

Nile Basin Initiative
Shared Vision
Program

**EFFICIENT WATER
USE FOR
AGRICULTURAL
PRODUCTION**

PROJECT DOCUMENT

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*Council of Ministers of Water Affairs of
the Nile Basin States*

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ABBREVIATIONS AND ACRONYMS

CIDA	Canadian International Development Agency
DRC	Democratic Republic of the Congo
ENSAP	Eastern Nile Subsidiary Action Program
ESW	economic and sector work
ET _p	potential evapo-transpiration
FAO	Food and Agricultural Organization of the United Nations
GDP	gross domestic product
ha	hectare(s)
ICARDA	International Center for Agricultural Research in the Dry Areas
ICCON	International Consortium for Cooperation on the Nile
ICRAF	International Center for Research in Agroforestry
ICRISAT	International Crops Research Institute For the Semi-Arid Tropics
IFAD	International Fund for Agricultural Development
IMT	irrigation management transfer
IPP	Irrigation Improvement Project (Egypt)
ISF	irrigation service fee
IWMI	International Water Management Institute
JICA	Japanese International Cooperation Agency
km ²	square kilometers
LVEMP	Lake Victoria Environmental Management Project
mm	millimeters
m ³	cubic meters
NBI	Nile Basin Initiative
NELSAP	Nile Equatorial Lakes Region Subsidiary Action Program
NGO	non-government 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
O&M	operations and maintenance
PMU	project management unit
ppm	parts per million
RELMA	regional land management unit
SAP	Subsidiary Action Program
SIDA	Swedish International Development Agency
SVP	Shared Vision Program
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
WUA(s)	water users association

Please note that all dollar figures are current U.S. dollars unless indicated otherwise

PREFACE

In an historic effort, the ten countries of the Nile have come together within the Nile Basin Initiative to realize a shared vision *‘to achieve sustainable socio-economic development through the equitable utilization of, and benefit from, the common Nile Basin water resources.’* Recognizing the tremendous benefits that can be reaped from cooperation, yet fully aware of the challenges ahead, the Nile countries have embarked on a remarkable journey to translate their shared vision into concrete activities and projects that will build confidence and capacity across the basin (the *Shared Vision Program*), as well as initiate concrete investments and action on the ground at local levels (*Subsidiary Action Programs*).

Presented herein is one of the projects within the Shared Vision Program. The full project portfolio includes:

- Nile Transboundary Environmental Action
- Nile Basin Regional Power Trade
- Efficient Water Use for Agricultural Production
- Water Resources Planning and Management
- Confidence-Building and Stakeholder Involvement (Communications)
- Applied Training
- Socio-Economic Development and Benefit-Sharing.

As a whole, the Shared Vision Program aims to create an enabling environment for cooperative development and management. Though each project is different in focus and scope, all contribute to building a strong foundation for regional cooperation by supporting basin-wide engagement and dialogue, developing common strategic and analytical frameworks, building practical tools and demonstrations, and strengthening human and institutional capacity.

The seven projects of the Shared Vision Program build upon each other to form a coordinated program. They address the major water-related sectors and cross-cutting themes deemed critical by the Nile riparians to ensure an integrated and comprehensive approach to water resources development and management, and that this development serves as a catalyst for broader socio-economic development and regional cooperation. Together, the projects of the Shared Vision Program seek to forge a common vision for – as well as build the capacity to achieve - the sustainable development the River Nile for the benefit of all. They pave the way for the realization of investments on the ground through the Subsidiary Action Programs.

The detailed preparation of the Shared Vision Program was accomplished through a unique, multi-country, multi-sectoral and highly participatory process led by the Nile Council of Ministers and Technical Advisory Committee and executed by the Nile Secretariat. More than 70 national experts, including 8 technical specialists from nine countries, were involved in detailed project preparation. For many, it was the first time that they were able to discuss common concerns with their colleagues from neighboring and co-riparian countries. The energy and hope for the future engendered by this preparation process were a visible demonstration of the power of cooperation, strong riparian ownership, and the commitment of the Nile countries to jointly pursue their common goal.

But the preparation of the Shared Vision Program is just a beginning. Implementing these projects and ensuring that tangible benefits are realized is the next challenge. It is a challenge which requires deepening partnerships with the international development community. Promoting cooperation among the countries of the Nile will inherently be a complex process. However, such cooperation is essential if sustainable development and management of the Nile is to be achieved.

1. SUMMARY

This proposal for a project on efficient water use for agricultural production was developed under the Shared Vision Program of the Nile Basin Initiative. The objective of this project is to provide a sound conceptual and practical basis for Nile riparian countries to increase the availability and efficient use of water for agricultural production. This is in keeping with the vision articulated by the Nile riparians: "to achieve sustainable socio-economic development through equitable utilization of, and benefit from, the common Nile Basin water resources." The project will do so through the establishment of a regional forum of experts involved in agricultural water to address issues related to efficient water use in the Nile Basin. The exchange of experiences will further Nile cooperation by enhancing mutual confidence and providing a critical building block to sustainable utilization of Nile waters.

Themes of a basin-wide regional relevance that will be addressed through the project have been identified by national experts and include watershed management, community-managed irrigation development, and public irrigation. The project has two main components:

Regional Consultations and Training. Consultations and training at the regional level will provide the opportunity to jointly review roles and challenges in increasing water use and efficiency for agricultural production, and to study concepts and practices which are currently being implemented. National consultations are expected to link the regional findings back to the national level.

Demonstration, Pilots, and Regional Exchange of Experience. The exchange of experience among member countries and the study of good practices on technical, institutional, financial, and environmental issues of water use for agricultural production will foster an atmosphere of collaboration among water related experts.

The project will not only enhance individual and institutional capacity to address issues related to efficient water use for agriculture, but also have large but immeasurable benefits in building intra-riparian cooperation and confidence by establishing a forum of regional experts. This forum is expected to play a lead role in developing a common culture of good practice and collaborative and equitable development of agricultural water. The estimated cost of the two components under this project is \$5 million.

Project Preparation. This project was developed by representatives of the riparian countries through a complex, multi-country, participatory process. National experts from each of the Nile Basin countries worked with members of the Nile Basin Initiative Technical Advisory Committee (Nile-TAC) and the Nile Basin Initiative Secretariat (Nile-SEC) to conduct national-level reviews and to contribute substantively to the preparation of project documents. This project document reflects riparian perspective on national and regional needs, project components which are deemed to be implementable and confer real benefits, and a project design based on lessons learned from other related projects in the region. The participatory project preparation process demonstrates riparian ownership and commitment to successful project implementation.

2. PROJECT DEVELOPMENT OBJECTIVE

2.1 Project Development Objective

Project Objective. The objective of this project is to provide a sound conceptual and practical basis for Nile riparian countries to increase the availability and efficient use of water for agricultural production.

In line with the NBI Shared Vision, this objective implies that the overall goal of the project is to increase the availability and efficient use of water for agricultural production in support of sustainable socio-economic development in the Nile Basin countries. However, recognizing the limits of a basin-

wide project, the *focus* is expected to be on the provision of a “conceptual and practical basis” for Nile riparian countries for more efficient water use in agriculture.

Agricultural Water Use Efficiency. This can be defined in a variety of ways. A first definition is technical in nature, and focuses on the amount of water abstracted relative to the amount of water consumed by a crop. Losses are the amounts of water that have been abstracted above the crop water requirements. However, under a system perspective, losses at one point in the system could be used again in another place. The agronomic definition of efficiency focuses on the amount of crop produced per unit water. According to this definition, losses are the amounts of water that have not contributed to additional production of biomass within the system. A third, economic definition of water use efficiency emphasizes the productivity of water in terms of “value generated per unit water,” and seeks a water allocation to highest value uses within the system (allocative or economic efficiency). Losses are those amounts of water that could have been used in a more productive way.

Efficiency in this Document. The primary focus of this project document is on agronomic water use efficiency in the sense of increased value of agricultural production or “more crop per drop.” This is reflected by the priority themes of the country reports prepared by national experts in Basin countries that are summarized in Box 1. The working hypothesis is that a project focusing on increasing water availability and its efficient use could lead to increased agricultural production. The primary opportunities identified are to better manage watersheds, to enhance productivity of rain-fed agriculture, to identify options for development of community-managed irrigation schemes, and to improve management of public irrigation systems, while at the same time strengthening government institutional capacity. The riparian countries at a later stage might decide to widen the perspective to include considerations of economic efficiency across the Basin.

Box 1. Possible Project Themes Based on Country Reports

- Formulate and implement appropriate government policies
- Enhance participation of water users and other private sector in development and management of water resources for agriculture
- Promote capacity-building programs, both for government and private sector institutions
- Identify and evaluate options for more efficient utilization of rainfall and runoff in upper catchment areas
- Identify options for improving the productivity of rain-fed agriculture, and for decreasing year-to-year variation in production
- Identify and evaluate options to reduce water losses in irrigation systems
- Identify and promote options for enhancing quality of natural resources by addressing environmental problems of deforestation, soil erosion and sedimentation, salinity, etc.
- Identify options for decreasing water consumption in the agricultural sector.

2.2 Performance Indicators

Expected long-term outputs of the project and associated indicators are:

The first output will be an enhanced enabling environment for sustainable watershed management and increased productivity by improved watershed management. Key indicators are the number of improved watershed management activities identified and implemented and the related increase in productivity.

Secondly, the project will result in an enhanced enabling environment for community-managed irrigation development and increased agricultural production. Appropriate performance indicators related to this output include the number of options for community-managed irrigation development towards increased agricultural production.

Finally, the project will review options for reform in publicly managed irrigation and implement appropriate pilots implemented that demonstrate improved system performance. This includes exploration of options for irrigation development. Performance indicators for this output will include

the number of options for publicly managed irrigation reform towards improved system performance and increased reliability of water supply reviewed and piloted.

3. STRATEGIC CONTEXT

3.1 The Nile Basin Initiative (NBI)

The Nile Basin. The Nile River, the longest river in the world, traverses more than 6,700 kilometers from its farthest point at the headwaters of the Kagera River in Rwanda to its delta in Egypt on the Mediterranean Sea. Ten countries share the Nile: Burundi, Democratic Republic of Congo (DRC), Egypt, Eritrea, Ethiopia, Kenya, Rwanda, Sudan, Tanzania, and Uganda. The Nile River Basin covers 3 million km²—one tenth of Africa’s total land mass. It serves as home to world-class environmental assets, such as Lake Victoria (the second largest fresh water body by area in the world) and the vast wetlands of the Sudd. It also serves as home to an estimated 160 million people within the boundaries of the Basin; while nearly twice that number—roughly 300 million—live within the ten countries that share the Nile waters.

Challenges and Opportunities. Despite the extraordinary natural endowments and rich cultural history of the Nile Basin, its people face considerable challenges. Today, the Basin is characterized by poverty, instability, rapid population growth, and environmental degradation. Half the Nile riparian countries are among the world’s ten poorest. Population is expected to double within the next 25 years, placing additional strain on the scarce water and other natural resources. Yet the Nile holds significant opportunities for win-win development that could enhance energy availability, food production, transportation, industrial development, environmental conservation, and other related development activities in the region. Cooperative water resources management might also serve as a catalyst for greater regional integration, both economic and political, with benefits far exceeding those derived from the river itself.

Towards a Long-Term Legal and Institutional Framework. Aware that forward movement on Nile cooperation requires a development focus, a permanent institution, and agreement on core legal principles, the Nile riparians established a forum to facilitate a process of legal and institutional dialogue in 1997. In early 2000 a panel of experts, including senior government lawyers and water resources specialists from each country, produced a draft text of a “Cooperative Framework.” This draft Framework has moved the riparians a long way and important compromises have been reached. However, some key issues remain to be resolved, and the Council of Ministers agreed in August 2000 to extend the process to further dialogue on outstanding issues. The United Nations Development Programme (UNDP) has pledged its continued support to the process—a process which by its very nature requires time and effort.

The Nile Basin Initiative. Recognizing the need to take concrete steps to realize the development potential of the Nile while the dialogue on a permanent legal and institutional framework continues, the Nile riparians took an historic step towards cooperation in the establishment of the Nile Basin Initiative (NBI). Formally launched in February 1999, the NBI is a transitional institutional mechanism that includes all riparians and provides an agreed basin-wide framework to fight poverty and promote economic development in the region. The Initiative is guided by a shared vision “to achieve the sustainable socio-economic development through the equitable utilization of, and benefit from, the common Nile Basin water resources”¹ and a set of policy guidelines which provide a basin-wide framework for cooperative action. The NBI is comprised of a Council of Ministers of Water Affairs of the Nile Basin (Nile-COM), a Technical Advisory Committee (Nile-TAC), and a Secretariat (Nile-SEC) located in Entebbe, Uganda.

A Strategic Action Program. To translate the NBI’s shared vision into action, a strategic action program has been launched to identify and prepare cooperative projects in the Basin. The Program

¹ Council of Ministers of Water Affairs of the Nile Basin States, *Policy Guidelines for the Nile River Basin Strategic Action Program*, February 1999.

consists of two complementary sub-programs, a Shared Vision Program (SVP) of technical assistance and capacity-building-type projects to be implemented basin-wide to create an enabling environment for cooperative development and Subsidiary Action Programs (SAPs) carried out by smaller groups of Nile riparians, comprising physical investments at the sub-basin level.

The basin-wide Shared Vision Program currently includes seven projects. Four of these are thematic in nature, addressing issues related to environmental management, power trade, efficient water use for agriculture, and water resources planning and management. The remaining three are facilitative, supporting efforts to strengthen confidence-building and stakeholder involvement, applied training, and socio-economic development and benefit-sharing.

Two Subsidiary Action Programs have formed. The Eastern Nile (EN-SAP) currently includes Egypt, Sudan and Ethiopia, while the Nile Equatorial Lakes Region (NEL-SAP) includes the six countries in the southern portion of the Basin, as well as the downstream riparians Sudan and Egypt. These subsidiary groups have identified joint investment projects which warrant further investigation and preparation.

Riparian Consultative Process. The Nile-COM is the main policy and guidance forum for Nile Basin cooperation. Important roles of the Nile-TAC are to coordinate joint activities and establish working groups as needed to accomplish specific tasks. The Nile-TAC is responsible to the Nile-COM for the preparation of the Shared Vision Program, which will be coordinated and implemented at the basin-wide level. While the Nile-TAC is to promote the establishment of working groups of concerned countries to identify Subsidiary Action Program projects at the sub-basin level, the responsibility for Subsidiary Action Programs will rest with the involved riparians. Throughout the process, high priority will continue to be placed on strengthening the process of consultation in order to build trust and confidence. Figure 1 below illustrates how country activities will take place within sub-basin frameworks, which will occur within the broader context of the basin-wide framework. The basin-wide framework also includes an "international discourse" to promote international support for the sustainable development and management of Nile waters.

International Consortium for Cooperation on the Nile (ICCON). An International Consortium for Cooperation on the Nile (ICCON) is being established to support the NBI's Strategic Action Program. Its first meeting is scheduled for June 2001. The ICCON will be a unique forum, organized by the World Bank at the riparians' request, and envisioned as a long-term partnership of the riparian states and the international community. The first meeting of the ICCON will seek to raise funding for a portfolio of basin-wide Shared Vision Projects and the preparation of projects identified under the Subsidiary Action Programs. The first ICCON meeting will also celebrate cooperation and demonstrate international solidarity for cooperative development in the Nile Basin.

Partnerships. Support for the Nile Basin Initiative has been characterized by partnership since it began. The initial partners comprised the World Bank, the United National Development Programme (UNDP), and the Canadian International Development Agency (CIDA). These initial 'cooperating partners' played the role of concerned facilitators, assisting the process of dialogue. As the NBI moved into the preparation of the Strategic Action Program, the governments of Denmark, Finland, Germany, Italy, the Netherlands, Norway, Sweden, the United Kingdom, and the United States, together with the Food and Agriculture Organization (FAO) and the Global Environmental Facility (GEF), actively supported the Initiative, directly or through World Bank trust funds. With the first ICCON, the circle of partners will widen as the international development community commits further support for Shared Vision Projects and for preparation of Subsidiary Action Projects.

Summary. The NBI provides a transitional institutional mechanism, an agreed vision and basin-wide framework, and a process to facilitate substantial investment in the Nile Basin to realize regional socio-economic development. The NBI represents deep commitment by the Nile riparian countries to foster cooperation and sustainable development of the River Nile for the benefit of all.

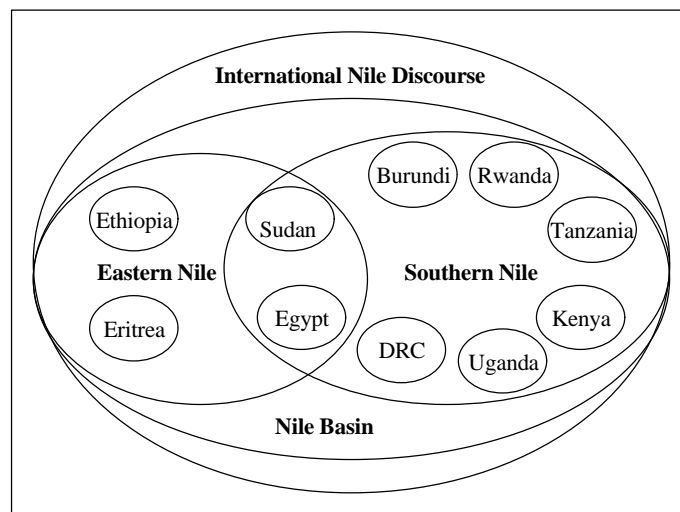


Figure 1. An Illustration of Possible Levels of Nile Cooperation

3.2 NBI Guidelines and Project Goals

The policy guidelines² adopted by the NBI's Council of Ministers of Water Affairs (Nile-COM) in February 1999 further define the primary objectives of the NBI. These objectives are:

- To develop the water resources of the Nile Basin in a sustainable and equitable way to ensure prosperity, security, and peace for all its peoples
- To ensure efficient water management and the optimal use of the resources
- To ensure cooperation and joint action between the riparian countries, seeking win-win gains
- To target poverty eradication and promote economic integration
- To ensure that the program results in a move from planning to action.

This project contributes to achieving the goals of the NBI by addressing issues related agricultural water use. Agriculture is the main water using sector in the Basin, and issues related to agricultural water use are expected to figure high on future management plans by countries. These issues also directly affect the daily lives of the majority of the people living in the Basin. To-date no basin-wide mechanism exists for exchange among practitioners, technocrats, and decisionmakers within the sector. This project therefore seeks to provide an avenue within the NBI strategic action program to begin to address these issues.

3.3 Main Sector Issues and the Nile Strategic Action Program

The country reports by national experts (see also Section 8) have identified several institutional, technical, environmental, and economic/financial constraints related to increasing available water for agriculture and its efficient use. The analysis of the national reports has been synthesized in Annex B. Table 1 summarizes issues and strategic options proposed by the countries.

The agricultural sector in the Nile Basin countries accounts for 80% of all water use in the Basin. Despite large differences in climatic conditions, and despite the fact that interests across the Basin may vary, it appears that Nile Basin countries face a number of common concerns. In general terms, the agricultural sector is characterized by its high economic importance, dominance of subsistence agriculture, a high variance of rainfall, and a related low productivity of rain-fed agriculture. In most countries, irrigation facilities and storage for agricultural water use are limited, while sedimentation

² *Policy Guidelines for the Nile River Basin Strategic Action Program*, Council of Ministers of Water Affairs of the Nile Basin States, February 1999.

and the related problem of maintenance pose serious threats to the long-term sustainability of investments. This is aggravated by poor investments and O&M cost recovery from farmers. Excessive use of agro-chemicals as well as water pollution, deforestation, and soil erosion are the most serious environmental problems. In addition, a number of institutional weaknesses appear to exist: lack of operational policy, unclear roles of private and public sector involvement, and need for capacity-building are among the most important ones. In particular, the absence of a regional forum for exchange of experiences in the field of agricultural water use was identified as a priority issue. As a result, regional knowledge, expertise, and experience are not sufficiently being utilized.

3.4 Sector Issues to be Addressed by the Project and Strategic Choices

The main technical, institutional, economic, and environmental challenges and opportunities are discussed separately for the three water-using agricultural sub-sectors:

- Watershed management
- Community-managed irrigation development
- Management of public irrigation.

The analysis seeks to answer the following questions:

- With respect to which issues would a basin-wide approach have an added value?
- How can the selected issues be addressed? What are possible mechanisms for finding solutions to the problems that have been identified?
- On the basis of previous experiences, what are the lessons learned, and what are the best practices?

Watershed Management

The Problem. All country reports emphasized the problems resulting from poor management of watersheds in the equatorial Nile Basin countries and in the Ethiopian plateau. The catchment highlands are densely populated and intensively used for farming and animal grazing. Poor farming practices on steep lands and uncontrolled grazing has led to excessive deforestation and removal of vegetative soil cover. As a result, much of the rainfall turns into runoff and is not effectively utilized for agriculture. In addition, the runoff causes soil erosion, decline in soil fertility, sedimentation in downstream irrigation systems, and flash floods, which further exacerbate the low productivity of rain-fed agriculture, a common concern in the equatorial Nile Basin countries.

Most problems associated with watershed management are of a transboundary nature, and need a regional perspective for the identification of solutions. There is no regional forum for the discussion and exchange of experience between Nile Basin countries national experts. In addition, many recent developments in the field of watershed management are particularly innovative, both in terms of approach as well as activities. However, in the absence of sufficient contact among fellow practitioners and policy makers, new developments go unnoticed, and important learning opportunities are lost.

Challenges. Most country reports mention a large potential for stabilizing and improving crop production and rangeland carrying capacity by better management of watersheds, in particular because good watershed management practices are also effective in conservation of rainwater and its effective use for agriculture. Biological methods, including forestation and restoring the vegetative soil cover, decrease runoff by promoting infiltration of rainwater into the soil. Physical technologies for good watershed management, such as terraces and storage ponds, also help to conserve rainwater and play an important role in making rain-fed agriculture less dependant on erratic rainfall. In addition to direct rainfall, there are a number of other options to increase water supplies for agriculture. In several countries, numerous Nile and non-Nile streams could be developed for small-scale irrigation.

Table 1. Synthesis of Main Issues and Strategic Options

ISSUES TO BE ADDRESSED		
<p>Technical/ Environmental</p> <p>Excessive deforestation of catchments and resulting soil erosion</p> <p>Inadequate management of watersheds: rainfall/small streams not well utilized, excessive use of agro-chemicals, deforestation, and soil erosion</p> <p>Low and erratic productivity of rain-fed agriculture</p> <p>Inadequate irrigation system O&M</p> <p>Low performance of irrigation</p> <p>Mismanagement of irrigation, excessive water use, and losses</p> <p>High sedimentation in irrigation system</p> <p>Increasing soil salinity</p> <p>Degradation of water quality due to urban discharges</p> <p>Inadequate development and use of wetlands</p> <p>Lack of data</p>	<p>Institutional</p> <p>Low capacity of government institutions</p> <p>Low institutional capacity to address technical, institutional, and financial aspects of efficient agricultural water use</p> <p>Lack of departmental coordination</p> <p>Lack of government support services (extension, research, etc.)</p> <p>Lack of trained personnel</p> <p>Inadequate research and extension</p> <p>Inadequate information and data for planning</p> <p>Lack of water user/community and private sector participation in irrigation</p> <p>Low participation of water users in irrigation system O&M</p> <p>Lack of ownership rights in irrigation systems</p>	<p>Economic/Financial Issues</p> <p>Poor cost recovery for O&M</p> <p>Lack of public funds and cost recovery from users</p> <p>Low financial capability for proper irrigation O&M</p> <p>Lack of credit sources for farmers</p> <p>Absence of incentives for efficient water use</p>
STRATEGIC OPTIONS		
<p>Improved Watershed Management</p> <p>Encourage community participation and extension to promote land and water conservation practices</p> <p>Promote forestation and vegetative land cover</p> <p>Promote appropriate crop cultivation and livestock grazing practices through community extension and training programs</p> <p>Identify and demonstrate technologies for rain harvesting, e.g., capturing water from streams to support small-scale irrigation</p> <p>Promote proper use of agro-chemicals to reduce water pollution</p>	<p>Improved Community-Managed Irrigation Development</p> <p>Develop small-scale irrigation by harvesting rainfall and water from streams</p> <p>Identify strengths and weaknesses of public and private sectors in promoting and supporting local community-based efforts</p> <p>Promote private sector and local community roles in agriculture and water resources development, including water users associations</p> <p>Formulate and implement policy reforms that provide incentives for efficient and sustainable use of land and water resources (water use fees, cost recovery mechanisms, etc.)</p> <p>Strengthen performance monitoring, data collection, and its use in planning and management of natural resources</p> <p>Improve agricultural land and water management in the wetlands</p> <p>Identify proper drainage and irrigation infrastructure, develop and implement laws that define land ownership and procedures for using wetlands, and train farmers in the use of wetlands for agriculture</p>	<p>Options for Reform of Public Irrigation and for Irrigation Development</p> <p>Studies to identify and demonstrate effective cost recovery mechanisms to finance irrigation O&M</p> <p>Develop and strengthen water users associations for irrigation system O&M</p> <p>Rehabilitate aging irrigation infrastructure, especially in Sudan and Egypt, to reduce water losses</p> <p>Promote efficient crop selection and management practices</p>

Experiences. In order to exemplify the importance of watershed management and integrated approaches, it may be helpful to briefly review the experiences of the Fanya Yuu project in Tanzania. Fanya Yuu (“throwing soil uphill” in Swahili), is a technique that has been used in East Africa for many years, and involves the digging of small contour trenches, the spill of which is thrown uphill. This soil slightly reduces the uphill slope, and therefore the velocity of runoff water. Over time, the field

immediately uphill of the trench levels out through sedimentation. In this way, terraces are made naturally and much less labor is required. The Fanya Yuu was successful because farmers realized that labor investments were returned within 1.5–2 years, even though initial labor investments were high as compared with the alternative of planting fodder grasses along lines. The technique allowed farmers to not only grow fodder, but also beans and fruit trees.

The relevant lesson to draw in this context is that rainwater harvesting development based on water capture from runoff streams is intimately connected to the condition of watersheds and related management practices, in particular from a farming system perspective. As a consequence, the issue of improving rain-fed agriculture must essentially be addressed in concert with proper management of watersheds. This is recognized by country reports, most of which emphasize the urgent need to improve the existing condition of watersheds and initiate better management practices in direct relationship with the issues of land insecurity and land tenure.

Opportunities. Improving watershed management contains a number of important win-win opportunities for upstream and downstream users alike, both on a national and on an international level. Development activities for improving watersheds and rainwater harvesting, such as forestation and constructing small reservoirs, will need effective coordination among several government agencies (forestry, water resources, etc.), and between countries. Common decisionmaking bodies for watershed users, at present absent, should be established so as to provide a forum for discussion. Experiences by countries need to be exchanged, and best practices documented and disseminated. Also, staff involved need to be trained so as to create a favorable environment for coordination and cooperation in the Nile Basin.

Community-Managed Irrigation Development

The Problem. Agriculture in the equatorial countries, Ethiopia and southern Sudan, is almost entirely dependent on rainfall, which is highly variable and erratic. Irrigation facilities are extremely modest and to a large extent limited to private estate plantations. The result is that crops do not receive the right amount of water at the right time, and the productivity of agriculture is low. Rice crop yields of 1.2–1.8 tons/ha are reported, compared with typical rice yields of 6 tons/ha for irrigated cultivation.

Although irrigation has a high potential for intensifying agriculture and increasing agricultural productivity, costs associated with irrigation development are often prohibitively high, more so in Sub-Saharan Africa than in any other region in the world³. With dwindling prices for major staple crops, extensive large-scale irrigation development to meet the challenge of satisfying future food demands will be outside the scope of most Nile Basin riparian countries.

New approaches towards irrigation development need to be identified that do not exclusively focus on infrastructure delivery. As interesting initiatives have been and are being taken on an individual country level, there is a need for intensified regional exchange of experiences between national experts, private sector representatives, and farmers so as to identify and adopt appropriate approaches and to learn from each others' experiences.

Challenges. A large potential exists region wide for increasing the productivity of rain-fed agriculture by improving the reliability and adequacy of water supply. A possible water source would be rainwater harvesting, mentioned in the context of better watershed management. Another option identified in the country reports is to develop irrigation schemes by capturing water from small streams, which are numerous in these countries. Rather than becoming involved in costly small-scale irrigation development themselves, the approach would be for governments to *identify options* for small-scale irrigation development. There are a number of pilot initiatives currently in Africa that encourage private investments in irrigation.

³ See World Bank 1994. *A Review of World Bank Experience in Irrigation*, Washington, D.C.

Experiences. In the Senegal valley, for example, farmers themselves have installed diesel pumps to irrigate land that, technically speaking, was not recommended for irrigation. Nevertheless, from 1976 onwards, over 800 20ha schemes have been successfully developed with a minimum of government interference. In sharp contrast, large-scale, centrally managed, government initiated irrigation in the delta area of the Senegal river was undertaken with major investments and without much success.

If provided with the appropriate enabling environment, farmers themselves are well capable of investing in their own sustainable development. The role of the government should be transformed into being a service provider and facilitator.

Opportunities. Improving community-managed irrigation through the identification of development options addresses a number of issues simultaneously and builds upon local stakeholders and the private sector for developing the small-scale irrigation sector. The question that needs to be answered is how governments, farmers, and the private sector could become instrumental in unleashing the energies available at grass root level for sustainable and farmer-driven irrigation development. Experiences need to be exchanged, and important lessons that have been learned need to be collected, documented, and disseminated among Nile Basin member country stakeholders.

Management of Public Irrigation

The Problem. In government-managed irrigation systems several common concerns have been raised in the country reports. Water users are not actively involved in system O&M, especially at the tertiary level. Although currently, they are required to pay irrigation service fees, cost recovery rates are often extremely poor. Other cost recovery mechanisms are not well developed. The result is that the irrigation systems do not receive proper operation and maintenance, and as such are not productive. Irrigation water deliveries are not properly matched to crop water requirements, and appropriate drainage infrastructure has often not been included in the original design. This results in excessive water loss and related problems of waterlogging and salinity. In addition, due to inflexible and unreliable water supplies, very little use is made of available rainfall in irrigation. Efficiencies are further decreased because farmers grow crops, such as rice and sugarcane that use large amount of water.

Challenges. To respond to these concerns, it may be helpful to review past experiences with these issues. Inadequate O&M is a leading cause of poor performance in most large government-managed irrigation systems. Some of the solutions to O&M problems have been to increase public funding or to initiate payment of user fees. Both approaches have been tried in many countries without much success. Water fees often become part of the general government revenue and are not available for system maintenance. In other cases, allocation of maintenance funds is insufficiently transparent.

Experiences. A relatively successful solution is based on the logic that satisfactory users groups beget satisfactory O&M, which begets satisfactory cost recovery. The Irrigation Management Transfer (IMT) approach takes the next logical step beyond participation; it empowers farmers to take over many system management tasks themselves, while collection and allocation of funds is done in a decentralized and transparent way. The Irrigation Improvement Project (IIP) in Egypt, for example, is currently trying to promote farmers water users associations that can assume responsibility for system O&M at the tertiary level. An outstanding experience outside the Nile Basin is the reform of the Office du Niger, a large-scale previously publicly managed irrigation scheme located in Mali. After transfer of O&M responsibility to local committees, production levels, water fee recovery rates, and maintenance spending have all gone up.

The important lesson here is that the users themselves are better than others at achieving efficient irrigation management. However, mere “involvement” or “participation” is not enough incentive; as much as possible, farmers should be empowered and the irrigation systems turned over to them. This means that the user groups will be given the management (in some cases even the ownership) rights to the system facilities, and the legal authority to recover O&M costs from their members. Legislation

on water users associations must include appropriate provision for payment of fees (who is responsible for payment – owner or sharecropper, possibility to impose fines, and procedures for dealing with defaulters). Irrigation system turnover is a complex process in large-scale publicly managed irrigation systems.

Opportunities. It is clear that the issue of reform of publicly managed irrigation poses a number of challenges that are shared among a number of Nile Basin countries. Important lessons can be learned from other countries in the Basin, provided that a forum exists for the exchange of experiences. Irrigation management transfer is likely to become one of the major issues in the Basin, and has a demonstrated impact on efficient water use.

There is a good understanding in the country reports of the main issues that need to be addressed by the project. What seems to be absent is a regional forum for consultation, exchange of experience, training, and sharing lessons learned among Nile Basin stakeholders. The activities proposed under this project are in the form of studies and consultations that share experiences. For each proposed activity, the role of government, the private sector, and the local communities in the activity needs to be identified.

4. PROJECT SUMMARY

4.1 Project Components

The immediate objective of the project is to create a regional forum to address issues related to agricultural water use in the Nile Basin. In a first phase, the project will address the issues and themes identified during the in-country analysis through two components or types of activities, regional consultation and training, and demonstration/pilots and regional exchange of experience. Possible topics to be addressed under the three themes (watershed management, community-managed irrigation development, and public irrigation management) are presented in Table 2.

Component 1. Regional Consultations and Training

Activity 1.1. Basin-wide consultations/seminars/training in topics related to watershed management, community-managed irrigation development, and public irrigation management

Rationale. Consultations, seminars, and training at the regional level provide the opportunity to jointly review roles and opportunities in increasing water use and efficiency for agricultural production, and to study some of the concepts and practices which are being discussed elsewhere. Topics for consultation may include, but are not limited to:

- Public-private sector roles in watershed management, community-managed irrigation development, and management of public irrigation
- Management transfer of natural resources to local communities
- Decentralization and contracting through local communities
- Management transfer and joint management of irrigation infrastructure
- Recovery of O&M and investment costs through user fees
- Role of water users associations (WUA).

The primary addressees of this component will be agriculture and irrigation government officials within the Nile Basin countries, although it is expected that the private sector and community representatives would provide input to these consultations. These regional consultations will raise issues and identify opportunities. As such, they can provide inputs towards, but will not substitute for, national-level policy dialogue (see Activity 1.2).

Approach. The project manager with support of national project coordinators (see Section 4.3) will consult with government officials in the Nile Basin countries and develop a first series of consultations, seminars, and training in priority areas. This will include the development of a

Table 2. Possible Topics to be Addressed by the Project

		POSSIBLE TOPICS		
		WATERSHED MANAGEMENT	COMMUNITY-MANAGED IRRIGATION DEVELOPMENT	MANAGEMENT OF PUBLIC IRRIGATION
COMPONENTS	REGIONAL CONSULTATIONS/TRAINING	Technical aspects of watershed management Public-private sector roles in planning and management of watershed management Management transfer of natural resources to communities Participatory appraisal and diagnostics of catchment degradation	Public-private sector roles in development of community-managed irrigation Cost recovery, service fees for WUAs, and incentives for efficient water use Current use of wetlands and options for sustainable use for agriculture Decentralization and contracting through local communities	Ways to improve water use efficiency Public-private sector roles in planning and management of irrigation systems Management transfer and joint management of irrigation infrastructure Recovery of O&M and investment costs through user fees
	DEMONSTRATION PILOTS AND REGIONAL EXCHANGE OF EXPERIENCE	Terracing, cut and carry for livestock, minimum tillage Green fertilizer (intercropping) Role of empowered communities in watershed management	Rainwater harvesting, spate irrigation, flood control, treadle pumps Role of WUAs in sustainable irrigation	Low water-using technologies O&M cost recovery Improved management of national irrigation boards Role of WUAs in increasing water use efficiency
EXPECTED OUTPUTS		Enabling environment for sustainable watershed management enhanced and increased productivity by improved watershed management demonstrated	Enabling environment for community-managed irrigation development enhanced and increased agricultural production demonstrated	Options for reforms in publicly managed irrigation reviewed and piloted, demonstrating improved system performance, and options for irrigation development explored

curriculum and the identification of possible participants. After execution of a first series of consultations, lessons learned will be reviewed and possible follow-up activities will be recommended.

Products. This activity will deliver, among others, the following products:

- Guidelines for public-private partnership in watershed management
- Manuals for management transfer of natural resources to local communities
- Compilation of case studies for O&M and investment cost recovery
- Methodology of irrigation management transfer to WUAs
- Training curricula in the field of O&M of agricultural water supply schemes.

Activity 1.2. National-level consultations on agriculture/irrigation policy at country request

Rationale. Whereas the primary focus of the project is on regional activities, it will be important to allow for feedback of results of regional consultations into the national level policy and decisionmaking process. The project will therefore provide an opportunity to support national irrigation policy dialogue for those countries that request such support. For this purpose, a drawdown facility will be established through which governments can access support, advice, and assistance in the review and analysis of existing policies and institutions, policy dialogue, and development. The services provided by the facility will be of a support nature only, given that national policy development is a sovereign activity and should therefore be prepared by nationals of the country concerned.

Approach. The project management unit (PMU) will administer limited funds for policy support to countries requesting such support. It will establish criteria for access and rules for its use. In order to access the drawdown facility, countries will have to apply to the PMU, explaining proposed use of the funds, including objectives, activities, and outputs.

Products. The products that this activity is expected to deliver include:

- National-level policy recommendations for addressing issues related to efficient water use for agriculture
- Proposals for national studies to be conducted to complement regional research
- Advise for review and analysis of existing policies related to efficient water use for agriculture
- National contributions to regional projects.

Component 2. Demonstrations/Pilots and Basin-Wide Exchange of Experience

Rather than developing pilot schemes by themselves, the proposed project will at first focus on existing pilots and projects in the Basin. In addition, and on the basis of the outcomes of the first phase, specific options for new pilots will be studied and proposals to that end will be prepared. These will be considered for funding under subsequent phases of the project.

Activity 2.1. Exchange of good practice and experience and identification of project opportunities

Rationale. This activity aims to exchange experience and study good practice on technical, institutional, financial, and environmental issues of water use for agricultural production in watershed management, community-managed irrigation development, and in public irrigation. Possible topics include the following.

In watershed management:

- Terracing, cut and carry for livestock, minimum tillage
- Green fertilizer (intercropping)
- Role of empowered communities in watershed management.

In community-managed irrigation development:

- Rainwater harvesting, spate irrigation, flood control, treadle pumps
- Role of WUAs in sustainable irrigation.

In public irrigation development:

- Low water-using technologies
- O&M cost recovery
- Improved management of national irrigation boards.

These topics will be jointly studied by relevant government officials, and by other public sector and community representatives. Special consideration will be given to the role of gender in project planning and implementation. The project will also identify specific project opportunities for implementation at subsidiary level for example, NBI Subsidiary Action Programs (SAP), and will recommend approaches that would ensure the sustainability of proposed projects.

Approach. The PMU in collaboration with national project coordinators (a) collates and reviews relevant ongoing pilots and full-fledged projects in the Basin, (b) identifies relevant experiences outside the Basin, (c) identifies relevant groups for exchange, (d) organizes exchange visits, and (e) disseminate lessons learned. The PMU will closely collaborate with agricultural working groups within NBI Subsidiary Action Programs, both in terms of good practice and in identification of project

opportunities. The PMU will also consider approaches towards support to demand-driven pilots in the three thematic areas, meeting needs of communities, and ensuring sustainability.

Products. Examples of products include but are not limited to:

- Action plans for promoting low-cost irrigation technology to farmers
- Proposals for pilot projects in the field of terracing and minimum tillage, to be funded under a later phase of the project
- Reviews of best practices in the field of rainwater harvesting and water conservation
- Inventory of projects in the field of irrigation bureaucracy management reform
- Compendiums of lessons learned in empowering communities for watershed management
- Project proposals for possible implementation under SAP.

Activity 2.2. Basin-wide twinning of institutions and exchange visits among WUAs, research institutions and irrigation bureaucracies

Rationale. Most of the Nile Basin countries suffer from insufficient research, extension, and support services to the agricultural sector. This basin-wide project provides an opportunity to pool resources, link ongoing initiatives across the Basin, and eventually, to provide targeted support to fill gaps. It also offers an opportunity to create new partnerships among institutions at various levels, for example among farmer/water users associations, cooperations, research institutes, and others.

Approach. The PMU together with national project coordinators will establish a roster of relevant research institutes, WUAs, government, and private organizations and identify opportunities for twinning, and encourage proposals for joint activities. Based on the roster and consultations, specific institutional gaps will be identified and proposals for support be prepared.

Products. The products that are expected to be delivered under this activity include, for example:

- Letters of agreement between institutions
- Joint work programs between research bodies
- Joint publications by irrigation bureaucracies on experiences with management reform
- Action plans for establishment of umbrella organizations by WUAs.

Outputs. It is expected that the following long-term outputs can be achieved in the three thematic areas identified:

- An enhanced enabling environment for sustainable watershed management and increased productivity by improved watershed management demonstrated
- An enhanced enabling environment for community-managed irrigation development and increased agricultural production
- Reviews of options for reforms in publicly managed irrigation with pilot projects, demonstrating improved system performance, and exploration of options for irrigation development.

Initial Budget. The project will be implemented progressively, building on successes obtained during early phases. Initial budget allocations are presented in Table 3. The budget assumes that project staff will be regional recruits; if they are considered international recruits, the budget rises by approximately \$0.27 million to a total of \$5.01 million.

The budget will balance allocations towards the various groups of stakeholders in the project, including farmers' organizations, the private sector, government, and parastatal staff. This shall ensure that all stakeholders, including those who traditionally have less access to project resources, will be able to benefit.

Table 3. Initial Budget Allocations

INITIAL BUDGET ALLOCATIONS	
DISBURSEMENT CATEGORY	AMOUNT (US\$ million) Regional Recruits
Consultations/demonstrations	2.33
Salaries	1.79
Equipment & operating costs	0.07
SUBTOTAL	<hr/> 4.19
SVP Coordination, Quality Assurance and Monitoring (3%)	0.13
Contingencies (10%)	0.42
GRAND TOTAL	<hr/> 4.74

4.2 Benefits and Target Population

Making Use of Comparative Strengths. The project seeks to identify options to make efficient use of water and increase agricultural production. While local communities and farmers will be the ultimate beneficiaries, the project will address all relevant actors, government institutions, communities, and the private sector in their respective roles and will seek to make use of their strengths and comparative advantages. The project will ultimately encourage local communities to initiate new approaches towards water use for agricultural production. The community-based efforts need to be supported by appropriate definition of user rights and incentives, which is a critical role for the government agencies. Also, the government and the private sector can provide the necessary technical assistance in support of local initiatives.

Given the nature of this regional project, expected primary beneficiaries and proposed project activities are related in the following way.

Component 1 Beneficiaries. The primary audience of the basin-wide seminars and consultations will be agricultural experts and senior-level government officials from the participating countries, but the private sector and community representatives will provide inputs to these consultations.

Component 2 Beneficiaries. All parties—the public sector, the private sector, and community representatives are expected to benefit from the study of good practices and exchange of experience. Due consideration will also be given to gender roles.

4.3 Institutional and Implementation Arrangements

Implementation at Regional Level. A project organizational chart is shown in Annex E. At the policy level, Nile-TAC will have project oversight. A regional project coordination committee, composed of senior-level government staff and representatives from donor agencies and research institutions will be responsible for regional coordination. The project coordination committee will be key for anchoring the project and its activities in the respective line ministries in the NBI countries and to provide sectoral guidance for the project's activities. For project implementation, a small project management unit (PMU) will be established, consisting of a project manager and support staff for procurement, finance, and administration. A lead specialist, recruited on an as-and-when-needed basis, will provide technical backstopping. The project manager, who will report to the regional project coordination committee, will supervise the administrative and financial aspects of the project and execute the work

program. In order to decrease overhead costs, it is recommended that the project be co-hosted with (an)other SVP project(s) and co-managed by one project manager.

Implementation at National Level. Each participating country will recruit a national project coordinator to coordinate and implement the project at the national level. Project implementation will ensure participation of all relevant government and private sector stakeholders, including ministries of water, agriculture and forestry, local communities, NGOs, and the private sector.

Release of funds for the implementation of the project activities will be related to:

- The establishment of a regional project coordination committee
- The establishment of a project management unit (PMU), consisting of a project manager and a lead specialist
- The identification of a national project coordinator for each country, to be supported by relevant stakeholders involved in project implementation of all project components.

The project provides for the establishment of ad-hoc regional thematic working groups. These groups will, at the request of the project manager and on advice from the lead specialist, provide technical back-stopping to national project coordinators and support the lead specialist in the design of regional activities. These working groups will consist of national level lead specialists with an international reputation in selected areas of relevance to agricultural water use. These specialists may represent, for example, research institutes, the private sector, NGOs, and farmers' unions.

5. PROJECT RATIONALE

5.1 Alternatives Considered

At the outset of project identification, the following alternatives were considered:

- Comparative advantages and agricultural trade in the Basin, to address questions related to economic efficiency and regional optimization of water use for agricultural production, urban and industrial functions, power generation, environment, navigation, etc.
- Water use efficiency, to address issues related to technical and institutional options for increasing efficient water use for agriculture.

However, it appeared that issues related to economic efficiency and trade would be addressed in other components within the Shared Vision Program, such as the Socio-Economic Development and Benefit-Sharing Project. These issues may also be addressed in subsequent agricultural projects as cooperation grows. Therefore, it was decided to focus on agronomic water use efficiency and related issues.

An additional choice was made between the following two alternatives:

- Implementation of pilot and demonstration projects throughout the Basin
- Focus on capacity and institutions building, exchange of experience, and basin-wide consultations.

For a number of reasons, the second option has been retained. In the first place, it became clear that during a first phase of the project, donor contributions would primarily be sufficient for capacity and institutions building. It is, however, understood that the first phase will be an opportunity to identify and appraise a number of project ideas that will be submitted for funding, either under a second phase of the project, or by other projects (for example, SAP). These project proposals are expected to address the issues summarized in Table 1, including issues of a more technical nature. In the second place, under an initial phase, the added value of this project would be in particular to contribute to regional confidence-building through the establishment of a forum of experts in the field of agricultural water use. Presently, such a forum does not exist. In the third place, there was a strong feeling that with the number of projects currently under implementation in the region (see Annex C),

there would be a sufficient number of pilots already underway. It was therefore decided to shift the focus away from pilot implementation towards basin-wide pilot stocktaking and the organization of study tours and exchange visits.

5.2 Major Related Projects Financed by External Support Agencies (ESAs)

Agriculture and water resources development have been one of the priorities for the Nile Basin countries. Considerable assistance from external support agencies has been received. An outline of on-going or recently completed projects related to agricultural water use in the Nile Basin countries is provided below and in Annex C. From a review of these and similar projects in other regions, important lessons have been incorporated in the project design.

Of direct relevance to the proposed project are efforts by ICARDA (the International Center for Agricultural Research in the Dry Areas), ICRAF (the International Center for Research in Agroforestry), and ICRISAT (the International Crops Research Institute for the Semi-Arid Tropics) that have established regional drawdown facilities for training, study tours, and workshops related to agroforestry and to arid and semi-arid agriculture. In addition, the FAO and UNDP both finance regional programs that are relevant to the current project proposal.

ICARDA. ICARDA is involved in cooperative agricultural research carried out in many countries in West Asia and North Africa. The results of research are transferred through cooperation with national and regional research institutions, with universities and ministries of agriculture, and through the technical assistance and training that the Center provides. A range of training programs is offered and these efforts are supported by seminars, publications, and specialized information services.

ICRAF. ICRAF is involved in cooperation with national institutions in technology-generating research projects and training programs through the *Agroforestry Research Networks for Africa (AFRENA)*. ICRAF, with headquarters in Nairobi, offers agroforestry training courses, fellowship schemes, on-the-job training and agroforestry education, and organizes international conferences and workshops in Africa.

ICRISAT. ICRISAT serves as a global center for the development of improved farming systems that will help to increase and stabilize agricultural production through more effective use of natural and human resources in the seasonally dry semi-arid tropics. It also assists in the development and transfer of technology to the farmer through cooperation with national and regional research programs, and by sponsoring workshops and conferences, operating training programs, and assisting extension activities. ICRISAT has established skill development programs to improve the background and qualifications of agriculturists in national and cooperating programs concerned with ICRISAT mandate.

RELMA. In 1998, the Swedish International Development Agency (SIDA) established the Regional Land Management Unit (RELMA) based in Nairobi as a tool to address issues of food security in Eastern Africa (Eritrea, Ethiopia, Kenya, Uganda, Tanzania, and Zambia). RELMA aims at focusing on the productive potential of the farm in land husbandry, including aspects of soil and water conservation, agroforestry, animal and crop husbandry, water harvesting, and farm economy and marketing. Activities include dissemination of information, production of publications, training, institutional capacity-building, networking, and manpower development.

FAO. FAO's Special Program for Food Security aims at enabling conditions, improving access to food, producing food, increasing the role of trade, dealing adequately with disaster, and investing in food security. This is done through (a) participatory constraints analysis and resolution, (b) agricultural policy reform aimed at addressing macro-level socio-economic and institutional constraints, and (c) an investment program that ensures availability of the resources required to overcome infrastructure constraints.

With funding from the Italian government, the FAO is also involved in the implementation of the Capacity-Building for Nile Basin Water Resources Management Project. The project focuses on strengthening capacities in water resources planning and data base management, however, it does not focus specifically on agricultural water use.

In addition, a significant number of projects are being implemented in the region from which lessons can be learned. These are summarized in Annex C. Although all listed projects are being implemented in Nile Basin countries, not all of them work at present exclusively in river basins belonging to the Nile Basin.

5.3 Lessons Learned and Reflected In Proposed Project Design

The review of lessons learned during design of this project included vast experience in the Nile Basin countries, as reflected in the country reports, but also went beyond the Nile Basin, and looked into selected experiences worldwide. Part of these experiences is reflected in Annex B, and some important lessons are summarized below.

- Efficient use of water for agriculture is a transboundary issue, both in terms of the origin of the problems, the strategies for addressing them, and the implementation of viable solutions.
- Whereas most programs and projects have a component that aims to bring sectoral people together for specific purposes, there is no Nile basin-wide regional forum of national experts involved in agricultural water use.
- Stakeholder participation and leadership in irrigation development and management has emerged as an effective approach towards sustainability. It has provided user input in designs resulting in systems that are easily manageable, and it has led to better management and water delivery service.
- Community-managed small-scale irrigation development has shown a better performance track record than publicly managed irrigation. This is especially true when the systems are initially developed by local communities or turned over to irrigators' groups for management. In large government-managed systems, fWUAs can manage the tertiary level better, improving water use efficiency, and conserving a significant amount of water.
- Water Users Associations have demonstrated abilities to take responsibility for system O&M. The government can support WUAs by providing appropriate legal and financial framework. WUAs should be empowered to collect service fees from their members, but the fees must be used to provide better service rather than making them part of government revenue.

It is proposed that the consultations and exchange proposed in this project will deal with these experiences in more detail.

5.4 Value Added of Donor Support in this Project

Agricultural Water Use—An Important Topic in Basin-Wide Dialogue. Given that agriculture is the predominant consumptive water user in the Nile Basin (as elsewhere), basin-wide consultation, training, and exchange of experience among professionals in the sector is a first step towards a constructive and informed discourse on agricultural water use in the Basin. This dialogue has never taken place before, and for many of the national experts participating in project preparation, it was the first time that they met colleagues from co-riparian countries. In the course of project preparation, it became clear that many of the Nile Basin countries face similar structural problems. A basin-wide project thus provides an opportunity to learn jointly as well as from each other, and to address issues of common concern. In line with the objectives of the Shared Vision Program, this project seeks to create an appropriate enabling environment for the realization of the NBI Shared Vision in the sector.

Donor Support to this Project. It is expected that this project will qualify for donor support in the form of grant assistance. Donor support would provide for the incremental cost or added dimension of a regional project which provides opportunities to promote confidence-building and cooperation in a region where the latter is still not the norm. This project provides the opportunity to draw level with a discussion which has taken place in the agriculture sector in many parts of the world during the last decade or so, but which appears to have largely by-passed many of the Nile countries.

The project should be seen as precursor and as a first contribution towards confidence-building and cooperation. Future phases of the project, if proven instrumental to achieving the objectives, will focus more on joint, basin-wide activities, grass-root stakeholders involvement, and implementation of relevant pilots and initiatives that have been identified under the first phase.

Country Commitment. While it is expected that donors will contribute towards the additional cost of regional cooperation, they will closely observe indications of country ownership and commitment towards the project. In the most general sense, country commitment will be reflected by country contributions towards the Nile Basin institutions (such as Nile-SEC). It is also expected that countries would provide in-kind contribution at different tiers of the project organization.

6. ISSUES REQUIRING SPECIAL ATTENTION

6.1 Economic/Financial

Support from Donor Agencies. Country funds will probably be limited, at least in the initial project phase. Therefore, support from donor agencies will be critical for project implementation and successful performance. On this basis, it is expected that a future phase of the project will become more involved in actions on the ground. The current phase will be instrumental to that end, as outcomes from exchange visits and regional consultations are expected to include concrete project proposals for funding.

6.2 Technical/Environmental

- With the large number of on-going initiatives in the Basin, the challenge will be for the PMU to demonstrate *leadership* and stay ahead of developments, to identify promising developments at an early stage, and to take initiatives where needed and appropriate. It is clear that modern communication technologies will play an important role in the implementation of the project.
- Linking the agriculture sector solidly with the *environment* should not be taken for granted, particularly because of the many new developments that have taken and are taking place. This issue needs to be addressed through technical backstopping by environmental experts.
- *Lack of data*, especially on flow characteristics of streams, groundwater, etc. is an important concern that needs to be addressed. Data will not be available immediately. The project will need to adopt a collaborative approach and work together with existing agriculture-related projects (such as the Tanzanian River Basin Management Project), as well as with other SVP projects (such as the Nile Basin Decision Support System component of the Water Resources, Planning and Management Project).

6.3 Institutional Issues

All activities that seek to promote cooperation among ten countries of the Nile Basin will inherently be complex. However, such cooperation is essential if sustainable development and management of the Nile is to be achieved. This challenge must therefore be met. Key institutional issues will be regional coordination, institutional capacity at the national level to implement and sustain project outcomes, the training and retention of staff at national and regional levels, and continued commitment to regional cooperation. One of the common concerns expressed in the country reports is the

inadequate capacity of government institutions to provide effective leadership and support services. The NBI project approach, therefore, should assist in capacity-building of national experts. Capacity-building through the organization of study tours and exchange visits will be an important part of the project.

The Shared Vision Program will be coordinated by the NBI. The collaboration of all Nile riparian governments in the NBI is an historic step and an expression of the commitment of the riparian governments to regional cooperation. The preparation of the Shared Vision Program projects has been complex, multi-country, multi-sectoral process involving more than 70 national experts from nine countries in the preparation of seven projects. The NBI institutions, supported by the Nile-SEC, have effectively managed this process, demonstrating Nile riparian capacity for basin-wide coordination. Effective implementation of the Agricultural Water Use and other Shared Vision Program projects, however, will be a challenge. The creation of strong project management (implementation) units, as well as continued attention to strengthening the regional coordination capabilities of the NBI institutions will be critical to the success of this project.

However, ownership of the project should not remain limited to national experts in the capital city. Other stakeholders need to be directly involved in the project, such as representatives from the private sector and WUAs. The project resources will be proportionally earmarked for the various stakeholder groups. In addition, care will be taken to make sure that all stakeholders are properly informed about this opportunity. And finally, project management is expected to take appropriate initiatives to make sure that all stakeholders benefit in a balanced way.

7. SUSTAINABILITY AND RISKS

7.1 Sustainability

Project Ownership. Sustainability of project initiatives will greatly depend on the approach adopted during project design and implementation. First and foremost is the question of project ownership. Through a resolutely participatory process of project design, every effort has been made to ensure that respective sector ministries genuinely “own” the project. This first step will prove to have laid the foundation for future steps, when local communities and the private sector need to be genuinely engaged in the process and encouraged to take ownership. Project ownership will also be demonstrated through continued commitment to sustain the Nile Basin Initiative institutions.

Tangible Benefits. The second important concern is whether the project will result in tangible benefits for the local communities and farmers. The initial beneficiaries of the project will be selected government agencies and ministries, the private sector, and local farmer organizations. For long-term sustainability, the project benefits must reach the national level and the private sector. As these long-term benefits are likely to be less visible than the outcomes of, for example, direct infrastructure delivery, the project will need to remain alert and need to demonstrate tangible change for stakeholders. Incorporating regional experiences at the national level will need to form an important element of this strategy.

Regional Cooperation. Project sustainability will also depend on the level of cooperation that can be maintained among the Nile Basin countries. Transparent operational procedures, open communications, networking, and sharing of information are important factors that will influence regional cooperation in the long run. The project will, from the beginning, need to establish good communications among the member countries, and establish full transparency with respect to the transmission of messages.

7.2 Critical Risks

The major critical risks of this project as identified by the agricultural water use experts involved in project preparation are summarized below.

- NBI cooperation stalls
- Lack of commitment of individual countries and support for national level activities
- Insufficient regional level management capacity to ensure basin-wide coordination
- Insufficient national level institutional capacity and cooperation to implement and sustain the project
- Riparians unable to reach consensus on specific project elements and the extent of information sharing
- Insufficient donor support and funding and inability to establish sustainable funding mechanisms.

Factors that mitigate these risks are described in the following paragraphs.

NBI Cooperation. The NBI has evolved from a long process that has culminated in the formation of this inclusive mechanism in the Nile Basin. Cooperation has continued in the face of difficult challenges. The riparian governments have continuously expressed their commitment to the NBI process, as well as to the continuation of the riparian process to agree on a basin-wide Cooperative Framework.

Country Commitment. National experts, appointed by the riparian governments, have fully participated in the project preparation process to ensure there is full riparian ownership and strong national commitment to successful project implementation. Further, the project will primarily be implemented by staff from the region and the detailed work program will be developed by regional working groups, with input from national networks and stakeholders, to ensure the project meets national as well as regional needs. The project components are demand-driven and the project will be developed with full participation of riparian teams. The two components have also been designed to include awareness-raising, training, and mutual benefits to motivate participation in the national water use for agriculture networks and in return have access to the benefits of project tools.

Regional Coordination Capacity. The institutions of the NBI, supported by the Nile-SEC, have effectively managed a complex, multi-country, multi-sectoral process to prepare the seven projects of the Shared Vision Program. This demonstrates capacity for basin-wide coordination. Effective implementation of the Efficient Water Use for Agriculture Project and other Shared Vision Program projects, however, will be a challenge. The creation of a strong project management unit has been incorporated into the project design, while the continued strengthening of the regional coordination capabilities of the NBI institutions will be addressed at the Shared Vision Program level.

National Institutional Capacity. Recognizing that some countries in the Basin face institutional capacity constraints, the project has been designed to strengthen institutional and human resources capacity in the recipient countries. The drawdown facilities will support learning by doing and can also provide seed money to start larger planning and institutional efforts if desired. The project at the national level will most likely be anchored in the national institution responsible for agriculture. The three-year time frame of the project, the extensive focus on training, and exchange of experience are designed to strengthen institutional capacity for efficient use of water for agriculture.

Consensus and Information Sharing. Several project elements require riparian consensus. The project components have been designed to build confidence and collaborative attitudes among the respective riparians through openness and transparency in operations and through the participatory development of the systems. The project is also designed to ensure national ownership and confer national benefits, as well as to become an important element in NBI operations. The project will provide the technical framework to support information exchange, while the extent of regional information exchange is likely to evolve gradually as cooperation grows and real needs emerge to address common issues.

Donor Support and Long-Term Financial Sustainability. All project components initially require donor financial support. However, it is expected that at project completion, the performance of the project will form a basis for continued donor support. Under the prevailing situation in the Basin, it is

difficult to see how the project could become financially independent in the short term, although some of its elements may be taken up by the private sector. Financial sustainability will be understood in this proposal as the long-term capability of the project to provide sufficient quality so as to continue to attract donor funding.

There are several important assumptions that may result in the project not meeting its desired outputs. These were discussed in the national experts meetings and are outlined below.

Commitment of the Nile Basin Countries. The project success will be critically dependent on the countries' continued commitment to the collaboration with other Nile Basin member countries, and to achieving the objectives of the SVP program, as articulated by the NBI. This is intimately related to political stability in the region. Many countries in the region are facing conflict, political uncertainty, extreme poverty, disease, etc. These conditions are not conducive to a long-term project aimed at improving an enabling environment on a regional basis. On the other hand, this and other NBI projects seek to build trust among the Nile Basin countries. It is therefore crucial that this process have palpable benefits. The emphasis on regional cooperation, the collaborative efforts that have been made to design the project, and the regional ownership that is the result thereof are powerful instruments for not only achieving the project's objectives, but also for accomplishing the longer term trust and understanding.

Institutional Leadership. The project depends on the capability of government institutions and staff to provide visionary leadership. This is a challenge in a setting where incentives for staff, research, innovation, and supporting infrastructure are often insufficient. Through regional learning from study tours, exchange visits, and consultations, the project endeavors to create institutional capacity and leadership that will form the basis for implementation of project activities. It should be pointed out that the project intends to seek visionary leadership within, and not outside the boundaries of the Nile Basin.

8. PROJECT PREPARATION PROCESS

The preparation of the Efficient Use of Water for Agriculture Project, as well as the other projects within the Shared Vision Program project portfolio, was directed by the institutions of the NBI and involved the active participation of technical experts from across the Basin. This complex, multi-country, multi-sectoral process, which is described below, demonstrates riparian ownership and commitment to successful project implementation.

8.1 Evolution of the Shared Vision Program: A Coordinated Basin-Wide Program

The Shared Vision Program evolved from four thematic areas, or pillars, as described in the NBI policy guidelines to a coordinated program of seven basin-wide projects between February 1999 and December 2000. The process, summarized in Table 4, was executed and coordinated by the Nile-SEC, involved active participation of and guidance from the Nile-TAC, and received formal endorsement by the Nile-COM at critical milestones.

The final portfolio of Shared Vision Program projects includes:

- Nile Transboundary Environmental Action
- Nile Basin Regional Power Trade
- Efficient Water Use for Agricultural Production
- Water Resources Planning and Management
- Confidence-Building and Stakeholder Involvement (Communications)
- Applied Training
- Socio-economic Development and Benefit-Sharing.

Four of these are thematic projects—focusing on environment, power, agriculture, and water resources management—and three are facilitative projects related to confidence-building and stakeholder involvement, training, and benefit-sharing. The thematic projects aim to provide a technical foundation, including common analytical frameworks, practical tools and demonstrations, and human capacity, to support regional cooperation; while the facilitative projects serve to forge a common vision and ensure long-term sustainability. The projects build on each other, and together will serve to provide an enabling environment for cooperative development.

The Shared Vision Program projects are linked to each other and to the Subsidiary Action Programs in important ways. For example, the information management system of the DSS component of the water resources project will provide a common communication platform and information management system for all Shared Vision Program projects. At the same time, the benefit-sharing project will develop and evaluate socio-economic development scenarios, which will provide the context for potential river development alternatives. The efficient water use for agriculture project will coordinate with the applied training and stakeholder involvement projects to share knowledge and expertise as relevant.

8.2 Detailed Project Preparation: A Multi-Country, Multi-Sectoral, Participatory Process

As noted above, preparation of the Shared Vision Program projects was driven by Nile-TAC, coordinated by Nile-SEC, and involved significant substantive input by Nile-TAC members. Detailed project preparation was a complex and highly participatory process, which involved eight national experts from each country, representing expertise in environment, power trade (ministry and utility perspectives), agriculture, water resources, training, and communications. The project preparation process created a forum for interaction among the technical experts from different water-related sectors across the Basin. As such, the project preparation process has laid the foundation for broad-based support for project implementation.

Preparation of each Shared Vision Program project was supported by a lead consultant and a focal point of the World Bank-UNDP-CIDA Nile team.

For the Efficient Water Use for Agricultural Production Project, one national expert was appointed from each country, typically with experience in the field of agricultural water use. One lead consultant was employed to facilitate the preparation process, while a Nile team focal point served as a liaison and provided technical support to the Nile-SEC. A list of the individuals involved is provided in Annex A.

The national experts played a critical role in the preparation process. Under the guidance of the Nile-TAC member, the experts conducted national level reviews and analyses. The national experts, along with the Nile-TAC members, provided critical input regarding project formulation during the two three-day working group meetings, as well as reviewed and revised project documents throughout the preparation process. This project document reflects riparian perspective on national and regional needs, project components which are deemed to be implementable and confer real benefits, and a project design based on lessons learned from other related projects in the region.

Table 4. Preparation of the Shared Vision Program

DATE	MEETING TYPE	LOCATION	KEY OUTCOMES
July 1998	Nile-TAC	Dar es Salam, Tanzania	Drafting of policy guidelines that define the SVP and four major thematic areas of the program
Feb 1999	Nile-COM and Nile-TAC	Dar es Salam, Tanzania	Adoption of the NBI Policy Guidelines, and instruction by Nile-COM to prepare a portfolio of priority SVP projects for ICCON
May 1999	SVP Planning Meeting	Sodere, Ethiopia	Preliminary list of priority projects, including project goals and objectives, based on consultation and brainstorming by Nile-TAC members and 2 additional sectoral experts from each country
May 1999	Nile-COM and Nile-TAC	Addis Ababa, Ethiopia	Approval of list of priority projects and project preparation process
Sept 1999	Nile-TAC	Entebbe, Uganda	Based on output from Sodere planning meeting, development of project concept notes for seven priority projects and approval of a detailed project preparation process and schedule for each project
Dec 1999	Project Preparation 1	Entebbe, Uganda	Review and further development of draft project concept notes/documents by working groups (WGs). For each project, the WGs included a Nile-TAC member and national expert(s) from each country. A total of 8 national experts were involved from each country. Each project was assisted by a lead consultant.
Dec 1999 – Nov 2000	National Analysis and Consultations	Nile Basin countries	Lead consultants together with national experts prepare draft project documents. Depending on the project and country, national experts provided inputs through preparation of national reports, country consultations, and/or country visits by lead consultants
Jan 2000	Nile-TAC	Entebbe, Uganda	Review of progress in project preparation and further refinement of project concepts as warranted
Mar 2000	Nile-TAC	Delft, the Netherlands	Review of progress in project preparation and further refinement of project concepts/design, as warranted
July 2000	Project Preparation 2	Addis Ababa, Ethiopia	Review and further development of detailed draft project documents by working group members for each project and Nile-TAC members
Aug 2000	Nile-COM and Nile-TAC	Khartoum, Sudan	Approval of SVP project portfolio and updated project summaries
Oct 2000	Nile-TAC	Via electronic mail	Review of draft final project documents
Dec 2000	Distribution of draft final project documents	Via express mail and electronic mail	Distribution of all English draft final project documents to all Nile-TAC members (French versions sent February 2001)
Mar 2001	Nile-COM	Khartoum, Sudan	Final approval of SVP project portfolio and project documents

ANNEX A. LIST OF COUNTRY REPORTS

COUNTRY	TITLE	AUTHOR (NATIONAL EXPERT)	DATE
Burundi	National Situation Analysis	Nimubona Dismas	April 2000
DRC	Rapport national en vue de l'elaboration d'un projet pour l'ensemble du bassin lie a l'utilisation de l'eau pour la production agricole	Muruhuka Ntako Jean Bosco	May 2000
Egypt	Country Level Analysis for Project Preparation – Egypt Country Report	Mohamed Lofty Youssef Nasr	June 2000
Ethiopia	Country Level Analysis for Project Preparation – Ethiopia	Makonnon Loulseged	July 2000
Kenya	Country level analysis for project preparation – Kenya	Charles J. Mbara	April 13, 2000
Rwanda	National Document (Rwanda) On Efficient Water Use For Agricultural Production	Jean-Pierre Murenzi	May 10, 2000
Sudan	Country Level Analysis for Project Preparation – Sudan Country Report	Dr.Omer El Awad	May 14, 2000
Tanzania	National Level Analysis Report – Tanzania	Idris A. Masenza	June 13, 2000
Uganda	Country Level Analysis for Project Preparation – Uganda Country Report	John B. Kalule-Sewali	June 2000

The following Nile-TAC members also participated in the working group that prepared this project proposal:

COUNTRY	TAC MEMBER
Burundi	Manasse Nduwayo
DRC	Kayembe Ditamta
Egypt	Ahmed M. Fahmy Abdalla
Ethiopia	Dr. Mohamed Ahmed Hagos (the current Tac member is Kidane Asseffa)
Kenya	James.K. Waititu
Rwanda	Vincent De Paul Kabalisa
Sudan	Dr. Osman El Tom Hamad
Tanzania	Mrisho Kivugo (the current Tac member is Butingo Luhumbika)
Uganda	Patrick O. Kahangire

ANNEX B. AGRICULTURAL WATER USE IN THE NILE BASIN

A. Agriculture Sectors

Economic Importance of Agriculture. Agriculture is the mainstay of most NBI countries. It contributes about 35-50% of GDP and it employs about 60-90% of the work force. In Egypt, however, agriculture's contribution is relatively lower—about 17% of GDP, while employing about 30% of the population (Table B.1).

Table B1. Contribution of Agriculture Sector to National Economy, 1990–1995 Average

COUNTRY	% CONTRIBUTION TO		AGRICULTURAL EXPORTS		AGRICULTURAL IMPORTS	
	GDP	EMPLOYMENT	US M\$	% of Total	US M\$	% of Total
Burundi	50	94	44	97	7	8
DRC	51	70	1190	27	45	7
Egypt	17	30	1022	8	6706	15
Ethiopia	52	85	195	60	74	No Data
Kenya	35	85	No Data	No Data	39	No Data
Rwanda	40	90	66	90	55	19
Sudan	34	60	398	74	192 193	14
Tanzania	50	84	360	50	76 77	7
Uganda	42	90	382	65	73	6

Source: Country reports

Dominance of Subsistence Agriculture. Agriculture in NBI countries, except Egypt and parts of Sudan, is mainly a subsistence activity, characterized by small landholdings, low use of inputs, and low crop yields. For example, small farmers, who grow mainly food crops such as cereals and vegetables, cultivate over 75% of the agricultural land in Tanzania. Reported yields of rice, a crop that has become increasingly important, vary from 0.75 tons/ha in DRC to 1.5 tons/ha in Uganda (Table D.2). Yields of other cereals (maize, wheat, and millet), fruits, and cash crops (sugarcane, coffee and tea) are also below average. Most agriculture is not commercially oriented and agricultural support services including input supply, agro-processing, and marketing are poorly developed. Livestock, often present in large numbers, form an integral part of agriculture and human welfare in rural areas.

Exports-Imports. In addition to securing food for local consumption, agriculture is an important source of foreign exchange earnings. Data presented in Table B.1 show that the agricultural sector contributes 65-90% of the total value of exports in Rwanda, Sudan, and Uganda. Large commercial plantations in equatorial countries (including Kenya and Uganda) grow cash crops such as coffee and tea for export. In downstream countries (Egypt and Sudan), cotton is an important part of agricultural exports. In most countries, the value of agricultural exports exceeds that of imports with the exception of Egypt where the agricultural share in total exports has declined from about 16% in 1990 to below 8% in 1997, and imports have risen to 15%. The value of agricultural imports in Egypt is approximately seven times the value of exports.

Irrigated Agriculture. Agriculture in Egypt and Northern Sudan is different from other Nile Basin countries in the sense that almost all of it is based on irrigation water. Rainfall is very limited in this desert climate, and the Nile is by far the major source of water, both for agriculture and urban use. With advanced water control and high use of inputs, crop yields in Egypt are significant — rice yields over 8.5 tons/ha are reported in the delta region (Table B.2). Other major crops in Egypt and Sudan are wheat, cotton, sugarcane, vegetables and clover. Cotton, gum arabic, and sugarcane are important export crops. In upstream countries, on the other hand, irrigation facilities are very limited. Even in large countries such as Kenya, only 62,000 ha of land is irrigated, compared to 2.6 million ha of rain-fed land (Table B.2). In Tanzania, an estimated 155,000 ha out of 3 million ha of rain-fed land is irrigated (5%), while only 8,700 ha out of 2.2 million ha is under irrigation in Burundi (0.3%).

Public Policies. Governments in the Nile Basin countries recognize the importance of agriculture, which is clearly reflected in their policy statements (summarized in Table B.3). There is a strong consensus to revive and modernize agriculture, and introduce structural reforms to orient the sector towards a market-based economy. National development objectives include increased incomes and food security, increased rural employment, and increased foreign exchange earnings. To achieve these objectives, several countries have implemented macro-economic reforms to liberalize markets, remove price controls and subsidies, and restructure public sector to allow more private sector participation.

Performance of Policy and Development Programs. The country reports provide limited information on the performance of the policy reforms and related development programs. In Sudan, Egypt, and Kenya, there are indications that macroeconomic policies have resulted in more liberalized markets through removal of government subsidies and price controls. The private sector in Egypt plays an increasingly active role in crop processing, marketing, and extension services. Sudan has turned over the management of small and medium size irrigation schemes to farmers' water users associations. However, the reports also indicate that reforms have also had negative effects for farmers. Production inputs, such as fertilizers, are expensive in comparison to agricultural commodity prices that have fallen sharply worldwide. In addition, farmers have inadequate access to credit. Water users associations in Sudan are reported to face difficulties in adopting appropriate cost recovery mechanisms with the result that the schemes are not receiving proper O&M.

Table B2. Description of the Agriculture Sector in Nile Basin Countries

COUNTRY	MAJOR CROPS	PRODUCTION 1,000 TONS/YR	CROP AREA (1,000HA)		CROP YIELDS (TONS/HA)
			RAIN-FED	IRRIGATED	
Burundi	Cereals (maize, rice)	266	Total = 8.7 ⁴		Rice: 3.0
	Legumes and tubers	1,762			Wheat: 1.2
	Fruits and cash crops	1,526			
DRC	Cereals (rice, maize)	1,556	1,991	13.5	Maize: 0.8
	Tubers	17,303	2,168		Tubers: 8.0
	Cash crops (coffee, cocoa)	201			
	Sugarcane	98	8.6	3.6	Sugarcane: 8.9
Egypt	Cereals (wheat, rice, corn)	19,000	2,620		Wheat: 6.0,
	Cotton	628	332		Rice: 8.6
	Sugarcane	14,710	122		Cotton: 2.14
	Clover	1,614	1,026		Sugarcane: 117.0
			Total irrigated land: 3,300		Fruits: 1.88
Ethiopia	Cereals (maize, teff, barley, sorghum, wheat)	8,629	6,688	No Data	Maize: 1.85
	Pulses	802	905		Wheat: 1.12
	Oilseeds	213	478		
	Vegetables	520	52		
Kenya	Sugar	447	2,640	62	Wheat:1.9,
	Fruits and vegetables	1,890			Maize:1.6
	Tea, coffee	348			Rice:5.0,Potatoes:7
	Cotton	23			.0-9.0
					Sugarcane:43.0
					Cotton: 0.6
Rwanda	Cereals (maize, wheat)	174	1,100 mostly rain-fed. Highlands: 700,000 ha Wetlands: 160,000 ha dry season cultivation Irrigated rice: 3,360 ha.		Maize: 0.9, Wheat:
	Beans, peas	157			0.8
	Bananas	2,897			Rice: 1.8
	Potatoes	1,038			Potatoes: 4.8
	Coffee, tea	15			Sugarcane: 80.0
Sudan	Cotton	3,500	10,000	1,900	Wheat: 1.6, Cotton:
	Cereals(sorghum, wheat)	3,550			1.6
Tanzania	Cereals	3,305	3,036		Maize: 1.2, Rice:
	Coffee, tea, sugarcane	80	300		1.25
	Cottonseed	252			Wheat: 1.4
	Paddy rice (irrigated)	549		440	Potatoes: 1.7
Uganda	Cereals	2,084	5,000	32	Maize: 1.23, Rice:
	Root crops,	5,764			1.4
	Coffee and tea	23			Cotton: 0.6,
					Sugarcane: 50.0

Source: Country reports

⁴ There is a potential to further increase the irrigated area in Burundi to 0.2 million ha. Most irrigation will be small-scale; no large-scale irrigation development is planned.

Table B3. Government Policies for the Agriculture Sector in Nile Basin Countries

COUNTRY	POLICY NAME	DEVELOPMENT OBJECTIVES⁵	STRATEGIC OPTIONS
Burundi	Information not available	Increased incomes and food security Increased foreign earnings Protect agriculture and livestock	Increase research and information Increase private sector involvement in extension and marketing Privatize agro-based industry
DRC	National Agriculture and Rural Sector Revival Program (1997-2000) No one policy to promote better water management for increased agricultural production	Ensure food security, reduce rural poverty, and increase employment Revive cash crop production Increase export earnings Increase food production at 20-60% annual growth rate Increase cash crop production at 20% annual growth rate for tea, 60% for palm oil and 170% for coffee	Formulate government policy for agriculture Restructure institutions to support policy Implement revival program through local participation Support private sector to increase its investments in agricultural production Register and redistribute abandoned farmland to new Congolese people Support agricultural research and improve technical expertise of government staff Improve rural infrastructure (roads, marketing) Improve veterinary services Develop small-scale irrigation systems
Egypt	Structural Adjustment Program (1986-present)	Optimum allocation and utilization of agricultural resources Food security and increased exports Create new employment opportunities in rural sector	Increase irrigation water use efficiency (Irrigation Improvement Project) Support Cotton Prize Stabilization Fund Increase edible oil production (sunflower, soybeans, etc) Increase sugar production by expanding sugarbeet cropping Upgrade horticulture marketing efficiency
Ethiopia	Agricultural Development Led Industrialization (1994-present)	Increase domestic food production Increase export commodities Provide resources for industrialization	Improve productivity of small-holder farmers who account for 96% of the agricultural output Promote private sector investments Expand large-scale commercial farms
Kenya	National Food Policy, 1994 and National Development Plan 1994-2001	Food self-sufficiency and security Generate employment and incomes Rural-urban balance	Liberalize markets and remove price controls Promote beneficiary participation, including cost sharing of development and O&M Restructure public sector to allow for private sector role in marketing, research and extension, and water resource development
Rwanda	Specific name not available	Improve living conditions Improve food security Improve food self-sufficiency	Need appropriate policies for watershed management, ownership, and use of wetlands Develop information to plan for exploiting key resources such as wetlands Extend pastures and forests for conservation of highlands Revive plantation cash crops (coffee, tea) Promote private sector role in crop processing and marketing, and in extension.

⁵ Little information was provided about the results of policy implementation. It is therefore difficult to draw lessons about what works and what does not.

Table B3. Government Policies for the Agriculture Sector in Nile Basin Countries (cont'd.)

Sudan	National Comprehensive Policy 1992-2000	Increased food security Efficient use of resources Balanced regional growth Increased exports	Increase irrigated cropped area 3 times Increase rain-fed cropped area 10 times Increase grain production by 6 times Note: After seven years of policy implementation, little of these targets have been met
Tanzania	Agriculture and Livestock Policy, 1997	Food security and increased rural living standard Integrated and sustainable use of natural resources Increase foreign exchange earnings	Support agr. Research, extension and training Develop new markets and products Provide good infrastructure Control standards, appropriate taxes, and subsidies
Uganda	Plan for Modernization of Agriculture	Eradicate poverty Ensure food security Generate employment	Decentralize public institutions Efficient use of land and water resources through water harvesting, irrigation techniques Provide market information, effective research, and extension

Source: Country Reports

B. Water Resources for Agriculture

Background information on government policies and development opportunities with respect to agricultural water resources is summarized in Table B.5.

Rainfall

Rainwater Availability and Spatial Variability. Most country reports underline the fact that rainfall has a high spatial variability. For example, in a comparatively small country as Rwanda, the average annual rainfall varies from 700-1,000 mm in the lowlands to 1,400-2,000 mm in the highlands. Similarly, in Kenya, rainfall varies from a low of 600 mm in the Rift Valley and Tana River area to a high of 1,400 mm in the Lake Victoria region. Sudan experiences a rainfall variation from 1,200 mm in the southwest of the country, to desert conditions with less than 25 mm in the north. In Egypt, rainfall is extremely limited and makes no significant contribution to crop water requirements. Average annual rainfall for southern Egypt is barely 25 mm, and increases to 200 mm on the coast.

Reliability. Another characteristic of Nile Basin rainfall is its highly erratic pattern in time and thus its unreliability. The rainfall pattern shows high variation from year to year, and within a year. For example, strong rains in 1998 associated with the El Niño phenomenon resulted in a significant amount of crop damage in many Nile countries. In sharp contrast, rainfall was very low in 1999, leading to reduced crop production. Rainfall patterns also show a large degree of seasonal variation. In Rwanda, for example, at least four seasons are identified—minor rainy season from September to December; minor dry season from January to February; major rainy season from March to May; and major dry season from June to mid-September (during which water is the constraint for an additional cropping season).

Productivity of Rain-fed Agriculture. Rainfall is currently a primary water source for agriculture in the equatorial countries and in Ethiopia and Sudan, where it supports a large amount of cropped area. This includes about 8 million ha in Ethiopia, 10 million ha in Sudan, 5 million ha in Uganda, and 3.3 million ha in Tanzania (Table B.2). Rain-fed agriculture in Sudan produces 75% of the sorghum and 100% of the millet, major staple food crops for the rural population. Most country reports from the Equatorial Lakes region underline the fact that, despite the presence of high water resource potential

in the form of rainfall, the level of resource development for storage, irrigation, and drainage is very low. As a consequence of the quasi-exclusive dependence of agriculture on unreliable rainfall, use of agricultural inputs is insignificant, and overall productivity of rain-fed agriculture remains low.

Surface Water Resources

Surface Water Runoff. Several rivers drain the humid equatorial plateau into an extensive natural system of lakes including the Lakes Victoria, Kyoga, and Albert — the source of the White Nile, as well as the Ethiopian plateau, which is the source of Blue Nile, Sobat, and Atbara Rivers. In Uganda alone, the average annual runoff into rivers is estimated at 220 m³ per second, which is large in comparison to other regions. Lake Victoria outflow is estimated at 914 m³ per second. Despite the large amount of stream runoff, very little of this water resource is presently utilized for irrigated agriculture and runoff is causing soil erosion, flash floods, and sedimentation in downstream bodies of water.

River Water for Irrigation. The river Nile is the major source of irrigated agriculture in Sudan and Egypt—about 97% of Sudan's and 100% of Egypt's irrigation water originates from the Nile. Farmers in Egypt use some 55 billion m³ annually (including recycled wastewater) to irrigate about 3.3 million ha, while Sudan uses about 15 billion m³ to irrigate some 1.9 million ha.

Losses in Irrigation Systems. Most of the irrigation schemes in Sudan are located in the Central Clay Plains, on the eastern side of the Central Sudan. The source of water is the Blue Nile, its tributaries and River Atbara. These plains are characterized by a flat topography and exceptionally low-permeability soils, and water losses due to seepage and percolation are reportedly small. In irrigation systems in Egypt, individual pumping from supply channels to the land results in considerable operational losses, especially at the farm level.

Groundwater

Data Constraints. The use of groundwater for irrigated agriculture is comparatively small in the Nile Basin countries. In the equatorial countries, most groundwater development is for domestic and other urban uses, and not for agriculture. Availability of proper information is a major constraint towards groundwater development. Large-scale development of groundwater resources for agriculture would particularly require detailed hydro-geological data that are presently not available. However, groundwater resources easily available for irrigation development appear to be limited.

Groundwater for Irrigation. Groundwater use in Egypt and Sudan depends on the aquifer type — whether it is non-renewable (desert aquifers) or renewable (aquifers underlying the Nile Valley). The use of the desert aquifers is limited because the groundwater level is deep (sometimes exceeding 1000 m), the development cost high, and the quality uncertain. The current total abstraction in the Sinai and Western Desert regions in Egypt, for example, is estimated at 0.5 billion m³ per year. Use of groundwater for irrigation in Sudan is limited to very small schemes of 2-3 ha each in the Nile Valley where the groundwater depth is relatively shallow. The irrigation schemes tend to be located near the urban centers and produce fruits and vegetable, to justify the high production cost. The Sudan country report estimates that about 4.0 billion m³ per year of groundwater could be safely developed for urban and agricultural uses.

Wetlands

Current Use of Wetlands. Wetlands are an important resource in Nile Basin countries including Burundi, Rwanda, Tanzania, Uganda, and Sudan. Because of increasing population pressure, wetlands are more and more used, developed, and drained in unsustainable ways, including for the purpose of agricultural production. In Burundi, for example, a 1990 estimate shows that about 40% of the wetlands are being cultivated. Current wetlands use has still a low intensity, with only one crop cultivated during the dry season (July–September) using the residual soil moisture. In the rainy season, river flows inundate the wetlands and crop growth is not possible. In Rwanda, about 57% of

the country's total wetland area (about 160,000 ha) is currently used, of which about 71% is cultivated.

A number of Nile Basin countries have adopted legislation on sustainable use of wetlands, particularly Uganda, according to which drainage of wetlands is outlawed. In Uganda, extensive research has been carried out as a basis for new strategies towards sustainable wetland development and use.

C. Water Resources Policies

Policy Statements and Objectives. Most policy statements share a common objective to manage and develop water resources in an integrated and sustainable way, so as to provide water in adequate quantity and quality to the benefit of all social and economic needs (Table B.5). Development of rain-fed agriculture, due to its prevalence in the countries' agriculture, and as a result of high investment costs related to irrigation development, receives high priority in national water resources policy statements to increase food production. In addition to concerns about water quantity for agriculture, issues related to deteriorating water quality are also being raised. The quality issues include physical, chemical, and biological degradation of water quality (high silt content, localized occurrence of agro-chemicals, etc.). There are also concerns that in many countries, appropriate government agencies are not in place to provide effective leadership.

Table B4. Policies and Development Opportunities for Agricultural Water Resources

COUNTRY	INSTITUTIONS	POLICY AND OBJECTIVES	DEVELOPMENT OPPORTUNITIES
Burundi	Ministry of Territorial Planning and Environment, Ministry of Agriculture and Livestock	National Policy for Water Resources (Draft) Formulate National Water Guide by reinforcing IGEBU network Exercise rigorous control on environmental standards Promote small-scale irrigation Improve knowledge and management of wetlands	Create a water resources mgmt. Department Formulate national water plan Develop small-scale irrigation and wetlands Conduct a national program to prevent soil erosion Implement a national reforestation program Build capacity of public and private institutions
DRC	National Action Committee for Water Management (CNAEA, 1981-) The Regideso, National Rural Water Distribution Department. No one government department for water resources development and management.	National Policy for Water Resources Management (Min. of Environment, 1998) Promote better water supply and efficient use in urban areas Control and improve water quality <i>Presently no specific policy to promote efficient agricultural water use. In the Minimum Three Year Program (PTM: 1999-2001), irrigation is not included as strategic option to improve agricultural production</i>	Formulate government policy to promote agricultural production, especially through better water control and management Create a government agency for water resources Involve local communities in water development programs Develop small-scale irrigation and strengthen National Irrigation Unit, Promote forestation to check soil erosion Promote extension and research
Egypt	Ministry of Water Resources and Irrigation – Department of Irrigation, Ministry of Agriculture and Land Reclamation, Environmental Affairs Agency.	No policy name available Development objectives: Optimize the use of available water resources Improve water use efficiency in agriculture by reducing losses Develop groundwater resources Reuse: Agriculture drainage water Urban wastewater.	Support Irrigation Improvement Project (IPP) implementation to improve water use efficiency, Institute cost recovery to finance better system O&M, Develop groundwater in the Nile Valley, Western Desert and Sinai, Increase Nile flow through projects such as Jongli Canal (the country report qualifies this statement by noting that the gov. does not depend on these since the projects would require large international efforts).
Ethiopia	Ministry of Water Resources	Proclamation No. 92/1994: Utilization of Water Resources Promote role of private sector Give more responsibility to regional governments Ethiopian Water Resources Management Policy, 1999 Development of the water resources of the country for economic and social benefits of the people, on equitable and sustainable basis Allocation and apportionment of water, based on comprehensive and integrated plans and optimum allocation principles that incorporate efficiency of use, equity of access, and sustainability of the resource Managing and combating drought as well as other associated slow onset disasters ineralia, efficient allocation, redistribution, transfer storage, and efficient use of water resources	Develop irrigation infrastructure to cover some 2.5 million ha Develop hydropower in the range of 15,000 to 3,0000 MW Increase private investments for water related developments

Table B4. Policies and Development Opportunities for Agricultural Water Resources (cont'd.)

COUNTRY	INSTITUTIONS	POLICY AND OBJECTIVES	DEVELOPMENT OPPORTUNITIES
Kenya	Ministry of Environment and Natural Resources Ministry of Agriculture (Irrigation and Drainage Branch) Private NGOs and Estate firms	National Water Resources Policy, 1999 National Water Master Plan until 2010 – JICA Report	Build institutional capacity for implementing public policy Promote private sector participation Decentralize government institutions to allow local-level decisionmaking Formulate a national water conservation plan including better management of catchment areas Introduce water use fees Construction of small storage reservoirs Strengthen water resources monitoring
Rwanda	Ministry of Agr. Livestock, and Forestry, (Wetland Management and Irrigation Sections) Ministry of Energy, Water and Natural Resources; Ministry of Land, Human Resettlement and Environment Protection	National Policy for Water Resources Development Satisfy needs of population and livestock Preserve quality of water and land Promote private sector role Encourage users to meet costs Integrate national policy into regional and international framework	Develop reliable knowledge of water resources and development potential Improve and protect water quality Control discharge of pollutants Implement intensive reforestation in the Nile-Congo watershed (Nyungwe forest) Control soil erosion and water hyacinth problem Develop wetlands through proper drainage and irrigation
Sudan	Ministry of Irrigation and Water Resources Ministry of Agriculture and Forestry Ministry of Higher Education and Research	National Comprehensive Strategy (NCS, 1992) Full utilization of Nile water share (under 1959 agreement) Develop unused water resources Develop groundwater resources	Develop reliable data base Improve irrigation O&M through cost recovery from users Increase storage capacity Nile river Decrease soil erosion in upper watersheds and sedimentation in reservoirs and canals Utilize more rainfall through rain harvesting techniques
Tanzania	Ministry of Water (Basin Water Boards), Ministry of Agriculture (Irrigation Section). In the process of forming National Irrigation Agency.	Water Policy of 1991 (currently under review) Water Utilization Control and Regulation Act No. 42 of 1974, National Irrigation Development Plan Increase health and productivity of population Identify and preserve water resources and catchments	Better management of surface water including catchment protection and irrigation development Develop groundwater resource for city and domestic use Reform existing legal framework and information system Develop facilities to harvest rain and seasonal stream water Reduce losses in irrigation
Uganda	Ministry of Water, Land and Environment; Ministry of Agric., Animal, Industry and Fisheries; National Agriculture Research Organization	Nation Water Resource Policy Manage and develop water resources in an integrated and sustainable manner Secure and provide water in adequate quantity and quality for all social and economic needs	Develop facilities for better utilization of rainwater Strengthen government capacity to address water issues Strengthen data collection and information for proper planning Develop small-scale irrigation

Source: Country Reports

D. Main Issues Related to Agricultural Water Use

The country reports have identified several constraints related to increasing available water for agriculture and its efficient use. Despite large differences in climatic conditions, and despite the fact that downstream interests are not usually congruent with upstream interest, Nile Basin countries face a number of common concerns as described below.

Institutional Issues

Weaknesses of Government Institutions. Issues related to government organizations, their policies, programs, and roles in the development of agriculture and water sectors were common concerns in all country reports. Clear management weaknesses exist, including the lack of clear policy objectives, definition of roles and responsibility, and capability to involve the private sector. There is a shortage of skilled staff, financial resources, and data that are necessary for effective leadership in the development of agriculture and water sectors. In some countries, appropriate government institutions do not exist. For example, the Democratic Republic of Congo report mentions the need for creating a government agency for Water Resources Development and Management. Similarly, the Burundi report also identified the need to create a Water Resources Management Department.

Lack of Community/Private Sector Participation and Weak Support Services. A major common concern is the difficulty in institutionalizing private sector participation. The result is that the support services such as crop processing, marketing, credit sources, etc. are not well developed; water users associations remain paper organizations, and cost recovery mechanisms are difficult to implement. In addition, there is a lack of supporting infrastructure such as rural roads and electricity, while research and extension services are inadequate.

Absence of a Regional Forum for Exchange of Experiences in the Field of Agricultural Water Use. Although many of the agricultural water use concerns of Nile Basin members are shared among most of the countries, the prior focus for studies, consultations and exchange of experiences is outside the region. Surprisingly few opportunities exist for regional experts, researchers, government staff, and farmers to consult, share ideas, research results, and brief each other about new developments. As a consequence, regional knowledge, expertise, and experience has not received the value that they deserve, and regional collaboration is set back just because experts do not meet.

Policy Implementation Deficits. The government policies and objectives are not well articulated and are generally implemented with a top-down approach. Frequently, the development objectives are unrealistically high and performance monitoring and evaluation have not received priority. For example, the national policy in one country set the development targets to increase irrigated cropped area three times, rain-fed cropped area ten times and grain production by six times. These were clearly unrealistic objectives, and after seven years of implementation, few if any of the targets are met.

The case of the Privatization Policy in Sudan (1990s) is a good example, whereby the government handed over the management of medium-scale irrigation systems to the private sector and farmers' associations. The institutions managing the irrigation schemes faced great difficulties, however, and a large number of the schemes are at present out of production. They were not able to finance proper O&M because of difficulties in adopting effective cost recovery mechanisms. This led to deterioration of infrastructure and the level of services, which, in turn, led to unwillingness of the farmers to pay for O&M.

Technical Issues

Lack of Data. All country reports identify the lack of reliable data as a major constraint for proper design of water development and management efforts. There is a lack of access to research facilities and training opportunities, which limits national staff qualifications. These concerns are of particular

importance when pursuing new and delicate initiatives such as development of wetlands. Development and use of wetlands is fundamentally a management issue which requires appropriate knowledge of hydrology, soil, biological conditions, and social practices of people. Other examples of development initiatives requiring good information are; assessing degradation of watersheds, better utilization of rainfall for agriculture, groundwater use, etc.

Low Use of Rainfall. A major concern is that the available rainfall is not effectively utilized. In the absence of storage facilities, much of the rainfall becomes runoff that causes soil erosion, catchment degradation, and flash floods downstream. There is a strong consensus in most country reports that increasing productivity of rain-fed agriculture should be a priority issue. In view of the almost exclusive dependence of agriculture on rainfall, there seems to exist a large potential for improving crop production, yields, and rangelands carrying capacity by effectively utilizing rain harvesting techniques.

Watershed Degradation. Another common concern is the continuing degradation of watershed areas. The combination of human activities, livestock grazing and inadequate management practices has led to deforestation and removal of the vegetative cover. The result is flash floods and excessive soil erosion caused by rainfall runoff. Runoff of nutrients promotes the growth of hyacinth weed in the region, including Lakes Victoria and Albert and the Nile River. It has seriously reduced fish intake in Rwanda, Burundi, Uganda and Tanzania, and is a major O&M problem in irrigation systems of Sudan and Egypt.

Problems in Irrigation Systems. In Sudan and Egypt, with major irrigated agriculture, the following technical problems were identified:

- **Irrigation Efficiency.** The country reports from Sudan and Egypt maintain that the water losses from irrigation canals and fields are low, primarily because of the heavy clay soils. However, there are significant operational losses because of the aging infrastructure, inappropriate water management practices such as individual pumping by farmers, etc.
- **Inadequate Maintenance of Irrigation Facilities.** There is a general deterioration of irrigation service in most government-managed systems as a result of aging infrastructure, lack of maintenance, lack of funds, etc. Governments cannot afford to pay for irrigation O&M, and it has been difficult to institute effective cost recovery from water users.
- **Heavy Sediment Deposition in Reservoirs and Irrigation Canals.** The Blue Nile and Atbara rivers carry large sediment loads, with 4,000-6,000 ppm. It reduces the carrying capacity of irrigation canals and storage capacity in reservoirs. In Central Sudan, silt removal from canals alone is estimated to cost \$8/ha of irrigated land.
- **Limited Storage Facilities on the Nile River.** This is especially apparent in Sudan where the present storage capacity on the Blue Nile is 2.6 billion m³, which is only 6% of the annual yield. Similarly, the storage capacity on the Atbara River is 0.67 billion m³ which is 5% of the annual yield. About 76% of Sudan's irrigated lands receive water from these two rivers.
- **Strong Dependence on the Nile for Irrigation.** Some 97% of the irrigated area in Sudan and almost 100% of the area in Egypt depend on the Nile River. Over 71% of Ethiopian's water resources lie in the Nile basin. In Sudan, there are many non-Nile seasonal streams that are not utilized primarily because their development cannot be justified on economic grounds. However, for social equity reasons, small-scale irrigation development from these streams and from groundwater may be justified. In Egypt, there is potential for additional groundwater development.

Environmental Issues

Deforestation. Deforestation and degradation of vegetation in upper watersheds was identified in most country reports as a major environmental problem. There is a lack of community participation in

proper use and management of forests and vegetative cover in catchment areas. The problems of soil erosion, flash floods, sedimentation of reservoirs, and irrigation canals all result because of poor management of watersheds. As a result of frequent droughts (and regional wars), there have been mass population and livestock displacements, thereby increasing the already significant pressure on limited land and water resources.

Waterlogging and Salinity. In downstream countries Egypt and Sudan, waterlogging and salinity are reported to have increased. In Egypt, there is an increased use of drainage water, which has higher salt content. Also, the lands are more intensively cultivated and excessively irrigated. All these practices have raised ground water tables and increased soil salinity.

Economic/ Financial Issues

High Cost of Finance. Following liberalized market economic policies, governments in many Nile Basin countries have withdrawn subsidies on agricultural inputs such as fertilizers. With the prevailing high inflation rate, the cost of financing production inputs is exceptionally high. This, coupled with the lower prices for agricultural produce, has put farmers in a difficult position with respect to operation and maintenance cost recovery.

Lack of Access to Credit. Formal credit from banks is not available to a majority of farmers, while informal credit markets are very limited. Farmers are reluctant to obtain credit from banks because the transaction costs are high and because they lack collateral such as officially registered land.

Inefficient Marketing. The market information systems are not well developed and available to the producers. As such, private sector middlemen adopt bargaining practices that put the farmers at disadvantage. The poor market information systems have led to competition inefficiency, weak market integration, and lack of transparency. In addition, transaction costs are prohibitively high.

Poor Cost Recovery. Government organizations have difficulties in recovering costs associated with the provision of irrigation services. Farmers complain that the quality of service is not adequate (water is not supplied in the right amount at the right time) and therefore do not feel obliged to pay for it. Agency staff maintains that the funds are not enough for proper system operation and maintenance, and that they are therefore unable to provide required levels of service.

Table B5. Main Issues and Strategic Options Suggested in the Country Reports

COUNTRY	MAIN ISSUES	STRATEGIC OPTIONS
Burundi	<p>Excessive deforestation of catchments and resulting soil erosion</p> <p>Lack of clear definition of institutional roles</p> <p>Lack of funds for financing development projects</p>	<p>Anti-erosion campaign</p> <p>Biological methods: crop and tree cover</p> <p>Physical methods: terraces and storage reservoirs</p> <p>Institutional capacity-building</p> <p>Training of government personnel in engineering, hydrology, economics, etc.</p> <p>Strengthening of extension, research and technical assistance services</p> <p>Improve funding of development programs</p> <p>Improved water management</p> <p>Develop small-scale irrigation</p> <p>Develop wetlands for agricultural production</p> <p>Involve private sector and water users associations</p>
DRC	<p>Absence of state organization for water resource management</p> <p>Absence of clear policies for water resource development and management, private sector participation, etc.</p> <p>Inadequate water control due to lack of irrigation</p> <p>Absence of research, extension, and other support services</p> <p>High cost of irrigation development</p> <p>Absence of agricultural credit</p>	<p>Capacity-building</p> <p>Identify organization with main responsibility for water resources development and management</p> <p>Formulate appropriate policies, especially to encourage private sector participation</p> <p>Strengthen research, extension, and similar support functions</p> <p>Private sector participation</p> <p>Reduction of tariffs and taxes on imports and exports of agricultural goods</p> <p>Improve credit facilities</p> <p>Develop and strengthen water users associations</p> <p>Small-scale irrigation development</p>
Egypt	<p>Technical Issues</p> <p>Lack of field data and information, especially for groundwater</p> <p>Inadequate irrigation system O&M</p> <p>Institutional Issues</p> <p>Insufficient water user and private sector participation in irrigation</p> <p>Lack of government support services (extension, research, etc.)</p> <p>Lack of institutional coordination</p> <p>Financial/Economic Issues</p> <p>Lack of public funds and cost recovery from users</p> <p>Lack of credit sources for farmers</p> <p>Environmental Issues</p> <p>Increasing soil salinity</p> <p>Degradation of water quality due to urban discharges</p>	<p>Technical Improvements</p> <p>Tertiary level irrigation improvement</p> <p>Decision support systems to reduce mismatch of irrigation supplies and crop water requirements</p> <p>Encourage crops that require less water</p> <p>Institutional Reforms</p> <p>Strengthen Irrigation Advisory Service</p> <p>Strengthen and support water users associations</p> <p>Strengthen institutional coordination</p> <p>Improve agricultural support institutions (extension, research, marketing, etc.)</p> <p>Economic/Financial Improvements</p> <p>Strengthen private sector role by:</p> <p>Allowing it to compete with public sector in buying/selling and processing cotton</p> <p>Allowing it compete with PBDAC in farm inputs, credit and agricultural loans</p> <p>Allowing it to compete in extension and research</p> <p>Set floor commodity prices as incentive to farmers for increasing production</p>

Table B5. Main Issues and Strategic Options Suggested in the Country Reports (cont'd.)

COUNTRY	MAIN ISSUES	STRATEGIC OPTIONS
Ethiopia	Lack of data Lack of resources, especially skilled manpower Lack of research Low infrastructure development Environmental issues, including watershed erosion	Irrigation extension, service, and training Irrigation infrastructure development Improved catchment management to reduce soil erosion Data collection and management for sound development planning
Kenya	Low capacity of government institutions Inadequate involvement of the private sector Mismanagement of irrigation, excessive water use and losses Poor cost recovery for O&M Lack of ownership rights in irrigation systems Inadequate management of watersheds Rainfall/small streams not well utilized Excessive use of agrochemicals Deforestation and soil erosion	Capacity-building and institutional reforms Bridge gap between farmers and government Improve enabling environment for the private sector (irrigation extension, research, and development) Address mismanagement of agriculture Irrigation system management Reduce losses in irrigation system Empower farmers' WUAs Identify appropriate technology Watershed management and water harvesting Promote forestation and vegetative soil cover Harvest rainfall and stream flow to develop small-scale irrigation Water quality Reduce excessive use of agrochemicals, nutrient loading of streams Control sedimentation of lakes and streams
Rwanda	Organizational dispersion in water resources development Overlapping roles, conflict, and lack of information sharing Lack of clear policy for land ownership and use in wetlands Lack of experience in wetland exploitation, degradation of land quality Lack of private sector participation in land and water development Environmental degradation due to hyacinth, droughts, etc.	Policy and laws For wetlands, irrigated lands, ownership rights Better organization of government roles Promoting private sector role in water resources Capacity-building Research, demonstrations, and information Better guidance to private sector Improved watershed and wetland development Reforestation of uplands, training of local users Develop drainage and irrigation infrastructure in the valleys and wetlands Develop irrigation in the dry eastern savanna lands

Table B5. Main Issues and Strategic Options Suggested in the Country Reports (cont'd.)

COUNTRY	MAIN ISSUES	STRATEGIC OPTIONS
Sudan	<p>Low and erratic productivity of rain-fed agriculture</p> <p>Deforestation of watersheds and resulting soil erosion</p> <p>High sedimentation in irrigation system</p> <p>Low participation of water users in irrigation system O&M</p> <p>Low cost recovery for financing irrigation O&M</p>	<p>Water Control and Land Development</p> <p>Rain harvesting: identify and demonstrate technologies for more efficient use of rain water</p> <p>Develop non-Nile water streams</p> <p>Improve crop management practices (crop diversification, crop rotation, and proper inputs)</p> <p>Constraint Analysis Component</p> <p>Studies for enhancing water users participation in irrigation system O&M, including payment of service fees</p> <p>Study the impact of government's Free Market Policy on agriculture production</p> <p>Studies to identify government institutional strengths and weaknesses</p>
Tanzania	<p>Low management capacity</p> <p>Increased demand and pollution of water resources</p> <p>Lack of data for proper planning and management</p> <p>Lack of trained personnel</p> <p>Low performance of irrigation due to inappropriate design, aging infrastructure and inadequate O&M</p> <p>Deforestation of catchments, resulting in soil erosion and sedimentation in canals</p> <p>Low financial capability for proper irrigation O&M</p> <p>Absence of incentives for efficient water use</p> <p>Low participation of farmers</p>	<p>Improve Water Resource Management</p> <p>Strengthen government capacity</p> <p>Better data collection and use in planning</p> <p>Develop small-scale irrigation</p> <p>Rehabilitate aging irrigation infrastructure</p> <p>Empower WUAs</p> <p>Provide appropriate legal base, including cost recovery for O&M</p> <p>Build financial capability of WUAs</p> <p>Promote better watershed management</p> <p>Promote forestation through community participation</p> <p>Decentralization of authority to local government level and community</p>
Uganda	<p>Low institutional capacity to address technical, institutional, and financial aspects of efficient agricultural water use</p> <p>Inadequate information for sound development planning</p> <p>Inadequate research, extension, and training</p> <p>Inadequate community participation</p>	<p>Policy and strategies</p> <p>Increase agricultural water utilization</p> <p>Improve credit availability for intensive agriculture</p> <p>Improve marketing of agricultural produce</p> <p>Develop small-scale irrigation through construction of small reservoirs</p> <p>Pilot studies and demonstrations</p> <p>Better watershed management practices</p> <p>Utilization of swamplands</p> <p>Rain harvesting by small reservoirs</p> <p>Institutional capacity-building</p> <p>Strengthen Department of Agriculture including research and extension</p> <p>Strengthen private sector participation</p> <p>Identify appropriate technology</p>

Source: Country Reports

ANNEX C. RELATED PROJECTS IN NBI COUNTRIES

A large number of projects are being implemented in the region as summarized below. It should be noted that, although all projects are implemented in Nile Basin countries, not all of them work at present exclusively in river basins belonging to the Nile Basin.

Institutional Support to the National Irrigation Coordination Unit, DRC. Overall goal of the project is to increase agricultural production through irrigation development and its efficient management. Specific objective is to promote and coordinate irrigation development through following initiatives:

- Develop a basic data bank on water resources and exchange information with other countries
- Institute a water management policy and formulate a national irrigation strategy
- Organize WUAs and ensure their training
- Develop and implement capacity-building programs for government personnel and farmers.

The National Rice Program, DRC. UNDP/FAO and the government of DRC support the project. The project has assisted farmer communities to develop irrigated rice cultivation on about 2,300 ha. The development approach has been very successful specially because the local communities assume leadership in the development of irrigation infrastructure and its subsequent management. The irrigation facilities are simple and small-scale that can be easily developed and managed by the farmers' WUAs.

Irrigation Improvement Project, Egypt. The World Bank and the government of Egypt (1997–present) currently sponsor a second phase of the project. A first phase was supported by USAID (1989–96). Its overall goal is to improve water use efficiency in irrigated agriculture and increase crop production. Specific project objectives are:

- Promote organization of farmers in WUAs for collective pumping and efficient use of irrigation water at the tertiary system level
- Rehabilitate and improve tertiary level irrigation infrastructure
- Institute continuous water delivery from the main irrigation system
- Institutionalize a new government agency, Irrigation Advisory Service, to provide irrigation extension to the farmers and their WUAs.

The IIP project is now institutionalized as a separate sector within the Ministry of Water Resources and Irrigation. It has also led to the formation of an Irrigation Advisory Service. However, even after ten years of implementation and field demonstrations, IIP suggested practices have not been widely accepted. The fundamental problem is that its strategy does not really empower farmers and their WUAs.

Lake Victoria Environmental Management Project, Kenya/Tanzania/Uganda. The project is sponsored by the Global Environment Facility (GEF), the International Development Association (IDA) and the governments of Kenya, Tanzania and Uganda with a budget of \$77.6 million for 1996-2000 period. The project objectives are:

- Maximize benefits to riparian communities from sustainable use of resources within the Lake Basin to generate food, employment, and income
- Promote better management programs to stop environmental degradation of the Lake Victoria.

Watershed and Wetland Management Program, Rwanda. The project is managed by the Ministry of Agriculture, Livestock, and Forests and financed by the African Development Bank. The project aims to increase agricultural land by developing 10,000 ha of small swamps, and by applying improved soil conservation measures in the upper watersheds (erosion control terraces, etc.).

Present agriculture in Bugesera region is practiced on poor hilly soils where it is hampered by insufficient rainfall.

Rehabilitation of Pump Irrigation Schemes, Sudan. The project is financed by IFAD and implemented by the Ministry of Agriculture and Forestry, government of Sudan. Primary objective of the project is to rehabilitate the pump irrigation schemes on the White Nile as they are turned over to the farmers' associations. Initially, these pump irrigation schemes were owned and operated by the government. Recently, the schemes are being handed over to the farmers as a part of the adoption of market economic policies of the government.

River Basin Management and Small-holder Irrigation Improvement Project, Tanzania. The project is sponsored by the World Bank and the government of Tanzania, with a budget of \$31 million for the period 1996–2002. The project improvements will cover a 7,000-9,000 ha area and the project objectives are:

- Strengthen government capacity to manage water resources in river basins
- Improving stakeholder participation in Basin Water Boards
- Improve water use efficiency through improved performance of small irrigation schemes
- Increase crop yields and raise farmers income
- Promote farmers' participation in the development, implementation, and management of irrigation schemes.

Participatory Irrigation Development Program, Tanzania. The project is sponsored by IFAD and the government of Tanzania with a budget of \$25 million for the period 2000–2007. It will cover about 11,400 ha of agricultural land to pursue the following developments:

- Enhance government institutional capacity in irrigation development
- Promote farmers' organizations and increase their capacity for managing irrigation
- Promote private sector involvement in irrigation development.

Small-Scale Irrigation Development, Uganda. The project is sponsored by FAO and the Government of Uganda, with the overall purpose of increasing agricultural production by developing small-scale irrigation. There is abundant rainwater and surface stream flow that can be more productively utilized. The project will demonstrate how local communities can take leadership in building small-scale irrigation schemes, which can be managed by farmers' associations.

Olweny Swamp Rice Irrigation Project, Uganda. The African Development Bank and the Government of Uganda finance this on-going project. The purpose is to demonstrate to the local communities ways to develop and utilize wetlands in a sustainable manner. The project actively involves local people, especially womens groups, in cultivating irrigated rice in small wetlands. The project collaborates with IUCN, the National Environment Management Agency, and the National Wetlands Program in design, monitoring, and evaluation

The Kenya country report outlined the following major projects related to agriculture water resources:

- Rain-fed Rice Production Project, funded by the African Development Bank
- Small-Scale Irrigation Development Program, funded by the Dutch Aid.

ANNEX D. PROJECT DESIGN SUMMARY

HIERARCHY OF OBJECTIVES	KEY PERFORMANCE INDICATORS	MONITORING AND EVALUATION	CRITICAL ASSUMPTIONS
<p>Sector-related NBI Goal</p> <p>To increase the availability and efficient use of water for agricultural production in support of sustainable socio-economic development in the Nile Basin countries</p>	<p>Sector Indicators</p> <p>Agricultural production and productivity increased</p> <p>Water availability increased</p> <p>Water use efficiency increased</p>	<p>Sector / Country Reports</p> <p>ESW in agriculture, irrigation, and drainage (periodic)</p>	<p>(from Goal to Shared Vision)</p> <p>Willingness of member countries to take advantage of win-win opportunities, to share experiences, and to learn from best practices</p> <p>Willingness of member countries to continue process of cooperative development</p>
<p>Project Development Objective</p> <p>To provide a sound conceptual and practical basis for Nile riparian countries to increase the availability and efficient use of water for agricultural production</p>	<p>Outcome/Impact Indicators</p> <p>Conceptual basis piloted, monitored, and evaluated; practicality demonstrated by likelihood of replication</p> <p>Level of satisfaction among Nile Basin member countries with project outcomes</p> <p>Number of new regional initiatives launched</p>	<p>Project Reports</p> <p>Nile-Sec reports</p> <p>External evaluation reports (mid-term and final)</p> <p>Beneficiary assessment reports (annual)</p>	<p>(from Objective to Goal)</p> <p>Political willingness in place to go beyond pilots</p> <p>Availability of institutional leadership</p> <p>Reciprocal openness of member countries to host study tours, exchange visits, and share information and outcomes of pilots.</p>
<p>Output from Each Component</p> <p>Options for sustainable watershed management identified and increased productivity by improved watershed management demonstrated</p> <p>Options for community-managed irrigation development identified and increased agricultural production demonstrated.</p>	<p>Output Indicators</p> <p>Number of options for sustainable watershed management identified</p> <p>Number of improved watershed management activities identified and implemented</p> <p>Extent to which productivity has increased in watersheds where above activities have been implemented</p> <p>Number of options for irrigation development identified and implemented</p> <p>Extent to which agricultural production has increased</p>	<p>Project Reports</p> <p>Nile-Tec implementation progress reports</p> <p>Technical audit reports (periodic)</p> <p>Disbursement rates</p> <p>Evaluation reports (mid-term and final)</p>	<p>(from Outputs to Objective)</p> <p>Sufficient administrative flexibility to implement changes to approach when necessary</p> <p>Monitoring and evaluation in place to analyze outcomes and formulate conceptual basis</p> <p>Nile-Tec sufficiently staffed for appropriate administrative and financial support</p> <p>Other pillars willing to share project management</p>
<p>Options for reforms in publicly managed irrigation reviewed and piloted, demonstrating improved system performance, and options for irrigation development explored</p>	<p>Number of options for publicly managed irrigation reform reviewed and piloted</p> <p>Extent to which system performance improved</p>		

PROJECT DESIGN SUMMARY (CONT'D.)

HIERARCHY OF OBJECTIVES	KEY PERFORMANCE INDICATORS	MONITORING AND EVALUATION	CRITICAL ASSUMPTIONS
Project Components/Sub-Components <i>Watershed management</i> Studies/consultations Demonstration/pilots, and exchange of experience <i>Community-managed irrigation development</i> Studies/consultations Demonstration/pilots and exchange of experience <i>Management of public irrigation</i> Studies/consultations Demonstration/pilots and exchange of experience	Inputs (budget for each component, including contingencies) \$2.4 million \$1.5 million \$0.8 million	Project Reports Progress reports (quarterly) Disbursement reports (quarterly)	(from Components to Outputs) Willingness of government and farmers to test innovative approaches Open and frank exchanges between country experts Farmers sufficiently educated and empowered to self-organize Wide country level dissemination of outcomes of project

ANNEX E. PROJECT IMPLEMENTATION ORGANIZATIONAL CHART

