projects. This has been particularly useful to communicate results to broad Nile Basin wide communities. N4 will also communicate policy synthesis in an IWMI Policy Brief and Ethiopia: AWM Policy Brief Series which is already in use. The IWMI policy brief will also be utilized to synthesize and deliver key policy messages

We will also build on several innovative research dissemination techniques currently in use in other CGIAR projects, and collated and assessed through the IWMI-led CGIAR Knowledge Sharing in Research project; the IMAWESA-II network, which networks 23 countries and will be implemented by IWMI in the next 3 years, the AWM Landscape Solutions Network partners and the World Water Week all provide excellent opportunities for outward communications in Africa and globally

12.2 Evaluative culture

Briefly describe how you will support an evaluative culture in the project

With the Nile BDC coordination project and during the inception workshop, the project will develop its own monitoring and evaluation framework. It will develop impact pathways of the project and alignment of project with the other BDC projects in order to establish synergies, greater outcomes and impacts. In line with the proposed communication strategy, the project together with the coordination project will seek and identify coherent mechanisms for knowledge sharing, dissemination and uptake. N4 also seeks a possibility of co-publishing special issues of journals and special book with other projects.

On its own, the project also makes frequent self-reflection so that it achieves: the specific objectives of the project in generation, dissemination and use of knowledge; the common goals of the Nile BDC projects and the purposes of the implementing institutions and CPWF.

Furthermore, the project will form an integral part of the IWMI project portfolios, and hence will be part and parcel of other IWMI projects, subject to Quality Management System (QMS). It will have standardized procedures for documenting, reporting, monitoring and reviewing projects. It will use an IWMI financial management system that provides adequate management, control and mechanism of feedback for financial reflections.

The Project Leader is responsible for management, monitoring progresses, leadership in the execution of the project, producing progress and financial reports, submission and receiving timely feedback. This will ensure coherence and close monitoring of execution of the project, evaluation and adjustments as per needs.

12.3 Alignment with CPWF core values

The project has taken capacity building and dissemination as one of essential outputs. Sustainable and long term impact of the project will depend on the existence of the right capacity at a various levels including users, policy makers and innovators/researchers of RMS. We follow various paths for capacity building. Impact pathway analysis at the

inception phase will provide us the relevant identification of capacity building needs. We have set aside the necessary budget and mechanisms to engage the relevant institutions for capacity building during the implementation. During the CPWF phase 1 implementations, we have gathered good experience how to engage universities and students. Our engagement in capacity building with universities largely focuses on institutionalizing capacity to use methods and tools we are developing through engaging university professors in the research and co-supervision of students. Furthermore, through dissemination workshop, meetings and policy briefings at policy round tables, insights and knowledge will be transferred to build capacities.

The project also relies on interdisciplinary and diversity as its core value and mechanism of implementing the project. The research team is composed of researchers with a wide range of expertise form socio-economy including gender experts, agronomy, geospatial analyses, natural resources and enginnering backgrounds coming from local, regional and global institutions, which will provide unique combination of expertise and experience including engagements at local, national, basin wide and more. Through past and recently established networks, related to other projects currently, we can forge strong partnership, sharing and integration of experience.

Gender issues are part of the whole socio-economic environment in which agriculture and water management take place, and women in particular are at the heart of the issue in the Blue Nile. The impact and consequences of RMS disaggregated by gender will be given particular emphasis while undertaking impacts of RMS on poverty, equity and livelihood. Women are very low in number in tertiary education, especially at graduate level in the field of water and agriculture. Opportunities provided will target graduate women students to undertake their thesis in the project.

13. Assumptions and Risks

This project assumes that the NBI-ENTRO will continue to exist, strengthened and implement its projects on specific sites that are identified. Strong collaboration with on site implementing partners is expected. Failure due to for example non existence of NBI may disrupt the endeavors and interest of the donor supporting ENTRO sites. Alternative would be to use other similar sites. Furthermore, strong buy of results at the NBI level and continue to be the case in the potential "Nile Commission". Disruption in the developments may result in less application of the results, but not affecting the importance of the relevance of the results.

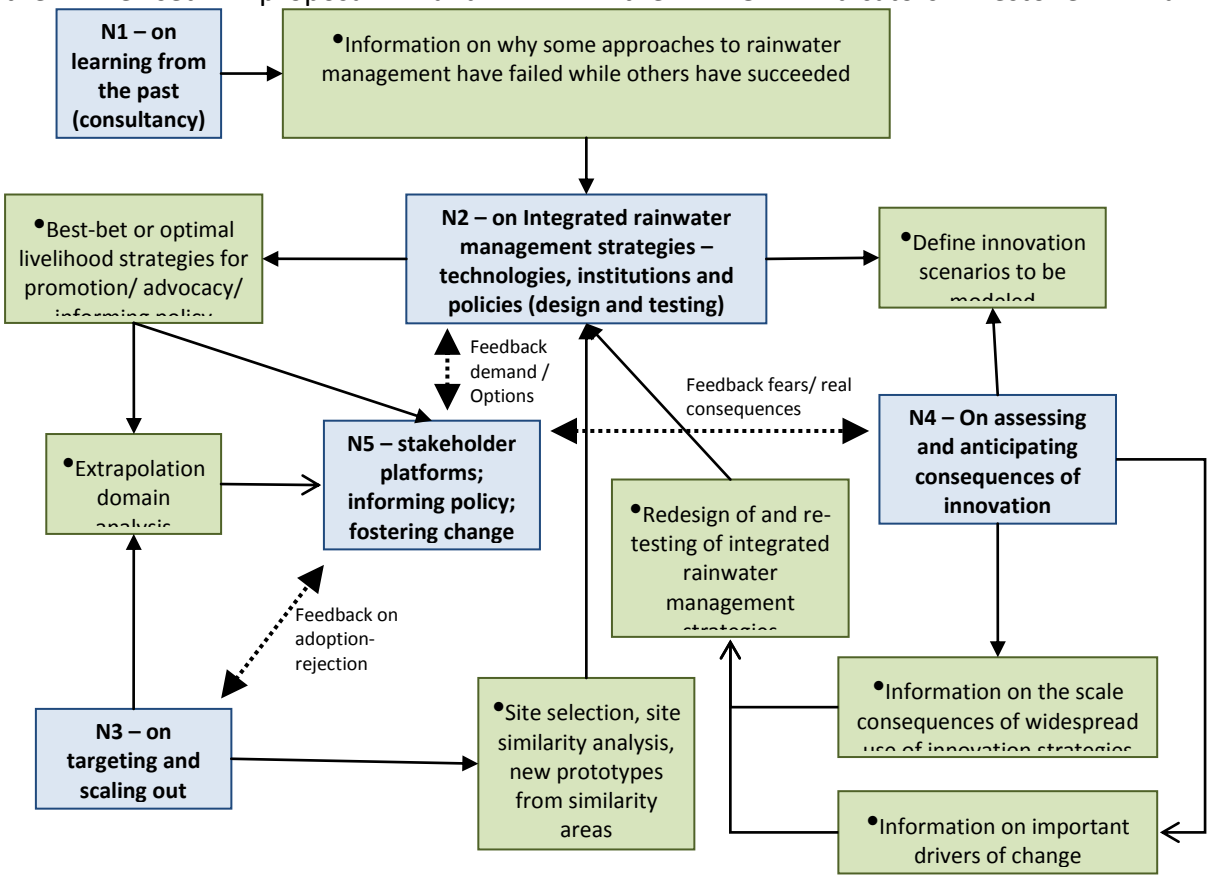
This project assumes that the Nile BDC Coordination and other projects start soon and interact effectively, share information, data and outputs. Thus, strong coordination of these projects is required in order to ascertain successful interactions. Particularly, synthesis of past work through P1 is essential at early stage of the project so that value addition and continuity on the past ascertained without repetition. In case project 1 does not deliver in time, it will still utilize the knowledge and experience of the project team and rely on its own synthesis.

RMS is a key priority area of interventions in Ethiopia to improve agriculture productivity. We assume that this will continue to be the focus areas in the next years to come. This focus will enable us to engage various stakeholders with great interest. Change of policy and strategies may disengage some of the partners.

It is expected that this project will provide useful tools, methods and innovations to be utilized by universities, students, donors implementing interventions in the Basin and elsewhere. In case such interest at local level may be at low level, the project will engage other institutions to provide their students, engage their staffs and researchers.

Any other comments to explain your project?

The project interaction plan is recently designed through the support of the CPWF to show the inter-linkages, and shown below. This will be adapted used as important higher level mechanism of interactions, but detailed and specific mechisims are designed and shown in the revised proposal and in the "OLM-Indicators-Milestone Plan"



14. Project Team[iii]

Names of team members	Professional discipline	Institutional affiliation and address	Area of expertise important to this project.	Brief description of research responsibilities with respect to the outputs and activities listed in the Gantt chart.	Commitments
Dr. Seleshi Bekele Awulachew	Water resources engineer/Hydrologist and Head of IWMI office	IWMI Nile Basin and East Africa Office C/O ILRI Campus-Ethiopia Bole Sub-City, P.O Box 5689 Addis Ababa, Ethiopia Tel. +251 (0)11 6463251	Hydrological and sediment modeling, intervention analyst, leadership, building partnership and capacity building	Overall leadership of the project. Contribute to outputs 1.1, 1.2, 2.1, 3.1, 3.2, 3.3., 3.4, 4.1, 4.2	Working on Re-thinking Storage for Climate Change Adaptation and AWM Solution projects, and Nile BDC P5 (proposed)
Dr. Mathew McCartney	Hydrology and Ecosystmes	IWMI Nile Basin and East Africa Office	Hydrological modeling, ecosystem analysis, environment	Contribute to outputs 1.1, 1.2, 3.1, 3.2	Leading Re-thinking Storage for Climate Change Adoption, NBDC N2 proposed
Dr. Fitsum Hagos	Development Economist	IWMI Nile Basin and East Africa Office	Hydro-economic and poverty modeling	Outputs 2.1, 2.3, 3.4	Work on AWM Solutions project
Dr. Everisto Mapedza	Social Science and Institutions	IWMI Nile Basin and East Africa Office	Institutional analysis and transboundary governance	Outputs 1.3, 2.2	BMZ LWP project
Dr. Solomon Seyoum	Hydrology and Climate Change	IWMI Nile Basin and East Africa Office	Rainfall variability, climate change, modeling	Outputs 1.2,3.1,4.1	Working on Re-thinking Storage for Climate Change Adaptation
Dr. Teklu Erkossa	Soil and Water conservation	IWMI Nile Basin and East Africa Office	Agronomist, irrigation, AquaCrop modeling and drainage of Vertisols	Outputs 1.1, 1.2, 3.2, 3.3	
Dr. Ranjitha Puskur	Agricultural Innovation Systems	ILRI PO Box 5689, Addis Ababa, Ethiopia	Policy and Institutional analysis, Innovation capacity building	Outputs 1.3, 2.2, 3.4, 4.1	
Dr. Don Peden	Agro-ecologist /	ILRI specialist on	Livestock Water	Backstopping on systems	

Names of team members	Professional discipline	Institutional affiliation and address	Area of expertise important to this project.	Brief description of research responsibilities with respect to the outputs and activities listed in the Gantt chart.	Commitments
	Range scientist Systems ecologist	livestock-water interactions (Canada and Ethiopia) d.peden@cgiar.org	Productivity in the Nile Basin; Animal sciences; Range/grazing management; Systems ecology involving natural and social sciences	integration of livestock into RMS. Outputs 1.3, 2.1 and 3.2	
Dr. Amare Haileslassie	System ecologist: focus on livestock nutrient and water interactions	International Livestock Research Institute (ILRI)-Hyderabad; India	Water flow, sediment (nutrient) flow, impact upstream - downstream analysis	Contribute to output 1.2, 2.1	
Dr. Holger Hoff	Climate, hydrology, water resources and ecosystems	SEI, Kraftriket 2b, Stockholm, 10691 Sweden	WEAP application and integration with participatory scenario development, hydrological modeling	Outputs 1.2, 3.1, 3.4, 4.1	Green Water Credits Project, Tana
Dr. Birhanu Zemadim	Water Resources and Environmental Engineering	School of Civil and Water Resources Engineering Bahir Dar University, P.O.B 1353, Bahir Dar, Ethiopia	Hydrology, modeling, Capacity building, Supervising students	Output 1.2, 2.2. 4, supervising students	Teaching at University
Birru Yitaferu Woldetsadik	Land Resource Management	ARARI		Output 2.2, 3.3, 4	Research projects of ARARI
Girma Haile Michael	Rainwater Harvesting, Policy development	Ethiopian Rainwater Harvesting Association	Rainwater Harvesting, Policy development	Output 1.2, 2.2, 4	Directing the ERWHA

Provide a brief text statement on why the lead institution is well-placed to lead the group.

The International Water Management Institute (IWMI) has been a lead actor and a major player in agricultural water management in the Nile Basin, with the objective of improving water and land management for food, livelihoods and nature and with the goal of contributing to the vision of 'A Food Secure World for All'. IWMI's research is organized around four themes: Water Availability and Access; Productive Water Use; Water Quality, Health and Environment; and Water and Society. IWMI has developed and implemented/implementing over 12 projects in the basin pertinent to its thematic priorities. Through its Nile basin office based in Addis Ababa, it addresses this challenge through an integrated program, of which Land, Water and Livelihoods theme. It is partnering with many institutions and has very good experience in partnering with the implementing partners of this project. is in key partnership with ILRI. By creating strong partnerships with a large number of strategic partners, IWMI and ILRI have implemented successful projects such as the Comprehensive Assessment of Water in Agriculture, as well as CPWF phase 1 projects such as the Upstream-Downstream project (CP 19), and the Nile basin focal project (CP 59), Improved planning of large dam operation: using decision support systems to optimize livelihood benefits, safeguard health and protect the environment (CP36), and contributed to CP37.

Provide brief text statements on why the proposed institutions are qualified to carry out the proposed research.

Institution 1: International Livestock Research Institute
ILRI, the CGIAR centre with a comprehensive livestock research mandate, maintains a campus in Ethiopia and has an extensive network of partners working in the country. ILRI works at the crossroads of livestock, environment and poverty. The over-arching challenges that ILRI is pursuing in its MTP are: i) Sustainable Intensification of smallholder mixed crop-livestock systems – increasing productivity through better use of limited natural resources; and ii) Reducing Vulnerability of livestock-dependent households in marginal systems subject to biophysical and socio-economic shocks. ILRI partners strategically with others to generate and synthesize knowledge and approaches that can help poor people cope with economic and environmental vulnerability and take advantage of growing livestock opportunities. ILRI has been leading or strongly contributing to various CPWF Phase I projects, including Livestock-Water Productivity (CP 37), The Upstream-Downstream project (CP 19), and the Nile basin focal project (CP 59). The Livestock-Water project was successful in alerting the R&D community on the positive and negative interactions of livestock and the environment, beyond Ethiopia. ILRI and IWMI share similar visions to poverty alleviation through empowerment and the use of local partnerships as primary goals and the means to accomplish it. . ILRI also has several decades of experience in working with the Ethiopian government to improve agricultural productivity, improve soil and land management and foster marketing opportunities for poor farmers most notably in the CIDA funded project, Improving Productivity & Market Success of Ethiopian Farmers.

Institution 2: Nile Basin Initiative – Eastern Nile Technical Regional Organization
The Eastern Nile Technical Regional Office (ENTRO) was established by an ENCOM decision in 2001, started operation in June 2002 in Addis Ababa, Ethiopia, and was restructured in 2004/2005. ENTRO manages and coordinates the preparation of Eastern Nile Subsidiary Action Projects. It works towards all inclusive Eastern Nile Sub-Basin Organization with a

ratified legal framework that satisfies the needs of the present and future generations of the riparian countries by 2015. It has achieved substantial action on the ground and a series of new projects have been prepared and are being implemented, not only realizing the benefits from the river but also to and beyond the river.

Institution 3: Stockholm Environment Institute (SEI) mission is to support decision making and induce change towards sustainable development, by bridging science and policy in the field of environment and development. This is done by innovative integrated systems research, which forms the basis for policy advice, capacity development, decision support and implementation of policy and practice. SEI has been engaged in a number of projects in the region such as linking SWAT and WEAP for the Tana River, SWAT modeling in the Blue Nile, the Green Water Credits IFAD project, the AWM solutions project in Ethiopia, recent WEAP training for NBI and the SSI project.

Others Institutions: Following are candidates: Cornell University, World Fish Center, Universities (Bahir Dar, Arba Minch, Addis Ababa and Mekelle, Omdurman Islamic University(Sudan)), ARARI/ORARI, EWRHA, NWRC (Egypt), HRS (Sudan), Consultants will be engaged to address specific tasks of the project. Examples: the Amhara/Oromia Regional Agricultural Research Institutes (ARARI/ ORARI) serve the two biggest regions in the Ethiopian Highlands portion of the Blue Nile. These RARIs are responsible for developing technologies and practices relevant to local use, and in facilitating the extension services needed to upscale interventions to wider communities across their respective regions (also with N2, N3 and P5). They are also key players in creating local partnership and influencing policy in RWM. *Cornell University works with Bahir Dar University on M.Sc. program on hydrology and watershed. The two universities have been working with IWMI on CP19. The partnership will continue through engaging students and establishing tasks pertinent to this project that can be addressed by students and staff.*

15. Indicative break down of budget

This is part of the project workbook.

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[i] This project is one of several that together constitute a research program to tackle the basin development challenge (BDC). Please read the description of the BDC that can be found in the Medium Term plan. If you are successful you will be expected to work as part of a coherent research program, led by the Basin Leader responsible for program coordination and coherence.

[ii] Project linkages and project contribution are shown in the BDC impact logic model in the Medium Term Plan

[iii] The quality and experience of your project team will help ensure the delivery of quality outputs.