EFFICIENT WATER USE FOR AGRICULTURAL PRODUCTION PROJECT (EWUAP)

Best Practices and Guidelines for Water Harvesting and Community Based (Small Scale) Irrigation in the Nile Basin

Part III – Action plans for Possible Investments to be Considered by the SAPs

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Indicative Exchange Rates (5 January 2009)

Country	Currency	Rate to US$

Burundi	Burundi Franc (FBu)	1215
DRC	Congo Franc	557
Egypt	Egypt £	5.52
Ethiopia	Ethiopian Birr	9.96
Kenya	Kenya Shilling	78
Rwanda	Rwanda Franc	560
Sudan	Sudan Pound	2.19
Tanzania	Tanzania Shilling	1,330
Uganda	New Uganda Shilling	1,975

Acronyms and Abbreviations

ADB	African Development Bank
AEZ	Agro-Ecological Zones
BCM	Billion Cubic Meters
BP	Best Practice
BoQ	Bill of Quantities
CMI	Community Managed Irrigation
CMIWG	Community-Managed Irrigation Working Group
ASALs	Arid and Semi-Arid Lands
CGIAR	Consultative Group on International Agricultural Research
CIDA	Canadian International Development Agency
CRS	Catholic Relief Service
DRC	Democratic Republic of Congo
DRWH	Domestic Roof Water Harvesting
DSS	Decision Support System
EIRR	Economic Internal Rate of Return
ENSAP	Eastern Nile Subsidiary Action Project
ENTRO	Eastern Nile Technical Regional Office
EWUAP	Efficient Water Use in Agriculture Project
ET_o	Reference Evapotranspiration
EU	European Union
FAO	Food and Agriculture Organisation
FCT	Ferro Cement Tank
FFS	Farmer Field School
GAA	German agro-action
GDP	Gross Domestic Product
GEF	Global Environment Facility
GIS	Geographic Information system
GTZ	Germany Agency for Technical Cooperation
ICARDA	International Centre for Agricultural Research in the Dry Areas
ICB	International Competitive Bidding
ICCON	International Consortium for Cooperation on the Nile
ICR	Implementation Completion Report
ICRAF	International Centre for Research in Agroforestry
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
I & D	Irrigation and Drainage
IFAD	International Fund for Agricultural Development
ILRI	International Livestock Research Institute
IO	Irrigation Organisation
IPM	Integrated Pest Management
IWMI	International Water Management Institute

IWRM	Integrated Water Resources Management.
JICA	Japan International Cooperation Agency
KBO	Kagera Basin Organization
MCM	Million Cubic Meters (Mm^3)
M&E	Monitoring and Evaluation
NBI	Nile Basin Initiative
NBTF	Nile Basin Trust Fund
NCB	National Competitive Bidding
NELSAP	Nile Equatorial Lakes Subsidiary Action Project
NEPAD	New Partnership for Africa's Development
NGO	Non-Governmental Organization
Nile-COM	Council of Ministers of Water Affairs of the Nile Basin States
Nile -SEC	Nile Basin Initiative Secretariat
Nile-TAC	Nile Basin Initiative Technical Advisory Committee
NPC	National Project Coordinator
NTEAP	Nile Transboundary Environmental Action Project
O&M	Operation and Maintenance
PAD	Project Appraisal Document
PMU	Project Management Unit
PIP	Project implementation plan
PPMI	Public/Private Managed irrigation
PMIWG	Public and Private Managed Irrigation Working Group
PRC	People's Republic of China
PSA	Project Services Agency
PSC	Project steering committee
PUWR	Potentially Utilizable Water Resources
PWS	Primary Water Supply
QCBS	Quality and Cost-Based Selection
RBA	Rapid Baseline Assessment
RWH	Rainwater harvesting
SAP	Subsidiary Action Program
SC	Steering Committee
SSI	Small Scale Irrigation
SIDA	Swedish international Development Agency
SLM	Sustainable Land Management
SVP	Shared Vision Program
SWC	Soil and Water Conservation
TAC	Technical Advisory committee
TOR	Terms of Reference
UNDP	United Nations Program for the Development
UNOPS	United Nations Office for Project Services
USAID	United States Agency for International Development
WB	World Bank
WFP	World Food Programme

WH	Water Harvesting
WHWG	Water Harvesting Working Group
WUAs	Water Users Associations (also see IO)

Note: *For Acronyms by Country, see Annex J. Agricultural Water in the Nile Basin – An Overview, Final Report, Ian McAllister Anderson, April 2008.*

Glossary

General	
Brick Tank	A tank constructed from bricks
Ferro Cement Tank (FCT)	The structure/frame of the tank is usually made from wire mesh and a mortar of sand and cement is used to make the wall
Hectare (ha)	10,000 m^2 = 2.471 acres
Blue water:	Equivalent to the natural water resources (surface water and groundwater runoff)
Green water:	Rainwater directly used and evaporated/transpired by non-irrigated agriculture, pastures & forests.
Agro-ecological zones	Agro-ecological zones defined by FAO on the basis of average annual length of growing period for crops, which depends inter alia on precipitation and temperature. The lengths are: humid > 270 days; moist sub-humid 180-269 days; dry sub-humid 120-179 days; semi-arid 60-119 days & arid 0-59 days.
Deficit irrigation	Deficit irrigation is the application of less irrigation water than that required for maximum plant growth, to optimize yield per unit of water rather than land – in other words, to optimize water productivity
Farmers' Field Schools	Farmer Field Schools are a way of testing and adapting new technologies. They consist of a community-based, practically oriented, field study programme, involving a group of farmers, facilitated by extension staff (public or private) or, increasingly, by other farmers, in which farmers learn together and test/adapt practices, using practical, 'hands-on' methods of discovery learning that emphasize observation, discussion and analysis to combine local indigenous knowledge with new concepts.
Food security	Food security is the condition of being able to supply one's food needs either from one's own production, or by buying in from other sources, whichever is more economically advantageous. Food security may be expressed in terms of the household, the nation or the region.
Irrigation and drainage system	The network of irrigation and drainage channels, including structures.
Irrigation and drainage scheme	The total irrigation and drainage complex, the I & D system, the irrigated land, villages, roads, etc.
Irrigation	Comprises of operations to supply additional water to agricultural land, to augment rainwater (if any) for the purpose of crop growth. Irrigation water may be supplied from groundwater, surface water, agricultural drainage wastewater or other wastewater (including from domestic or industrial use). For the purpose of this report, reference to irrigation includes drainage where appropriate.
Supplemental irrigation	'Supplemental' (or supplementary) irrigation involves providing water to augment rainfall for crop growth. Most irrigation is supplementary, except where it is provided entirely within a dry season.
Egypt	
Feddan	0.42 ha [2.375 Feddan = 1 ha]
Ardab	Wheat ~ 150 kg Maize ~ 140 kg Rice ~ 120 kg Bean ~ 155 kg
Cutl	Barseem ~ 150 kg
Kantar	Cotton ~ 157 kg
Ethiopia	
Bereha	Hot and hyper-arid): General term that refers to the extreme form of Kola, where annual rainfall is less than 200-mm.
Dega	Cool, humid, highlands): Areas from 2500-3000 meters where annual rainfall ranges from 1200 to 2200-mm
E.C.	Ethiopian Calendar (Add 8 to convert to Gregorian calendar)
Kebele	Lowest administrative unit below a district
Kola	(Warm, semi-arid lowlands): Areas below 1500 m with annual rainfall ranges from 200-800 mm.
(Weina Dega	(Temperate, cool sub-humid, highlands): Areas from 1500 to 2500 m, where annual rainfall ranges from 800-1200-mm
Woreda	District

Wurch	(Cold highlands): Areas above 3000 meters and annual rainfall is above 2200-mm
Tanzania	
Charco Dam	Small Earth Storage Dam
Lambo	Charco Dam
Jaluba	bunded field
Ndiva	storage reservoir
Uganda	
Matoke	Green banana cooked for food. Staple food in Uganda
Valley dam	On stream embankment for trapping and storing of surface runoff from a catchment area
Valley tank	On stream valley excavation of a reservoir for trapping and storing surface runoff from a catchment area

Glossary of Terms and Definitions

	Definitions	Remarks
Efficient water use for agricultural production	The optimisation of water used in agriculture for acquiring the maximum crop production per unit of consumptive use, and to minimise the amount of water diverted to the agricultural land to meet this consumptive use.	
Benchmark.	The designs value of process output (or performance indicator). The benchmark level is set by comparison with the best practices of comparable processes.	
Performance assessment (in irrigation & drainage)	A systematic observation, documentation and interpretation of activities related to irrigated agriculture with the objective of continuous improvement.	Benchmarking of schemes is important in this process
Best Practice (in Irrigation and Water Harvesting)	The Best Practice is one that gives optimum utilization of land and water resources for sustainable agricultural production and environmental management. A good example of what can be achieved in irrigation and drainage or Water Harvesting and can be used for Benchmarking of systems, as well as providing models for wider dissemination.	Definition of best practice varies according to the purpose to which it is to be put. In irrigation & water harvesting it relates to 5 main issues: Technical; Economic; Social; Management, Operation & Maintenance (MOM); Institutional.
Irrigable area.	Area (in hectares) with physical infrastructure that enables the delivery of irrigation water.	
Irrigated area.	Part of the irrigable area to which water is actually delivered during the growing season of the irrigated crop	
Cropping intensity	$\frac{\text{Total area cultivated during the year}}{\text{Command area}}$	
Irrigation intensity	Number of irrigation seasons per annual cycle	
Delivery performance ratio or Management performance ratio	$\frac{\text{Actual supply discharge}}{\text{Target discharge}}$	
Depth of delivered water.	Volume of water delivered to a certain offtake divided by the size of this area.	This depth commonly has the same dimensions as precipitation and Evapotranspiration (e.g. mm/day).
Conveyance efficiency	$\frac{\text{Volume of water delivered (to tertiary unit)}}{\text{Volume of water diverted/pumped from source}}$	
Distribution efficiency	$\frac{\text{Volume of water received at field}}{\text{Volume of water delivered (to tertiary unit)}}$	
Field application efficiency	$\frac{\text{Volume of water needed by crop (crop } ET_P \text{ - effective rainfall)}}{\text{Volume of water received at field}}$	
Irrigation system efficiency	$\frac{\text{Volume of water received at field}}{\text{Volume of water diverted/pumped from source}}$	
On-farm efficiency	$\frac{\text{Volume of water stored in the root zone}}{\text{Volume of water received at field}}$	Expresses role of soil water holding capacity
Reference ET	ET of unstressed short clipped and well watered grass	Defined according to FAO 56 guidelines
Crop coefficient	factor that converts reference ET into potential ET	
Potential ET	Consumptive use of an unstressed crop	
Actual ET	Consumptive use of an stressed crop	Stress could be caused by water, salts and heat
Crop water stress	ETp - ETa	Deficit in consumptive use
Crop water requirements	ET_p - effective rainfall	

Effective rainfall	Amount of rainfall that is infiltrated into the soil profile and subsequently available for consumptive use	
Irrigation water requirements	Water requirements for crops and leaching	
Bio-physical crop water productivity (kg/m3)	Yield of harvested crop / Consumptive use	Consumptive use comprises rainfall, irrigation, capillary rise and moisture depletion
Economical crop water productivity (US$/m3)	Value of harvested crop / Consumptive use	

References

a/. Bos and Nugteren (1974; 1990)
b/. ICID (1978)
c/. IWMI (1987; 1993)
d/. Boss, M..G.; Burton, M. A.; Molden, D.J.; (2005)
e/. Proceedings of EWUAP Inception Workshop; Best Practices; Nov. 2007.
f/. FAO Irrigation and Drainage Paper 56

The information presented in these reports reflects the views of the Consultants and does not necessarily represent those of the Nile Basin Secretariat. It has been compiled from data and information made available by the Project Management Unit (PMU) of the Efficient Water Use for Agricultural Production Project (EWUAP) together with published data obtained from international organisations and from the internet. This has been supplemented with the knowledge and experience of the Consultants who have worked in most of the Riparian states at some time over the last 35 years.

.1 Introduction

The problems and constraints identified throughout the Nile Basin countries were discussed in the *Agricultural Water in the Nile Basin – An Overview, Final Report, by Ian McAllister Anderson, April 2008* completed at the end of Phase 1 of the current EWUAP assignments. This overview identified a wide number of constraints affecting agriculture and agricultural water use in the Nile Basin countries, and also commonalities that exist. Water is not used efficiently within the Basin, and there is considerable scope for improving agricultural and livestock productivity, through support to existing users, and the upscaling of technologies and approaches used in some Nile Basin countries. The Nile Basin Commission, facilitated by the EWUAP project, provides an excellent vehicle for the sharing of ideas and experiences amongst the Nile Basin countries, to enhance the effectiveness and profitability of investments in the sector.

The Overview Report discussed those factors that could contribute towards achieving more efficient water use and productivity. The types of best practice that would contribute towards improvements in water use and crop production were discussed in detail along with the institutional constraints that are inhibiting progress. Priority areas for investments emerging from this process and analysis of constraints and issues are now presented in the following sections of this report as opportunities and interventions for addressing the constraints and problems.

Guidelines for Water Harvesting and Community Based Small Scale Irrigation have been produced,[1] and have built upon the Best Practices identified in the Nile Basin countries and elsewhere. They have been aimed at meeting the needs of the riparian countries, to encourage a wider use of available knowledge and techniques within the Nile Basin. EWUAP project will develop these together with each member state into suitable guidelines and manuals, adapted to their own country's particular use and in the vernacular language. Once this has been achieved, further initiatives can be undertaken to improve the productivity in all countries on existing developments, through appropriate rehabilitation and upgrading, including the uptake of improved techniques in new WH and Irrigation and Drainage (I&D) projects.

The following sections of this report contain indicative ideas for future directions, possible opportunities and priorities for investment in agricultural water management, aimed at improvement of the management of SSI and Water Harvesting in NBI countries. During the second day of the 2-day workshop in Nairobi on 13th and 14th November 2008, these ideas were discussed and developed further with senior delegates from each member country, to produce priority areas for follow up to the current EWUAP project (see Section 1.3 below).

[1] Anderson. Ian McAllister, Burton. Martin A, Best Practices and Guidelines for Water Harvesting and Community Based (Small Scale) Irrigation in the Nile Basin, Water Harvesting:- Part I - Best practices in Water Harvesting.; Part II - Guidelines for the Implementation of Best Practices in Water Harvesting.; Community Based (Small Scale) Irrigation:- Part I - Best practices in Community Based (Small Scale) Irrigation; Part II - Guidelines for the Implementation of Best Practices in Community Based (Small Scale) Irrigation. October 2008.

1.1 On going Programmes

Two Subsidiary Action Programs (SAPs), undertaken within the NBI framework, are delivering an initial set of agreed investment projects (estimated at US$ 700 million). Projects focus on power development and trade, agriculture and irrigation, including water and natural resource management and development. These projects, which are delivering on-the-ground results, are administered through either the Eastern Nile Subsidiary Action Program (ENSAP) or the Nile Equatorial Lakes Strategic Action Program (NELSAP) (see Figure 1.1). The Eastern Nile Subsidiary Action Program (ENSAP) currently includes Egypt, Ethiopia, and Sudan.[4] As set out in a jointly developed strategy adopted by the Eastern Nile Council of Ministers, the primary objectives of ENSAP are to ensure: (i) efficient water management and optimal use of resources through equitable utilization and causing no significant harm, (ii) cooperation and joint action between the Eastern Nile countries seeking win-win gains, (iii) target poverty eradication and promote economic integration, and (iv) that ENSAP results in a move from planning to action.

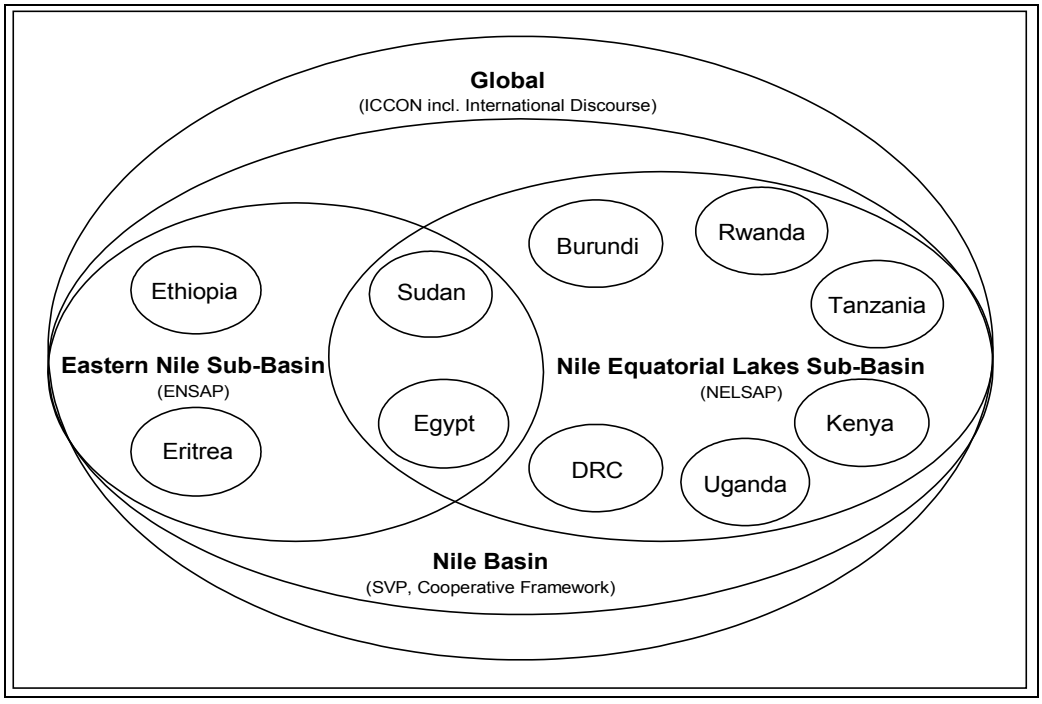

Figure 1.1: Levels of Cooperation within the Nile Basin Initiative

The Eastern Nile riparians recognize that potential investments need to be assessed within a regional context, and that benefits are most likely to be found in the bundling of projects within a multipurpose context. Consequently, consensus was reached that the objective of a first ENSAP project, referred to as the Integrated Development of the Eastern Nile (IDEN) Project, will be to "initiate a regional, integrated, multipurpose development project, through

[4] Eritrea, which is located in the Eastern Nile region, participated in its first meeting of the Eastern Nile Council of Ministers as an observer in March 2001 and may join ENSAP in the future.

a first set of investments which confer tangible, win-win gains, and demonstrate joint action between the Eastern Nile countries." IDEN includes a preparation process that facilitates integration, options analysis based on best practices, and prioritization of subprojects within an overall regional, integrated framework. The work of the EWUAP project has assisted in this by identifying and cataloguing Best Practices, and establishing the basis for improved training and equipping of practitioners in the Basin, to ensure that appropriate and sustainable projects and implementable designs are prepared.

The Nile Equatorial Lakes Region includes the six countries in the southern portion of the Nile Basin - Burundi, Democratic Republic of Congo, Kenya, Rwanda, Tanzania and Uganda - as well as the downstream riparian Egypt and Sudan. The water resources of the Nile Equatorial Lakes region include one of the world's great complexes of lakes, wetlands, and rivers. The region's economies are characterized by rainfed agriculture, subsistence farming, low productivity, limited industrialization, high percentage of rural populations and poor infrastructure development.

The objectives of the Nile Equatorial Lakes Region Subsidiary Action Program (NELSAP), as defined by the Nile Equatorial Lakes Council of Ministers, are to contribute to the eradication of poverty, promote economic growth and reverse environmental degradation. NELSAP is expected to be a long-term program, with multiplier effects in broader economic integration, as the program shows results on the ground. The work of the EWUAP project has assisted NELSAP in this regard, by providing information on suitable technologies and links to further much more detailed design information, thereby enabling practitioners to plan appropriate and well designed projects, to meet the identified needs. The areas for further investments outlined in the subsequent chapters of this report, will aim to ensure that future staff are better trained and equipped to continue this process, and that the considerable expertise that is available within the countries is utilised more effectively.

1.2 Overall Constraints

In the past, a lack of clear understanding of the issues that link agricultural water development to poverty reduction and agricultural productivity has been one of the reasons for underdevelopment of the subsector. Moreover, insufficient investments, inadequate involvement of farmers and support to them, as well as an ineffective central state management, has resulted in poor performance of many traditional and state irrigation schemes. These are characterized by low crop production (similar to rainfed lands), limited water use efficiency (10-15%) and poor irrigation infrastructure. There are no quick fixes or impacts. For successful interventions, a longer term commitment under programme support and funding, and better understanding by the donor community, is needed to overcome the constraints facing farmers in marginal areas. These challenges are further exacerbated by a lack of experienced technical professionals, who are involved in the decision making during the project concept and formulation stages. Extensive research reveals, that water sector strategies have not addressed the constraints experienced by both irrigated and rainfed farmers, and thus tend to dwell on water supply that has different types of constraints. The

full details of constraints and issues arising from the basin wide overview are given in Table 1.2.

Irrigated agriculture in the Upper Nile Basin continues to be characterized by low productivity and hence low profitability. Investment in agricultural water can contribute to agricultural growth and reduce poverty directly by: (a) permitting intensification and diversification on already developed land, and raising farm outputs and incomes; (b) increasing farm employment and discouraging migration to urban centres in search of better wages; and (c) increasing availability of food on local markets, thereby reducing local food prices and improving real net incomes. Public irrigation development in the Nile Basin countries has been excessively costly in the past, with few schemes realising the predicted returns and true potential. As many of the capital costs are now sunk, attention must be given to making these systems perform, and also to introduce complimentary rainwater water harvesting into the rainfed and arid areas. Although low productivity is correlated with unreliable water supplies, low input use and difficulty in accessing profitable output markets, will reflect the lack of incentives for change by most subsistence farmers. Expansion into new areas to increase production has not been a successful strategy, and needs to be more emphasized. A mix of water harvesting interventions is likely to be required, such as the improvement of existing irrigated areas, integrated watershed management (including the full range of water harvesting techniques and measures) and improved in-field water management and crop husbandry.

Institutional constraints include inadequate legal frameworks for land, water and farmers' organizations, and the conflicting approaches of public agencies for investment and management. Furthermore, there is lack of farmers' empowerment to manage their water resources, and to access effective agricultural support services, finance and markets. Without reforms, productivity and farm level profitability will continue to be constrained. The role played by women in most production systems, must be recognised when addressing these issues, with approaches specifically targeting them and encouraging their participation. This has been found to enhance productivity and poverty reduction impacts.

The importance of building partnerships to support any interventions and for the exchange of ideas, especially in the approach to integration and sustainability of water resources management needs to be emphasized. This includes partnerships between development partners (major donors; organizations for financing infrastructure improvements; suppliers of equipment; organizations with experience of institutional development relating to water user organizations); Government institutions; stakeholder and beneficiary organizations.

At the national level, strengthening the partnership between lead Government institutions in water resources and irrigation/drainage development is essential for integrating off-farm service delivery, with on-farm water and land management improvements. This is aimed at simultaneously enhancing water conservation and increasing land productivity. In addition, project mainstreaming of environmental considerations will involve further partners in the areas of environment and public health. Similarly, at the local level, activities aimed at securing the future sustainability of land and water management will depend on effective

partnerships between project beneficiaries, and WUAs, and between these organizations and government institutions.

Adequate human capacity is essential for effective, accelerated and sustainable irrigation and water harvesting developments. There is an increasing need to invest in capacity building through the strengthening of WUAs, and building of a strong professional base for the irrigation sector with links to training establishments. This would ensure that the trainer's outputs meet the changing demands of the end-users. Experience within the Nile Basin has shown a need for continual review, as many training and research institutions lose touch with private and public sector demands.

1.3 Findings During Workshop #2

Before the workshop, participants were provided with the draft versions of this Part III report and asked to review the issues and constraints, in the light of their own in-country experience. At the start of the 2-day workshop, they were asked to prioritise the 16 main areas for possible future investments (Table 1.1), and to review issues and activities. Additionally, they were requested to rank the proposed areas for support from 1 to 16, and then assign a score to each proposed area of support, with 10 scoring high and zero low). The results of the rankings are given in Figure 1.2 and the scoring in Figure 1.3.

Table 1.1: Proposed Areas for Support

No.	Areas for Support
2.1	Institutionalization of Knowledge and Experiences and sharing with Users in Nile Basin
2.2	Mainstream of Training Institutions into I&D and WH Activities in the Nile Basin
2.3	Introduction of Benchmarking System for BP in Nile Basin Countries
2.4	Facilitate the Improvement of Enabling Environments in Each Nile Basin Country
2.5	Improving Profile of Water Harvesting
2.6	Encourage the Wider Adoption of WH Techniques and Uptake of Technologies
2.7	Development and Dissemination of Full Range of Technologies Available
2.8	Improve Approach to Irrigation and Drainage Developments
2.9	Improve Approach to Spate Irrigation Developments
2.1	Facilitate the Construction of Small Dams and Storage Facilities
2.11	Institutional Development and Capacity Building
2.12	Community Involvement
2.13	Improved Approach to Extension Support
2.14	Improved Water management
2.15	Integrated Water Resources Management (IWRM)
2.16	Identification of Potential for WH & I&D for Main Catchments

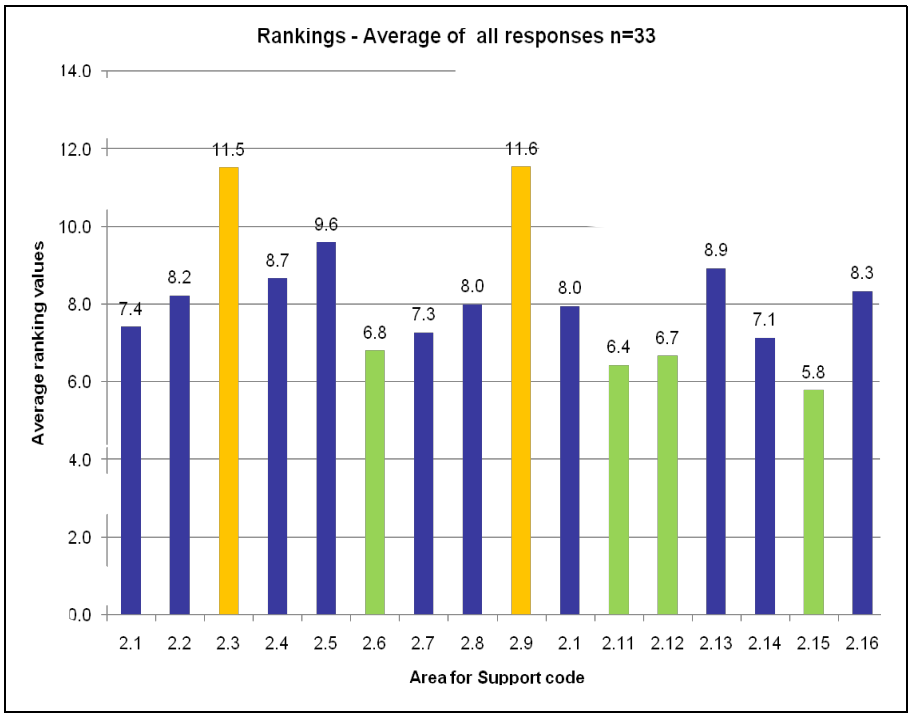

Figure 1.2: Results of survey - Rankings

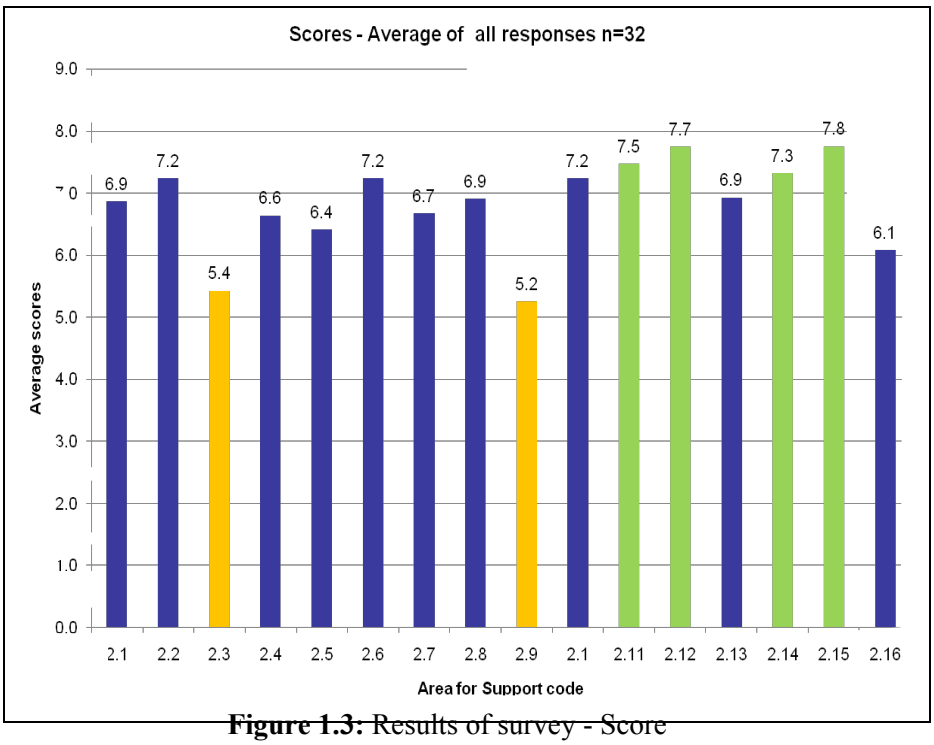

Figure 1.3: Results of survey - Score

The above figures showed that the top four ranked issues were (i) 2.15 - Integrated Water Resources Management, (ii) 2.12 - Community Involvement, (iii) 2.11 - Institutional Development and Capacity Building, and (iv) 2.14 - Improved Water Management. There were seven areas with scores > 7.0, fourteen with scores > 6.0, with the two lowest being 2.3 - Introduction of a Benchmarking System for BP and 2.9 - Improved Approach to Spate

Irrigation Development. Discussions with the participants revealed that they made their judgements primarily on the title and not the issues and activities. Thus, the ranking and scoring was based on what they understood were the issues, rather than reviewing the suggestions contained in the report.

On the second day, participants were divided into groups of approximately ten persons, according to location within the Nile basin. An additional group was formed to discuss water users associations, as this was an overriding issue in all of the discussions. Groups were asked to review the proposed Areas for Support, the Aim, Identified constraints and Activities, and to make recommendations for additional areas, if required. Thereafter findings were reported back to the plenary session. Although opinion on priorities varied across the Basin, it was clear that the issues identified encapsulated the priority areas for support within the Nile Basin countries. Further discussions into the areas of support however, resulted in some of the participants changing their opinions. All identified the need for support and an enabling environment for Water Users Associations, and there was much interest in the discussions of Group 4, who were dealing with this topic. In general, the issues raised by the French speaking countries within NELSAP countries, reflected the less developed WH and CBSSI, compared with the other Nile Basin countries, including the basic issues that needed to be addressed. In addition, it was also evident that these same countries stood to benefit from experiences and lessons learnt in the other countries.

A number of the groups wanted to combine some of the areas for support, and this has been taken into account in this final version of the Report. In conclusion, it was agreed that the sixteen aspects for assistance were combined under five main areas for support:

A PHYSICAL INFRASTRUCTURE DEVELOPMENT
B ENABLING ENVIRONMENT
C INTEGRATED WATER RESOURCES MANAGEMENT (IWRM)
D TRAINING, CAPACITY BUILDING AND NETWORKING
E FORMATION AND SUPPORT TO WATER USERS ASSOCIATIONS

Many of the identified areas for assistance involved software aspects, and it was generally felt that unless these interventions were combined with practical on-the-ground developments, they would be unlikely to achieve sufficient interest from the member country governments. In addition, practical examples would be needed for the field practitioners to illustrate the changes and different approaches.

The revised recommendations for investment are detailed in the following Section 2. These will then need to be formulated by the successor to EWUAP, or the individual countries, into potential investments and the scaling up of best practices for the Subsidiary Action programs, or other National Support Programmes.

Table 1.2: Constraints to Agriculture, Irrigation Development and Rainwater Harvesting

General	Agriculture	Irrigation and Drainage systems	Water Management and Productivity	Finance and Funding	Extension Services
Increased urbanization	Increase in cultivated area below the rate of increase in population	Poorly designed and sometimes inappropriate I & D Developments	Poor water management	High development costs	Inadequate extension services to support I&D and WH developments.
Declining landholding sizes	Poor adoption of technical packages for production	Poor condition of Irrigation & Drainage systems	Low irrigation efficiencies	Inadequate funding of WH and I&D developments	Poor extension support in almost every country
Lack of improvement in rainfed agriculture	Limited access to improved seeds and inputs	Poor performance of all systems especially on large scale and public managed irrigation schemes	Inadequate Management, Operation and Maintenance (MOM)	Weak or non-existent enabling environment	Inadequate emphasis on practical support for I&D and RWH
Growing population pressure	Growing importance of livestock in farming systems	**Water Harvesting**	Unformed or non-functioning WUAs	Poor levels of water fee setting and collection	Insufficient coverage and poor incentives for extension services
Lack of expansion of support to arid or semi arid areas	Livestock Productivity Constrained by Water Supply	Excessive Siltation of structures and reservoirs.	Failure to recognise existing organizational structure of indigenous irrigation schemes	Areas with good potential for improvement of I&D not addressed in a timely manner.	Lack of extension support for the establishment or strengthening of WUAs
Lack of coordination of programmes	Inadequate support for management of the rangelands	Problems with small dam construction and siltation.	Inadequate guidance related to irrigation operation and maintenance at local level	Lack of involvement or engagement of private sector in I & D sector.	Lack of extension technical capacity in agronomy & water management.
Falling labour and land productivity	Decline in soil fertility and deterioration in physical properties	Difficulty of raising profile of RWH in all Nile Basin Countries	Failure to hand over systems to WUAs	**Marketing**	Alternatives such as Farmers Field School (FFS) approach not tried.
Dependence of the agricultural sector	Lack of water sources and pastures for livestock	Lack of Integrated Catchment Management	Inadequate farmer participation	Failure to respond to changing needs of export markets	Poor yields, low productivity and low water use efficiency
Water Resources & Availability	Degradation of grazing lands	Lack of emphasis on development of runoff water harvesting	No evidence of asset management and longer term maintenance planning	Poor marketing of crops	Extension/Support Services to irrigated areas combined with rainfed services resulting in poor service to both.
Insufficient water to meet demands	Absence of clear legislation and enforcement to protect range lands	Full range of technologies available but not in use		Poor market facilities for fisheries	Limited research linkages to the farmer.
No early warning systems	Desertification	Lack of understanding of Spate Irrigation		High marketing margins on agricultural produce	Lack of training and supporting incentives for extension staff
Increasing levels of pollution	Declining Soil Fertility	Insufficient adoption of rainwater harvesting techniques and uptake of technologies		Little or no availability of market information	No effective grassroots/village-based, commercially oriented institutions
Declining quality of groundwater	Inadequate policies and legislation			Restricted access to markets	Lack of clarity in role of irrigation and the development of irrigated agriculture
No River Basin Management	Inadequate procedures for Planning, Design, Construction, & Implementation	Insufficient and sometimes inappropriate use of wells.			Loss of crops to disease and pests
More information on quality/extent of groundwater resources required	Lack of suitably detailed I&D design documents				Barriers to access and utilisation
	Failure to engage multi-disciplinary teams				Limited technical support for RWH
					Lack of information, knowledge and skills
					Facilitation teams with range of experience & knowledge not used.

.2 Areas for Support

2.1 Summary of Potential Areas for Support under SAPs

Following the discussions that took place at the final Workshop in Nairobi in November 2008, the areas for support were grouped into 5 main areas:

A PHYSICAL INFRASTRUCTURE DEVELOPMENT
B ENABLING ENVIRONMENT
C INTEGRATED WATER RESOURCES MANAGEMENT (IWRM)
D TRAINING, CAPACITY BUILDING AND NETWORKING
E FORMATION AND SUPPORT TO WATER USERS ASSOCIATIONS

It should be emphasized that this grouping was as a result of the discussion sessions by representatives from all member countries except Eritrea. Although the Consultants had their own ideas of grouping prior to and after the workshop, it is important that the Nile Basin countries endorse the results and take ownership of the process. All countries have similar problems, for which they considered that investments in appropriate projects would start to address. Such project formulation is the responsibility of each Nile Basin country or group of countries, and is beyond the scope of this current assignment. This chapter presents ideas on the potential areas for support, which will be an invaluable input into the project formulation and preparation process.

All of the issues are covered in Table 1.2 that derives from the overview report prepared during Phase 1[2]. Findings reveal that no new issues have been identified, and each riparian country has different emphasis and priorities for investment. Moreover, the workshop participants were unable to address the issue, as to whether the constraints should be addressed at a national or regional level. What is clear from the Best Practice reports is that there will be considerable savings in cost, and the advantage of including the currently omitted sharing of knowledge and experiences between NBI counties if the projects are treated on a regional basis.

Any support and interventions provided, must work within the current institutional arrangements and structures. Experience has shown that the establishment of new "project" structures hinders sustainability, and creates parallel organisations without a clear division between the two. Resources and obligations are not clearly defined and delineated, and the decision making processes become unclear.

The participants emphasized the need to ensure that all interventions should include both hardware and software aspects. Even where most of the emphasis related to software aspects, it is important to include some hardware components, in order to train those involved, as well as to gain an understanding of the implementation constraints that may exist. Such investments would also act as an incentive for change.

[2] Anderson, Ian McAllister. Agricultural Water in the Nile Basin – An Overview, Final Report for EWUAP, April 2008

A Physical Infrastructure Development

Overall Aim: *To improve the livelihoods of smallholder farmers within each Nile Basin country through efficient use of land and water resources*

A.1 Introduction of benchmarking for Best Practice in Nile Basin countries

Aim: *To improve performance of individual schemes and the sector as a whole*

Identified Constraints:

- Performance of I&D and water harvesting developments fall well below expectations.
- Little or no comparative assessment of performance and lessons learnt from best practice.

Activities:

- Sharing of knowledge and lessons learnt from Best Practices sites
- Organise knowledge sharing through exchange visits, study tours, training sessions and short term scheme placements
- Establish and regularly update *Register of Best Practice* in the Nile Basin
- Establish procedures for regular monitoring and evaluation of scheme performance
- Establish and agree key M&E indicators
- Identify successful interventions for upscaling
- Improvement of scheme monitoring and feedback
- Develop system for prioritisation of schemes, for further improvement using Best Practice and satellite imagery approach of LSI project
- Finance core staff to facilitate the process

A.2 Development and dissemination of full range of available water harvesting technologies

Aim: *To improve the uptake and use of appropriate technologies, thus improving farming productivity.*

Identified Constraints:

- Insufficient information is available on the full range of technologies available for domestic drinking and livestock water in rural areas and for backyard crop cultivation from storage.
- Agricultural extension staff lack suitable training and information, to be able to offer a reasonable support service in WH to beneficiaries.
- Limited information available on the use of spate flows for seasonal and supplementary irrigation of pasture and crops.
- Many farmers who would be interested in different technologies are located in the smaller and remoter rural villages.

Activities:

- Catalogue the range of technologies and equipment available for WH and SSI available in regional markets.
- Develop standards for equipment (human powered pumps; drip systems; etc) and preparation of appropriate information sheets for users to spread awareness.
- Plan and implement a programme for regional testing under varying site conditions of technologies available on the market, and examine requirements for local dealer support and provision of spare parts.
- Identify training requirements (for both farmers and field level technicians) and supply of technologies.
- Propose a programme for introduction of equipment and technologies to farmers to improve productivity and efficiency of water use (for abstraction, conveyance, irrigation scheduling, application/on-farm water management)
- Establish training and field support, including standards for technicians.
- Establish dealers in rural areas.
- Identify appropriate technologies and approaches for wider use and upscaling.

A.3 Improve approach to irrigation and drainage developments

Aim: *To improve the quality and sustainability of I&D development and its infrastructure, and to adapt management, operation and maintenance (MOM) suited to farmer/community levels of management and investment.*

Identified Constraints:

- Poor state of repair of existing small-scale and community managed irrigation systems
- Lack of community based management
- Lack of functioning water users associations

Activities:

- Increase awareness and understanding amongst politicians and key stakeholders of the benefits of WH and irrigation, and need for long term commitment.
- Link with training and strengthening of WUAs (E)
- Introduce more efficient water service delivery through improvements to conveyance of irrigation water, establishment of measurement structures and handing over some responsibilities to WUAs;
- Improve on-farm water management, linking with improved extension support
- Establish priorities for support based on identified needs for rehabilitation and upgrading (using data from the current RWH/CMI studies, adopting the LSI approach and methodology), covering all levels and aspects for improvement - (a) main canal system, (b) branch canal (secondary) and (tertiary) system, (c) quaternary and farm level irrigation system, (d) open and subsurface drainage network, (e) engineering studies, designs, construction supervision, (f) MOM arrangements, (g) community involvement and catchment management.
- Develop system for collecting, compiling and regularly updating cost data of all CBSSI and WH interventions for all countries within the Nile Basin.

- Prepare a comprehensive reference list on cost of interventions using up-to-date cost and development data for all countries within the Nile Basin.
- Prepare criteria for the assessment of small scale irrigation, small storage dams and water harvesting techniques to establish relevant benchmarking criteria (costs per ha or volume of stored water; cost per cubic metre of water used for production).
- Improve quality of engineering designs through exchange of standards and adaptation of community managed systems.

A.4 Improve approach to spate irrigation developments

Aim: *To ensure that designs and conditions for spate irrigation, both for crop production in arid areas and for supplementary irrigation in already planted areas are improved and understood.*

Identified Constraints:

- Limited detailed information on design aspects.
- Limited design material.
- Limited training

Activities:

- Establish guidelines for field and district level staff, to take advantage of seasonal runoff floods in rain shadow areas, and places where climate change has produced more variable rainfall.
- Develop runoff water harvesting systems in each country, and define conditions under which it can be most appropriately be used.
- Provide links with professionals from Sudan and Yemen where this technique has been practiced successfully for many years.
- Arrange exchange visits to spate irrigation areas to familiarise practitioners and farmers with practices and conditions under which they can be successful.
- Establish links with research organisations and training institutions to adapt standards and designs to reduce amounts of sediment entering spate irrigation headworks and main canals.
- Establish links with UNESCO-IHT in Delft that runs regular annual short courses on spate irrigation.

A.5 Facilitate the construction of small dams and storage facilities

Aim: *To improve the quality and sustainability of small storage dams within each Nile basin country.*

Identified Constraints:

- Need to approach small dam construction in a more scientific manner.

- Lack of understanding of need for sediment exclusion measures and catchment management to reduce erosion.
- Lack of upstream catchment management measures.
- Lack of consideration of siltation of dams in economic analysis.
- Need to update existing (dated) information and formulae on sedimentation.

Activities:

- Facilitate the construction of small dams and storage facilities through the preparation of appropriate manuals for the design and training of staff.
- Establish standard design manuals including design and runoff criteria for small dams, ponds and haffirs for field and district level staff using already available materials and EWUAP guidelines (WH-Part I & CBSSI-Part I Reports).
- Link with training and strengthening of WUAs (E)
- Examine runoff data for each country to update design norms for small catchments, and make these readily available to ensure that designs are approached more technically with catchment areas related to storage sizes.
- Introduce measures to reduce sedimentation.
- Encourage integrated catchment approach with construction of small dams and ponds associated with catchment conservation works, to reduce sediment transport and catchment erosion.
- Construction of Water Harvesting and I & D Facilities / structures.

A.6 Identification of potential for water harvesting and I&D development in main catchments

Aim: *To establish a programme for gradual improvement of WH and I&D within the Nile Basin countries, that is based upon longer term commitments from Governments and Donors.*

Identified Constraints:

- Comprehensive data on potential for improving irrigation developments and the establishment of wide scale water harvesting interventions do not exist.

- Prioritised processes for providing support to I&D and WH interventions either do not exist or are not widely followed

Activities:

- Establish locations, characteristics and experiences of good examples of improved and integrated water management approaches that exist within the Nile Basin.
- Utilising the work of ICRAF, prepare methodologies for identifying potential areas for upscaling of water harvesting.
- Identify potential for WH & SSI for main catchments in each country in collaboration with findings from LSI Consultancy and SVP Environment project, to define areas with potential and to assess resources, fix safe levels of development, define types of interventions, develop catchment plans, define stakeholders.
- Develop improved and integrated water resources management (IWRM) with greater community involvement.
- Link with training and strengthening of WUAs (E)
- Prepare an inventory of all existing schemes (location; information known on the systems; etc.) within the Nile Basin in each country, to establish the condition of systems (local data and information; satellite data; project reports; benchmarking).

B Enabling Environment

Overall Aim: *To establish a robust enabling environment in concerned countries, with suitable policies and laws in place relating to water resources, irrigation and establishment of water users associations*.

B.1 Facilitate the improvement of enabling environments in each Nile Basin country

Aim: *To establish a robust enabling environment in concerned countries, with suitable laws in place relating to water resources, irrigation and establishment of water users associations.*

Identified Constraints:

- Many countries do not have suitable enabling legislation for the establishment of WUAs, the introduction of service fees, licensing of water abstractions, water rights, etc.
- Lack of information for senior policy makers and managers on required approach and associated legislation
- Much is spoken about establishment of WUAs, but little effective legislation in place to form, establish and support WUAs
- Lack of awareness of procedures, training material, etc. available for formation and support of WUAs.

Activities (link with E)**:**

- Share knowledge and lesson learning from Best Practices sites and countries.
- Share knowledge through exchange visits, study tours, training sessions and short term scheme placements.
- Use outputs of NBI EWUAP and DSS studies to establish the status of enabling legislation in each country.
- Place all supporting documentation on Basin web site (Link with A).
- Establish forum for discussion between member countries over the processes used in other countries.
- Catalogue countries that have tries and tested legislation in place, and make information widely available (Link with A).
- Link with other on-going or completed projects within the member countries of the Nile Basin, to utilise relevant data and share experiences.
- Make available, where required, experienced international specialists in legal frameworks and legislation for water resources, irrigation and WUAs
- Make available, where required, experienced international specialist in institutional development, WUA formation and support

B.2 Improved approach to extension support

Aim: *To ensure that a more effective and active extension service is available to farmers using irrigation and water harvesting.*

Identified Constraints:

- Lack of adequate extension services, adversely affecting agricultural productivity.
- Rainfed, water harvesting and irrigated agriculture relying on same extension staff where they exist
- Inadequate training of staff in WH and CBSSI requirements and technical details.

Activities:

- Study of extension support for irrigation and water harvesting within the Basin.
- Identify alternative means for providing improved extension support for WH and CBSSI.
- Prepare a pilot programme for testing identified measures for improving extension services.
- Feasibility study to provide private advisory services, taking into account the need for farmers to pay for these services.
- Establish an awareness and training programme for farmers and communities linked to either existing or improved extension services.
- Prepare a training programme and advice on irrigated horticulture to lead farmers.
- Link with training and strengthening of WUAs (E).
- Establish mechanisms for setting up links with markets and buyers.
- Identify ways in which the research systems can more closely match the needs of farmers.
- Using experience within the Nile Basin countries, examine the best means of providing an effective information system on demand for crops and seasonal variations;
- Organise and implement the development of practical guidelines for farmers with messages that are easily understood, using experience within the Nile Basin countries;
- Identify mechanisms for establishing links with training institutions to improve the quality of services available to farmers.
- Identify means to introduce water harvesting approaches into extension training and university curricula.
- Identify improvements to training programmes so that staff can gain sufficient training and experience, to deal with the range of technical issues that confront them.
- Identify links with private sector consultants and experienced officers within the main line Ministries to support front line extension staff;
- Provide access to appropriate technical guidelines and reference material.

C Integrated Water Resources Management (IWRM)

Overall Aim: *To improve the understanding and adoption of IWRM to ensure better use and improved management of declining water resources availability.*

C.1 Integrated Water Resources Management (IWRM)

Aim: *To ensure that all interventions are not seen in isolation, and that management of water resources involves all stakeholders and covers all uses and users.*

Identified Constraints:

- Lack of IWRM is hindering agricultural development and productivity of water.

Activities:

- Establish locations, characteristics and experiences of good examples of improved and integrated water management within the Nile Basin.
- Prepare information on these sites for dissemination of experiences widely throughout the riparian countries, utilising work on Best Practices under EWUAP.
- Obtain experiences and feedback from first Subsidiary Action Program (SAP) projects in Ethiopia using IWRM approach.
- Institutionalise process of feedback from on going projects, to improve implementation and establish practical results based M&E system.
- Promote integrated watershed management activities within member countries (WH; SSI; SWC; environmental protection) using examples such as the Lare experience in Kenya, and the work carried out by MOA/WFP in Ethiopia.
- Provide support to improvement of extension services to equip them with tools and "menus" of possible interventions, to ensure that a full range of proposals are available for consideration by the benefiting communities.
- Identify watersheds for interventions (Link with B) and utilising the approach adopted for large-scale irrigation systems, by using available satellite imagery for overall planning.
- Divide target watersheds into management units and different components (such as forest and upper catchment cover, farmlands of rainfed and arable lands, non-arable lands, rainwater harvesting and settlement areas and irrigation system areas - both gravity and pumped).
- Assist with project preparation to feed into national and regional investment priorities.

C.2 Improved water management

Aim: *Improved management is expected to lead to increased efficiency and more sustainable use of land and water, and to have positive impacts on water distribution, quantity, quality, equity and timeliness.*

Identified Constraints:

- Low levels of water use efficiency restrict irrigable areas.

- Low water use efficiency adversely affects some sectors within communities (tailenders, poorer farmers).

- Inadequate adjustment to changing water availability due to climate change.

Activities (Link with E)**:**

- Improve water service delivery and link to payment of Irrigation Service Fees.
- Improve on-farm water management to raise productivity and efficiency of water use.
- Identify approaches and training to reduce water use at both off-farm and on-farm levels.
- Increase participation by water users and stakeholders in water management.
- Develop an integrated approach to planning, implementation and management of irrigation and drainage improvements.
- Identify measures to increase fee payment by water users to ensure adequate MOM such that systems do not deteriorate after investments in rehabilitation and/or upgrading.
- Examine experiences in other Nile Basin countries (such as Tanzania) to ensure that all water users are licensed and that water charges are introduced to pay for the services provided[3].
- Ensure that stakeholder participation in water management takes place not only at the higher level of decision-makers, but also at a local level for all scales of development[4].
- Prepare an awareness programme for users on the need to pay for the costs of services provided in getting water from the source to the point of use.
- Ensure that interventions relating to licensing/water pricing are coupled with investments to improve service delivery to the farmer's field.
- Identify means to introduce River Basin Management, using lessons learnt from other countries in the Nile Basin (such as the River Basin Management Smallholder Irrigation Improvement project in Tanzania).
- Link with training and strengthening of WUAs (E).
- Propose means for establishing national and regional early warning systems, public preparedness and other disaster management measures.

D Training, Capacity Building and Networking

Overall Aim: *To improve institutional and professional capacity, as well as sharing of information within the Nile Basin countries, to enhance sustainability of interventions*.

D.1 Institutionalisation of knowledge and experience sharing with users in Nile Basin

Aim: *To make sure that the region is better equipped to implement new programmes under ENTRO, NELSAP and other programmes by National Governments for rehabilitation of I&D, and new WH & I&D projects* and that institutional memory is improved and resistant to changes in governments and staff.

Identified Constraints:

[3] Both at River Basin level (River Basin Water Charges) and at scheme level (Scheme/WUA charges).
[4] Large Scale irrigation; Medium and Small Scale Irrigation; Water Harvesting.

- Lack of information exchange between organisations and between countries in the Nile Basin.
- International organisations with national representative bodies, such as ICID, do not link closely enough with other national organisations in the Basin.
- Lack of partnerships between private sector, government agencies and others to work together on development of irrigation and water harvesting.
- Reports, manuals and guidelines often not available after projects completed due to changes in staff, hostilities or other reasons.
- Successful project experiences and useful design guidelines and manuals are not shared with similar projects and organisations in other Nile Basin Countries.

Activities:

- Establishment of website for sharing material.
- Establish academic or other institute(s) as library, together with finance for staff.
- Link Basin training/academic institutions.
- Link with other proposed interventions (A, B, C & E).
- Develop processes for collection and storing of design materials, guidelines, manuals, etc.
- Ensure Donors utilise and make available to others, regional experiences and project outputs deriving from their funding across the Nile Basin countries.
- Strengthen existing organisations (ICID, RWHA, etc.) to create National and Regional knowledge sharing programmes.
- Establish Nile Basin Research Group.
- Establish Water Harvesting Network.
- Establish Register of Regional Expertise in I&D and WH.

D.2 Mainstream of training institutions into I&D and WH activities in the Nile Basin

Aim: *To ensure that new professionals are more appropriately trained, and have the opportunity to gain practical experience. In addition that research is carried out on a routine basis, into those aspects that Government or others do not have time or suitable staff to carry them out under routine works programmes.*

Identified Constraints:

- Formal training does not keep pace with demands of Government, the private sector, NGOs.
- Inadequate use made of skills available in training institutes by on-going projects.
- Training and research institutes not adequately equipped with documents - guidelines, manuals, etc.

Activities:

- Identify and finalise cooperating institutions in the Nile Basin.

- Review curricula to match course material to field needs.
- Relate training to demands of practitioners in the field (government, private sector, etc.).
- Include water harvesting in extension training and curricula of universities.
- Institutionalise field placements for students (both undergraduate and post graduate).
- Strengthen institutions to support improvements in irrigation, drainage and water harvesting.
- Identify opportunities for research in I&D and WH.
- Prepare guidelines to establish practical training/ capacity building programmes for districts and communities.
- Link with training and strengthening of WUAs (E).
- Define actions to be considered at grassroots level to increase greater awareness and understanding on the urgent need for efficient water use and/or improved productivity.

D.3 Improve the profile of Water Harvesting

Aim: *To improve the profile of WH within the Nile Basin, and ensure that planners, decision makers and village communities are more aware of the options available and that adequate support and finance is provided to include them in appropriate projects and programmes.*

Identified Constraints:

- Lack of government awareness and support for water harvesting.
- Lack of awareness and knowledge of available water harvesting techniques.
- Lack of awareness of benefits of water harvesting.
- Low profile of water harvesting in some countries.
- Lack of enabling legislation for water harvesting.
- Lack of institutional and organisational support for water harvesting.

Activities:

- Further and more complete cataloguing of best practice experiences and successes.
- Identify the characteristics that influence best practices in relation to agricultural regions/conditions in each country within the Basin.
- Develop manuals for professional staff, technicians and field level extension workers utilising current Reports (WH report Parts I & II).
- Develop standard training materials and manuals for the training of staff at all levels in WH technologies and processes for planning and implementation (WH report Parts I & II).
- Develop information packs comprising a series of menus of detailed, costed options for beneficiaries to aid in decision making.
- Identify best practice sites and present to decision makers, planners, practitioners and beneficiaries (link with A on benchmarking).
- Widely disseminate available techniques and conditions under which they are successful.

D.4 Encourage the wider adoption and uptake of Water Harvesting technology

Aim: *To ensure that all exponents of Water Harvesting properly understand all aspects of WH techniques, and are equipped with sufficient information and knowledge to adequately brief communities, so that they can chose the most appropriate solutions for their community and site conditions.*

Identified Constraints:

- Insufficient adaptation of rainwater harvesting for domestic drinking water and backyard crop cultivation in rural areas.
- Women and children are those most affected, as they are the prime water fetchers.
- Limited use made of rainwater harvesting techniques for vegetative cover and for livestock watering.
- Limited use of water harvesting techniques for improving and conserving water.
- Research/dissemination tended to ignore underlying reasons for poor WH uptake.
- Need to make more use of rainwater harvesting to compensate for changing climate and rainfall patterns.

Activities:

- Establish links with planners, decision makers and politicians using information available under other activities to illustrate achievable benefits and successes.
- Create awareness programmes through media and extension services using information and leaflets (Link with Training Support proposal).
- Ensure that water harvesting is included in all national water legislation frameworks and is high on the agenda for all governments and donors.
- Clearly define responsibilities for water harvesting and irrigation and drainage.
- Facilitate exchanges between countries and sites so that decision makers and politicians have wider understanding of WH benefits.
- Facilitate site visits within each riparian country for the in-service training of planners, designers and field staff.
- Adopt procedures that allow target groups to see for themselves the options available and to talk with the beneficiaries directly.
- Encourage adoption of water harvesting techniques for improving and conserving water, and the adoption of rainwater harvesting for domestic drinking water in rural areas, and for backyard crop cultivation from storage.
- Provide suitable material and training for extension staff and schools, so that farmers and their children are informed of the full range of options available and the conditions under which they have proved successful.
- Mainstream activities and support into Governments' development and training programmes.

D.5 Institutional development and capacity building

Aim: *To use established institutions within the Nile Basin for the benefit of all countries*

Identified Constraints:

- Lack of partnerships between established organisations in the Nile Basin countries.
- Lack of partnerships between different stakeholder groups.
- Lack of involvement of environment and public health organisations.
- Insufficient structured in-service training.

Activities (Link with D.2)**:**

- Establish a training programme to ensure that adequate professional capacity is available in each country for effective, accelerated and sustainable irrigation and water harvesting developments.
- Identify measures to strengthen potential cooperating institutions in each Nile Basin country to enable them to support improvements in irrigation, drainage and water harvesting.
- Prepare training guidelines and materials for use by member states in order to institutionalise practical training/capacity building within the Nile basin countries;
- Establish clearly defined objectives, roles and responsibilities for those institutions involved.
- Establish list of implementation service providers from the most competent and cost-effective sources, considering local contracting capacity and the respective strengths, weaknesses and accountability of public, private and NGO sectors.
- Define deliverables, time scales and exit strategies.

E Formation and Support to Water Users Associations

Overall Aim: *To improve sustainability and capacity of Water Users Associations and hence Community Management within the Nile Basin countries*.

E.1 Water Users Associations

Aim: *To improve the establishment of WUAs through utilising existing practical experience and knowledge within the Nile Basin Countries*.

Identified Constraints:

- Lack of legal framework (different forms – Co-op, company laws, etc).
- Insufficient experience in formation and establishment of WUAs.
- Poorly defined roles and responsibilities.
- Insufficient transparency and accountability.
- Unclear procedures and requirements for transferring of responsibilities from government to WUAs.
- Insufficient linkages of WUAs with other related services.

- Lack of attention to and understanding of requirements for successful use of Irrigation Service Fees (ISF).
- Designs often inappropriate for farmer management of schemes and aimed to be managed by skilled technicians.

Activities:

- Exchange visits to countries such as Sudan and Tanzania that have established supporting framework and considerable relevant experiences in establishment of WUAs.
- Harmonise existing legal frameworks and encourage exchange of laws and statutes between Nile Basin countries.
- Establish adequate legal basis for communities to participate in I&D scheme MOM.
- Set up at national level WUAs laws and bylaws under existing laws or new laws.
- Establish national and regional WUA supporting units.
- Capacity building – training.
- Increase advocacy for WUAs.
- Establish procedures for rehabilitation, upgrading and management transfer appropriate in each country.
- Develop strategic plan, guidelines and budgeting for O & M.
- Establish procedures for M&E (internal and external) including indicators and benchmarking.
- Establish programme to assist governments with formation and training of WUAs.
- Establishment of WUAs curricula in Higher Learning Institutions.

E.2 Community involvement

Aim: *To ensure that WUAs are established on all CBSSI and WH sites to ensure full community involvement and management and utilising successful experiences within the Basin.*

Identified Constraints:

- Lack of involvement of communities in the management of CBSSI and WH schemes.
- Lack of understanding of processes required to involve communities in management.
- Lack of understanding of communities' needs.
- Lack of knowledge sharing between communities and concerned organisations and between communities and other communities.

Activities:

- Increase awareness and understanding amongst politicians and senior government personnel of processes/ procedures required for formation/ establishment of viable and effective WUAs.
- Involve water users in all aspects (Planning, design, construction, operation, maintenance, M and E) at all levels of the irrigation system.
- Establish procedures for the establishment of WUAs for all levels of water harvesting and irrigation activities from planning through to implementation (including rehabilitation).
- Make available information on WUA formation, statutes and by-laws (Link with A).
- Carry out training in management, operation and maintenance during construction period.

- Provide links to organisations and projects that have been involved in the formation, establishment and support of WUAs.
- Facilitate visits to relevant schemes within the Nile Basin to learn about successful WUA development.
- Provide regular & continued support (technical and institutional) and guidance through WUA support units to operate and maintain the systems (services delivery, equity, bookkeeping, transparency, communication, etc).
- Provide feedback information into Basin-wide database on WUA formation and support.
- Prepare appropriate training programmes for upgrading and ongoing support to WUAs.