



# **NILE BASIN INITIATIVE**

## **EFFICIENT WATER USE FOR AGRICULTURAL PRODUCTION (EWUAP) PROJECT**

### **CONCEPT NOTE**

#### **AGRICULTURE IN THE FUTURE RIVER NILE BASIN ORGANIZATION**

**NILE BASIN INITIATIVE**

Initiative du Bassin du Nil

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## Table of Contents

<u>1 Executive Summary.....</u>	<u>4</u>
<u>2 Introduction .....</u>	<u>5</u>
<u>3 Agriculture program for the Nile Basin, Why? .....</u>	<u>6</u>
<u>3.1 Nile Basin Initiative and Water availability.....</u>	<u>7</u>
<u>3.2 Nile Basin and Agricultural Water Productivity .....</u>	<u>9</u>
<u>3.3 EWUAP project and Agriculture in general .....</u>	<u>11</u>
<u>4 Agriculture and Resource Management program in a Future River Basin Organization</u>	<u>13</u>
<u>4.1 Catchments / Watershed:.....</u>	<u>14</u>
<u>4.2 Rain-Fed Agriculture:.....</u>	<u>15</u>
<u>4.3 Irrigated Agriculture:.....</u>	<u>18</u>
<u>5 Agriculture program in other international River Basins.....</u>	<u>21</u>
<u>5.1 Mekong River Commission:.....</u>	<u>21</u>
<u>5.2 Indus Water Treaty.....</u>	<u>23</u>
<u>5.3 Organization for Development of Senegal River (OMVS):.....</u>	<u>23</u>
<u>5.4 Niger Basin Authority:.....</u>	<u>24</u>
<u>6 Immediate actions required by Nile SEC/ISP project .....</u>	<u>24</u>
<u>7 Outcome of Regional Workshop.....</u>	<u>25</u>
<u>7.1 Group I: Agriculture in a future River Basin Organization.....</u>	<u>25</u>
<u>7.2 Group II: Capacity Building and Research Services:.....</u>	<u>28</u>
<u>8 Concluding Remarks:.....</u>	<u>29</u>
<u>9 References .....</u>	<u>31</u>

## Acronyms

BMP	Better Management Practices
CN	Concept Note
EWUAP	Efficient Water Use for Agricultural Production
ISP	Institutional Strengthening Project
IWRM	Integrated Water Resources Management
MDG	Millennium Development Goal
MOU	Memorandum of Understanding
MRC	Mekong River Commission
NBA	Niger Basin Authority
NBI	Nile Basin Initiative
NEPAD	New Partnership for Africa's Development
NGO	Non Governmental Organization
RBO	River Basin Organization
SVP	Shared Vision Program
TD	Technology Development
ToT	Training of Trainers
WSSD	World Summit for Sustainable Development
WUA	Water User Association
WUE	Water Use Efficiency

# 1 Executive Summary

*The rationale behind the Concept Note (CN), is to create awareness and an understanding on the need for mainstreaming of the activities and achieved outcomes/ results of the Efficient Water Use for Agricultural Production (EWUAP) project as part of the future transitional arrangements or the permanent future organization. Much broadly, however, the whole idea behind the Concept Note is to bring to the attention of the NBI Secretariat and policy makers the need to support a land and water resources development program through an integrated catchment's or watershed management approach designed to address agricultural development in a sustainable manner. Hence, a need for the establishment of a pillar for resource management based agricultural development program in the transitional Institutional Strengthening Project (ISP) and/ or in a future River Basin Organization (RBO). Emphasis is placed in the CN on catchment's / watershed management approach in addressing some of the issues and aspirations of upstream and downstream inhabitants with respect to water, a final product of watersheds, which might provide some lessons for scaling up at the basin level.*

*The Concept Note also indicates immediate actions that need to be taken in order to ensure smooth transition of the EWUAP products into the new ISP*

*Adoption of a holistic management approach such as conservation based agriculture and integrated water resources use that tend to improve the overall productivity of land and water resources must be encouraged. Integrated water resources management, comprising land, water and other resources, within the context of a catchment's or micro-watershed management should lead to sustainable development and use of resources, and improved productivity as opposed to the current piece meal and fragmented approaches experienced in the Efficient Water Use for Agricultural Production (EWUAP) project dealing with the issues of water harvesting and irrigation practices in isolation.*

*Hence, a versatile intervention designed to improve overall productivity of the agriculture sector, that is, productivities of land and water resources should be considered. An integrated management approach using catchment's or micro-watershed as planning units will target primarily on resource conservation but will also positively contribute to the overall objectives of poverty reduction and livelihoods improvement because of the increased and sustainable productivity and the effective conservation of resources. In view of this, addressing issues of productivity improvement of the agricultural sector, efficient use of water and land, and conservation of available resources through a watershed management/ development approach might be a better option.*

*Water is a key common resource to the Nile River basin countries and is the basis for the mandate of the NBI and the future River Basin Organization. The use, management and administration of this important common resource, however, should not be envisaged in isolation but in conjunction with development activities in the agricultural sector. An integrated use of land and water resources with the objective of optimizing production and productivity through the intensified use of resources is critical. An integrated land and water management approach to resources use makes a lot of sense and more so when planned within the broader picture of catchment's management approach. The watershed management approach helps address simultaneously issues of proper land and water management, conservation of soil resources, and improved agricultural productivity because of availability of in-situ water.*

## 2 Introduction

EWUAP project is officially closing its activities by end of December 2008. The project objective was to create a forum at regional and national level to enable various stakeholders to discuss on issues related to efficient water use for agricultural production

The intended objectives of the project will to a large extent be achieved despite the very short life span of project implementation. Capacity has been built in the areas of Water Harvesting, and water management and irrigation, awareness created at national and regional level, trust and confidence built among the various stakeholders involved in all aspects of irrigation and water harvesting activities.

The outcome of EWUAP and expected outputs are expected to contribute to the realization of the overall objective of the Nile Basin Initiative: “to achieve sustainable socio-economic development through the equitable utilization of, and benefit from, the common Nile basin water resources”. This is to be realized through mutual cooperation and the development of common understanding on transboundary issues supported by proper planning and management of land and water resources, building of necessary capacity and enabling environment, and undertaking joint investments in areas that make sense in terms of long term engagement and sustainability to the whole process.

The establishment of the Nile Basin Initiative revolves around the proper planning and management of water resources for socio-economic development. In line with this, agriculture is at the forefront in terms the utilization of the water resources of the basin and engagement of a significant portion of the population of the riparian countries. The desired socio-economic development can only be realized if necessary support is provided to the sector so that productivity per unit of land or volume of water can be significantly improved.

Taking the basin countries at large, a break through in socio-economic development is unthinkable unless the riparian countries are willing to take measures in addressing the major constraints in the agricultural sector. Management efforts in the water sector that are not considerate of development needs of the agriculture sector will not achieve the objective of efficient use of water and, therefore, the saving and increased availability of water. Only development of the agricultural sector will contribute significantly to food security and poverty reduction, and help meet the Millennium Development Goals (MDG) and the objectives of the New Partnership for Africa’s Development (NEPAD) and the World Summit on Sustainable Development (WSSD).

Hence there is a strong need to effectively streamline the EWUAP products and outcomes into the ISP activities of the Nile Basin Secretariat in order to avoid any disruption and allow smooth continuity of activities at national and basin wide level. Consequently, the EWUAP project has developed a Concept Note to be considered

not only for an immediate action as part of a smooth exit strategy when project closes but stresses on the importance of supporting a comprehensive basin wide program on resources management and the improvement of the productivity of the agriculture sector as part of a future Nile River Basin Organization (RBO).

Most socio-economic development activities that are underway in most of the Nile basin countries right now are dominated by the agricultural sector. Agriculture as we all know is the single most important employer of labor, major contributor to GDP, and main consumer of water resources but with very low productivity. In line with this, transformation of the agricultural sector and improving the productivities of land and water resources is indeed very critical and needs no emphasis. Knowing fully well that the livelihoods of significant portion of the population of the Nile basin countries is dependent on agriculture and related activities, measures taken to develop and properly manage agriculture and agricultural water sectors in terms of improving the overall productivity will have a significant impact in addressing most of the problems associated with food insecurity and poverty, and hopefully in reducing conflicts.

### **3 Agriculture program for the Nile Basin, Why?**

Agriculture plays a predominant role in the lives and livelihoods of most inhabitants of the Nile basin countries and is known to contribute significantly to the overall economic growth and GDP of these countries. Agriculture also remains the main source of employment for the labor force in rural areas. Agriculture in general, and crop and animal production in particular, have been practiced in the basin for thousands of years, and yet productivity per unit of land and/or volume of water remains quite low since management practices in most of the Nile basin countries are traditional not supported by improved and/or new technologies. Thus, any improvements in food production, food security, food self-sufficiency, and poverty alleviation without significant improvements and transformation in the agricultural sector are quite unthinkable.

Both rain-fed and irrigated agriculture are widely practiced in the basin, rain fed agriculture being quite dominant in upstream countries while irrigated agriculture (mainly large scale) is prominent in down stream countries. In the Nile basin, as in many other parts of the world, agriculture is the largest consumer of water resources, a little over 75% by volume. Unfortunately, however, overall productivity of agriculture and agricultural water in most parts of the basin remains very low. Agriculture in the upstream countries is dominated by small-holder subsistence farmers who depend on traditional practices and the rains. Productivity in Sub-Saharan Africa is reported to be less than 0.2 kg per cubic meter of water and this is true for the basin.

Water is the key natural resource in the whole NBI set-up, its overall mandate and responsibilities, and in the implementation of its programs and projects. As a result, effective planning and management and productive use of water resources in the Nile basin is core agenda of the NBI. However, water should not be treated in isolation

but in conjunction with land and other natural resources and in view of this, improving the overall productivity of land and water resources is critical. In general, improving the productivity of water in the agricultural sector, under both irrigated and rain-fed conditions, through intensification and better management practices rather than expansion of cultivation in to marginal and less productive areas holds a great potential in realizing the objectives of food security improvement and poverty alleviation.

### 3.1 Nile Basin Initiative and Water availability

The Nile Basin Initiative (NBI), established by the riparian states, seeks to pursue sustainable socio-economic development through the equitable utilization of, and benefit from, the common water resources by creating a common understanding and cooperation among member states and stakeholders in addressing problems of food insecurity and poverty which in return will help promote regional peace, security, and stability. This requires strategic planning and cooperation among the riparian countries if the desired results and benefits are to be realized. The Nile Basin Initiative through the Shared Vision Program (SVP) projects is involved in building trust, confidence and capacity, and is exerting efforts in order to create a common understanding and an enabling environment for major investments and for cooperative planning, management and development of the water resources.

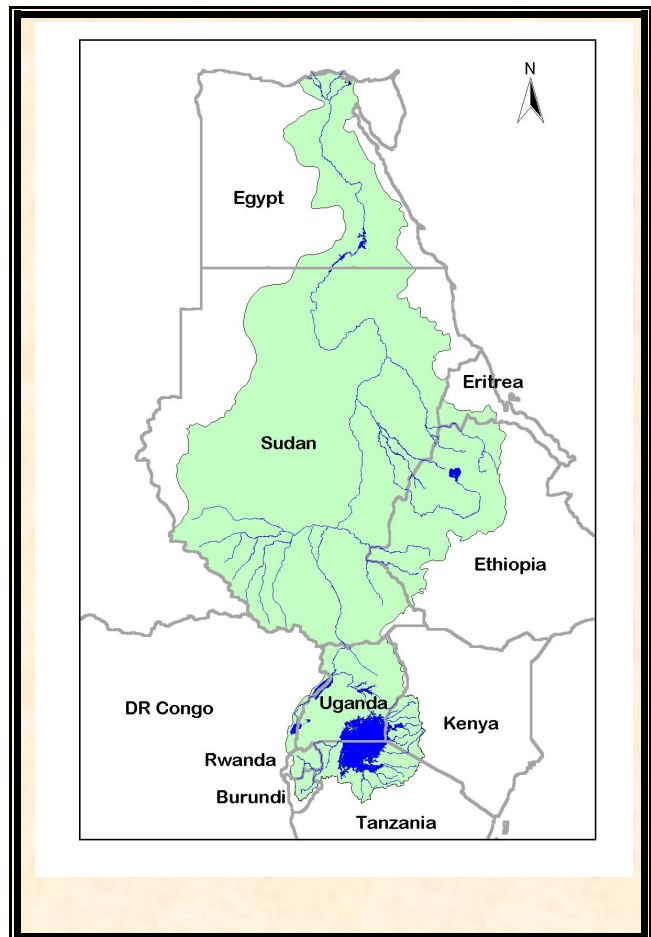


Figure 1: Nile Basin Countries

Ten countries, namely Burundi, Democratic Republic of Congo, Egypt, Eritrea, Ethiopia, Kenya, Rwanda, Sudan, Tanzania and Uganda share the water resources of the Nile River basin. The River Nile is formed by two main branches, the Blue and White Niles, which constitute the main hydrological system. The Blue Nile River originating in the highlands of Ethiopia is the major contributor in terms of total volume of flow whereas the White Nile with its source from the Equatorial Lakes region is known for its low but sustainable flow throughout the year.

The Nile basin encompasses a huge land mass, an area of a little over 3 million square kilometers, with diverse natural resources of which water is the most

important. The River Nile has resources that are of significant economic and social importance to the over 160 million inhabitants of the basin. Unfortunately, however, most of the riparian countries are quite frequently and closely associated with poverty, food insecurity and instability although potential and opportunity exists for economic development and growth because of the availability of diverse natural resources.

Views and opinions regarding the water resource potential of the Nile basin are diverse and often conflicting. Some indicate of the availability of sufficient water resources to support agriculture and other economic and social developments across all riparian countries while others paint a gloomy picture indicating gaps and limitations on the availability of water resources to meet social and economic development needs of the basin. Some of the widely and frequently raised technical, economic, and social related issues associated with water resources of the Nile basin include but are not limited to the following:

- Water in the basin is extensively used for agricultural production activities, a little over 75%, but there are growing demands from other sectors for water resources;
- Water use is considered relatively inefficient mainly because of the low level of productivity (water and land productivity);
- Water resources planning, management, and use is quite often in a fragmented approach rather than in an integrated watershed and basin wide approaches;
- Availability of sufficient and good quality water is under continuous pressure because of changes in climatic conditions, environmental degradation and pollution;
- Inappropriate use of land and natural resources coupled with lack of investment in the development and protection of watersheds and catchments, environmental degradation, and rapid growth of economic development and urban centers are contributing to decreasing trends in the availability of water;
- Lack of strategic planning and management of resources at both national and basin levels is exacerbating problems of water availability and efficient use;

There is a growing and continuous demand for more water and this might lead to increased competition within and among countries. Issues of growing demands for water could only be effectively addressed when all concerned work together in the overall planning and management of the water resources from a broader basin wide perspective.



### 3.2 Nile Basin and Agricultural Water Productivity

Availability and use of water resources (green and blue waters) is closely associated with the proper planning, management and development of catchments, watersheds or basins at large. Development and management of water resources is not viewed in isolation but as an integral part of the resources of watersheds. It is increasingly becoming evident that properly planned and managed watersheds can contribute to the sustainable flow and availability of blue and green waters in the forms of soil moisture, and surface and ground water.

Inappropriate land and water management and use practices tend to abuse resources there by contributing to major environmental degradation with basin wide implications is felt across the basin. In view of this, an integrated management and development of catchments or watersheds, whose end product is water, makes sense and is something to be recognized and adapted. So, management of water resources in the Nile basin in an ecologically sustainable manner through appropriate land use and management and an integrated development of resources involving agriculture (livestock, crop, fishery, and agro-forestry), natural resources (forest, range, and wild life), environment, and human resources is critical.

Available information indicates that productivity of the agriculture and agricultural water sectors in Sub Saharan Africa is up to 0.2 kg of cereals per cubic meter of water consumed. This is considered very low by any standards and, hence, strategies and development plans that target improvement of productivity in the agricultural sector (land and water) would have the greatest overall impact and will be quite rewarding.

Improving productivity of the sector will in return contribute significantly to food self sufficiency, food security and the alleviation of poverty at all levels. All efforts that are desired to bring improvements in the agricultural sector must be holistic and must integrate technical, social, economic, and institutional issues.

The low levels of productivity under rain-fed and irrigated agriculture in the Nile basin ought to be quickly addressed and reversed through the effective utilization of green and blue waters together with appropriate technologies and best practices. Such an integrated approach to resource use and management will contribute to increased productivity per volume of water or unit of land and, therefore, to increased overall production.

Current agricultural practices in the basin focus on the diversion and application of water (rainfall or diverted river/lake water) in order to produce crops and animals irrespective of the amounts of harvests or the levels of productivity or benefit in terms of monetary value per volume of applied water. The greatest challenge under such conditions, therefore, will be reversing the practice so that productivity per unit or volume of land or water could be optimized. This requires an overall improvement of the system so that more could be produced with the same volume of water or less volume of water is applied to produce the current levels of productivity.

As pointed above, agriculture is the major activity of most households in the Nile basin countries although mode of production is still traditional, dominated by small holder farmers characterized by low levels of production and productivity. Both rain-fed and irrigated agriculture are widely practiced in the basin, with rain fed agricultural activities closely associated with most up-stream countries while down stream countries are dependent on irrigation for their productions.

In any case, agriculture is identified as the main user of water resources in the basin although overall productivity of the sector is low and not commensurate with the amount of water consumed. The overall outputs of the agricultural sector measured in terms of production per unit volume of water or economic returns in terms of monetary value remain low and less desirable (0.2 kg of cereals per cubic meter of water).

The overall productivity of the agricultural sector is influenced by climatic conditions, soil fertility, land quality, availability and use of technologies and inputs, and most importantly by management practices. Interaction of all these variables in a positive way determines productivity but for some reason productivity of the agricultural sector, that is, water and land resources, in the basin has remained quite low. Efficient use of water for agricultural production must, therefore, be viewed holistically by taking in to consideration and addressing problems associated with all of the variables of production.

In most of the Nile basin countries, climate change and non-reliability of rainfall remains a major threat to the operation and management of agricultural activities and this coupled with depleted soil fertility and limited access to technologies and inputs is contributing to low and unsustainable productivity.

On the other hand, agriculture is a household enterprise influenced by various internal and external conditions that are beyond the traditional practices of crop and animal husbandry. Trade, market, value additions, technologies and inputs are some of the externalities that are influencing productivity. Unfortunately, however, agriculture in most of the basin countries is still traditional and highly linked with crop and animal productions for self sufficiency, and as a result is treated as a way of life in isolation of the system.

In modern production systems, however, crop and animal production activities are described as enterprises influenced by management, environment, markets and the availability of opportunities/services for value addition. Such attitudes and ways of thinking have helped transform the agricultural sector in many parts of the world and as a result have contributed to raising the level of overall productivity.

Unfortunately, however, and for various reasons, such an attitude in the Nile basin countries and more so in the upstream countries, has only been embraced lightly and this has not been of help in improving productivity of agriculture and agricultural water. The overall mind-set is tied up to the overall principle of producing enough for the family and not for markets. So, recognizing agriculture as an enterprise and

producing for markets has to be fully embraced and that might help improve performance of the sector and there by contribute to better utilization of land and water resources.

Similarly, an unwise use of natural resources, faulty management in farm practices, overgrazing, deforestation, and pollution have contributed to degradation of watersheds which is discernible in the form of reduced quality and quantity of land and water resources and ultimately in the decline of productivity of the agricultural sector.

The degradation of catchments and watersheds because of human interventions is immensely contributing to losses of soil fertility and soil productivity, sedimentation of rivers and dams, increased run-off and flooding, and diminishing recharge of groundwater and soil moisture. The introduction of agriculture in to new areas and changes in to existing farming systems in order to broaden economic developments or meet the basic and economic needs of growing population are identified as some of the factors that are contributing to the continual degradation of watersheds. These in return are contributing to food insecurity, poverty and other problems associated with a growing population.

In view of the above, efficient use of water for agricultural production should be treated within the broader context of improved agricultural productivity through watershed or ecosystems management and the principles of enterprise management.

The future Nile River Basin Organization should, therefore, focus on policy issues and strategies, and development agendas centered on watersheds and integrated resource management practices that might lead to improved agricultural productivity and, therefore, to increased access and availability of water and, hence, optimization of productivity and efficiency of use.

The future Nile organization should, therefore, push for the adoption of holistic planning and management approaches in addressing the issues of efficient use of water for agricultural production and, hence, integration of the various piece meal components into a much broader watershed or even basin wide management unit.

### **3.3 EWUAP project and Agriculture in general**

The Efficient Water Use for Agricultural Production (EWUAP) project, one of the SVP projects, is established to look in to some of the issues and problems of efficient use of water for agricultural production. This is to be realized through the establishment of forums, working groups and national focal points that foster exchange of information and experiences. However, the whole issue of efficient use of water for agricultural production should be viewed broadly in relation to improved performance of the agricultural sector where the interaction of land, water, inputs and relevant management practices are important. The objective of efficient use of water for agricultural production should, therefore, aim at better water and land

management practices that lead to improved productivity of agriculture and, hence, improved utilization of water resources.

The Efficient Water Use for Agricultural Production project is designed to deal with efficient use of water by focusing on water harvesting and irrigation (small and large scale) activities. The proposed interventions of the project are limited to establishment of forums for the exchange of information, knowledge and experiences, and the documentation and dissemination of technologies and best practices with the objective of contributing to improved use of water and saving there by increasing the availability of water for other economic uses.

Efficient use of water for agricultural production is influenced by various factors that affect overall productivity of land and water resources. Efficient use of water in the agricultural sector can not be achieved by the mere undertaking of limited and isolated interventions in water harvesting and small and large scale irrigations. Instead concerted efforts are required to address in a holistic manner the issues and problems affecting productivity of the agriculture and agricultural water sectors. Future interventions and support programs in the sector should therefore broadly focus on improving productivity of land, and water resources through the integrated use of land and water using catchment's or watershed management approach. Efficient use of water for agricultural production can only be addressed if productivities of land and water are achieved at all levels within a system. This requires holistic and integrated planning, management and development of resources which might also help address environmental degradation problems.

Current agricultural development efforts in most riparian countries are of short term nature focusing on quick results and benefits utilizing selected inputs and commodities (crop, livestock, fertilizer, seed, and chemicals) and management practices that are not considerate of the environment and the long-term sustainable use of resources. Short term Agricultural development activities have the potential to exacerbate environmental problems by exposing resources to further degradation because of the improper use and management and, hence, the chance of converting productive fields and catchments to an unproductive wastes and barren lands.

Efficient use of water for agricultural production or simply land and water resources management program could become more productive if addressed from a watershed and/or catchment's development approach which is also provides the potential to simultaneously deal with environmental issues, agricultural productivity, and availability of water on a sustainable basis. Information and experiences gained and the lessons learned from such an approach and management practices could also have wider implications and applicability beyond a specific micro-watershed in to the basin at large. Such an approach will be holistic and considerate of the ecosystem and the sustainable management of the environment for both upstream and downstream dwellers.

In view of such possibilities, adoption of a watershed management approach to rural development emphasizing on conservation based agriculture (integrating land, crop,

livestock, soil, water, and other resources) that actively involves upstream and downstream residents should be seriously considered. This encourages multiple use of water and holistic approach to management of resources contributing to improved and increased availability of water. It is within this broader context of resources development, management and use that activities related to water harvesting, community, and public and private managed irrigation project components should be addressed. The Efficient Water Use for Agricultural Production project from the outset should have been designed to deal with productivity issues and, hence, with the efficient use of water for agricultural production as opposed to dealing with specific sub activities

#### **4 Agriculture and Resource Management program in a Future River Basin Organization**

In line with the Shared Nile Vision *of sustainable socio-economic development through equitable utilization of, and benefit from, the common Nile Basin water resources* A broad based and integrated management and development of natural resources within catchments or watersheds will contribute significantly to the realization of the overall goal and objectives of the future River Basin Organization in a more realistic and sustainable manner.

An integrated approach to land and water resources management and development is quite complex and multifarious involving delicate ecosystems comprising households, communities, flora and fauna, and micro-environments that might require special interaction, management, relationship and harmony for mutual co-existence.

In line with this, understanding the system in terms of the weaknesses, strengths and opportunities so that relevant policies, strategies, and guidelines required for a harmonious habitation could be developed. Efforts along this require sharing of basic information and knowledge, building of necessary capacity, and changing the mind set and attitude of major stakeholders (paradigm shift) on the new approaches to resource management and development there by establishing the necessary enabling environment. Accordingly, some potential initiatives or interventions that might be considered by the RBO in the integrated use of land and water resources, that is watershed management approach to development, include:

#### 4.1 Catchments / Watershed:

Watershed is a hydrological unit used as a physical-biological entity and, in many occasions, described as a socio-economic-political continuum for planning and management of natural resources. In general, it is a topographically delineated land area that is drained by a stream or river system and is considered as a basic building block for land and water

planning. Watersheds are endowed with various natural resources (land, soil, water, biotic life, and minerals) that if managed properly can sustain life and the ecosystem and contribute greatly to a continuous flow of water which is an end product or yield of the system. The amount, quality and productivity of water in any given watershed are to a large extent influenced by management practices within the hydrologic unit.

#### Policy level actions could include among others

- Development of strategies, guidelines and approaches of bringing a paradigm shift on the whole approach of watershed based management to development;
- Development and establishment of guidelines, by-laws and criteria for bringing together various stakeholders in the watershed (upstream and downstream communities) and clearly define and establish roles and responsibilities;
- Development and establishment of national and basin wide criteria for identifying and selecting of potential site(s) for watershed development and management at local, national, and basin (transboundary) levels;
- Development of guiding principles and strategies for the development of watershed management plans and implementation of plans;
- Development of Memorandum of Understanding (MOU) describing the roles and responsibilities of upslope/valley bottom (upstream/downstream) communities on issues of access to water and land, sharing of benefits and/or resources realized as a result of implementation of watershed or integrated use of land and water resources;
- Establishment of a blue print of the necessary organizational/institutional set-up required to manage and administer watershed development programs (local, national and basin wide);
- Development of mechanisms of transferring ownership to community;
- Design and develop strategies related to inputs in terms of funds (credit/small grants), technologies, best practices, and other support services.
- Establishment of data base required for a continuous review and development of relevant policies and guidelines.
- Development of guidelines on land use and administration within existing laws and policies of country/basin and some of the traditional management practices;
- Develop strategies for piloting best practices in water harvesting (household and community) as an integral part of a watershed development program;
- Define mechanisms for the introduction of low cost irrigation systems and water saving technologies in relation to harvested water;
- Development of strategies and by-laws for the establishment of water users group/forum for proper management of harvested / diverted water resources;
- Development of strategies and mechanisms for up-scaling of practices across basin;
- Develop strategies for public/private partnership;

**Figure 2: Possible actions in watershed context**

However, because of anthropogenic interferences and the improper planning, management, and use of the resource base there is significant decline in the potentials and productiveness of land and water resources of catchments. Improper management and use of natural resources leads to environmental degradation in terms of losses of land, soil, fertility, biotic life, and vegetation and eventually to the decline in overall productivity, loss of economic vigor, and ultimately food insecurity and poverty. In view of such realities, efforts must be made to use land and water resources in an integrated manner with the aim of bringing benefit and sustainable change to the population and there by minimize environmental degradation.

#### 4.2 **Rain-Fed Agriculture:**

In most of the Nile basin and more specifically in the upstream countries, rain-fed agriculture supports production of food, oil, fiber and other industrial crops. However, productivity of farms in the rain-fed agricultural system is believed to be quite low and as a result most farmers are not able to meet and satisfy the immediate needs and requirements of their own households leave alone contributing to local, national and international markets. This, to a large extent, is due to lack of any meaningful support from the research and extension services, inaccessibility and high cost of inputs, limited or no access to credit facilities, and absence of functional markets. More important, however, is the human induced degradation of the environment (loss of top soil and soil fertility) contributing to a decline in productivity and the severe restriction of the potentials of soil and land resources to retain sufficient moisture and fertility to support any meaningful crop and livestock production during a growing season.

Changing climatic conditions and the non-reliability of rainfall in terms of amounts and distribution have also created uncertainties and difficulties to rain fed agriculture leading to a decline in land and water productivities. In addition, existing market and market systems do not provide necessary and desired incentives that might encourage farmers to invest on inputs and better management practices aimed at increasing production and productivity. Accordingly, farmers are not adopting best practices, and improved technologies, not using modern inputs and appropriate management practices and instead are continuing to operate using the same old traditional methods. Such conditions and realities are known to have played negatively in the overall program of productivity improvement in rain-fed agricultural systems.

Rain-fed based production systems and the ecosystem at large are fully dependent on that portion of rainfall that does not end up in streams, rivers and/or aquifers. It is only that portion of rainfall that infiltrates in to the soil and stored as soil moisture (green water) that can be partially accessed by growing plants and crops to meet evapo-transpiration requirements. Improving productivity of soil moisture has great potential in increasing production and, therefore, in minimizing the need for expansion in to marginal areas and thus avoiding further degradation of the environment.

Currently, increased agricultural production in most Nile basin countries comes from a combination of favorable rainfall conditions and the cultivation of new lands and certainly not from intensification and productivity improvements in already existing cultivated lands. Expansion in to new lands has its own draw back and is usually viewed negatively since such a practice has the potential of exposing well protected areas to forces of degradation and to the destruction of plant and animal resources and, therefore, contribute to an irreversible harm of the ecosystem. In view of this, intensification of rain-fed agriculture in the Nile basin is very critical and might be the most rewarding in terms of improved productivity and overall production and minimization of the impacts of environmental degradation that could have taken place as a result of area expansion in to marginal or protected land. This might be achieved through improved management and efficient use of soil moisture, conservation based agriculture, coupled with supplementary irrigation using harvested and/or diverted water when need arises.

Considering the extent of land cultivated under rain-fed agricultural system and the level of overall productivity (up to 1.0 MT/ha.), there is a real and great potential to significantly increase productivity and total production with some minimum efforts. Technologies and management practices that can transform the system and improve productivity per unit area or volume of water are known to be widely available in the basin and globally. Introduction of new and/or improved technologies and management practices might bring the desirable results of improved productivity and overall use of water resources and, therefore, the saving and availability of extra water for other activities such as double cropping using irrigation facilities and this might further contribute to increased production, extra income and food security.

- Identification, documentation, dissemination and familiarization of best practices and technologies through twinning activities and partnerships with NGOs, communities, and government offices;
- Provide detailed analysis of the influence of climate change on rain fed agriculture for review of policies and guidelines and suggest the means to adjust to the changes;
- In partnership with research organizations and higher learning institutions find mechanisms of better adaptation to the challenges of climatic changes;
- Develop strategies, guidelines and simple instructions on the management and practices of conservation based agriculture and integrated use of land and water resources;
- Development and preparation of guidelines, manuals and simple practical instructions on potential and practicable water harvesting structures and methods to be managed at household and community levels;
- Cost benefit analysis on investments and returns to water harvesting activities and provision of such information to governments and people from the private sector;
- Comparative analysis on potential benefits and rewards to be expected and realized as a result of improvements made in rain-fed and irrigated agriculture;
- Formulation and development of strategies and/or incentive mechanisms towards the improvement of productivity in rain-fed agriculture;
- Preparation of guidelines and practicable instructions on land management and conservation based agricultural practices;
- Preparation of guidelines and simple rules on administering supplementary irrigation practices;

**Figure 3 : Possible actions in rain fed agriculture**



The practice and philosophy of capturing/harvesting rain and making it available for multiple uses including agricultural production in the same spot or some distance further away where there is greater demand for water. Such a practice supports and insures sustained agricultural production and has the added advantage of reducing or minimizing the potential damages of flooding and soil erosion. Rain water harvesting includes the capturing of water from rooftops and other structures and storing it in well protected facilities such as cisterns or in the soil for use at some later critical stages. This assures continued production and at the same time avoids unnecessary competition and extraction of the limited water resources for irrigation purposes.

Improving the overall productivity of rain-fed agriculture coupled with adoption of best practices and management systems including better design of structures and selection of appropriate crops and cropping systems in irrigated farms so that efficiency of water use improves there by releasing extra available water for other development activities is important. In view of this, support to the improvement of agricultural activities (rain-fed and irrigated) is vital and, hence, the future Nile Basin Organization/institution should embrace agriculture as one major area of support/pillar and deal with some issues at the macro-level which might be related to information, strategic thinking, analysis and proper planning.

The future River Basin Organization in collaboration with national, regional and international research organizations could be involved in the process of identifying and sharing technologies and best practices that facilitate effective utilization of water resources (rain, soil moisture or surface waters). The existing traditional rain-fed agricultural production systems, characterized by low productivity levels, can be easily transformed to the extent that yield levels can be doubled, trebled or quadrupled with the introduction of limited but relevant technologies and management practices. Use of inputs (seeds and fertilizers), diversification of products to suit local conditions, conservation and improvement of soil and land resources, provision of supplementary or full scale irrigation using harvested and/or stored water, and the integrated use of land and water resources can all contribute to productivity improvement. In view of this, it is proposed that the future River Basin Organization should consider undertaking some activities that are of broader and global nature (see inserted box above):

Provision of supplemental irrigation during dry spells or critical growth stages of a crop can assure farmers of, at least, one reliable harvest. Such an intervention can substantially help increase yield of rain-fed agricultural products, thus contributing to improved productivity of rain-fed agriculture. Information on appropriate technologies that support effective implementation of supplemental irrigation activities in terms of development and use of farm ponds, shallow wells, pumps, and drip irrigation systems are available. Sharing of such an information including demonstration of these practices through some kind of pilot initiatives is important and should be supported. The future River Basin Organization could make some arrangements so that farmers can access small grants and/or credit facilities.

### 4.3 Irrigated Agriculture:

Potential exists in the different riparian countries for the development of small and large scale irrigation schemes. The problems associated with environmental degradation, changing climatic conditions, and uncertainties in rainfall (both amount and distribution) to support one harvest during a given season is forcing households, communities, NGOs, and governments to develop and/or support irrigation schemes, small and large, using available water resources. Development and management of non-traditional small and large scale irrigation schemes, however, requires information and financial resources for investment in addition to support services in terms of technologies and best practices, markets, trade and facilities for value addition.

The Nile basin has huge potential for the development of both small and large scale irrigation schemes based on narrow criteria of favorable climatic conditions and availability of potential large tract of cultivated and uncultivated lands. On the other hand, there are some beliefs and observations indicating that availability of relatively good quality water at any given time will be a limiting factor unless this is supported by water saving mechanisms and strategies at all levels. This might require basin wide cooperation in the planning, development and management of irrigation schemes and the efficient and effective use of the common water resources.

- Provide support to policy formulation and revision processes by sharing and availing necessary data and information;
- Formulation of strategies and guidelines on development and management of irrigation schemes from basin perspectives;
- Collect and assemble information on potential irrigable areas (national and basin level), sites for diversion and strategic storage of water, availability and delivery of water, sources of power and communication, potential crops and cropping systems in relation to available water, cost of water and water related services, water use by crop and site, potential consumption of water, productivity per unit of land or volume of water;
- Prepare manuals and guidelines on development, management and maintenance of basic infrastructure (roads, storage facilities, diversion weirs, schools, conservation structures, health facilities, and main, secondary, tertiary and field canals) in watersheds and irrigation sites;
- Prepare and provide clear description of the roles and responsibilities of the different stakeholders (households, communities, up and downstream dwellers, government, irrigation scheme developers, etc.);
- Define and establish the functions of head water regulators, managers, WUAs, and individual farmers;
- Devise and establish mechanisms on how funds invested by governments for the development and maintenance of major infrastructures can be recovered;
- Analyze, compile and avail information on hydrology, water balance, and water flow at specific/strategic locations, potential sites for water storage, potential crops, crop and total water requirements, irrigation scheduling, and productivity of some potential crops;
- Information on land use, soil, water and land productivity, evaporation and seepage losses, overall management approach of schemes, cropping systems, number of growing seasons, harvest per growing season or year, water use, and system efficiency;
- Assess situations related to water losses from major structures (dams, canals and irrigated fields) and advise governments on measures to be taken including options for alternative measures;

**Figure 4: Possible actions in irrigation**

Experiences and available information in the sector indicate that development and management of irrigation schemes requires investment and technical know how in the planning, construction, development, operation and management. Aside from the mammoth initial investment requirements, however, the fact that the expected benefits in terms of returns to investments cannot be realized in a short time is a major draw back to the development of irrigation. As a result, development of irrigation schemes is not favorably viewed by the private sector people who use quick returns as a criterion of investments. Thus, analysis and identification of the major constraints and difficulties affecting investments and the actions or incentives to be considered in order to encourage people from the private sector in the development of irrigation is important.

On the other hand, development and management of irrigation schemes needs information, and advisory services regarding costs of infrastructure development, costs of production, short and long-term benefits, and returns to investments based on crops and cropping systems, water use, productivity and total production, and availability of markets. The future Nile River Basin Organization should be involved in the establishment of global data base and provide advice and information to clients on potential sites for irrigation development, infrastructure requirement, operational costs, crops and cropping systems, water use efficiency, productivity, availability of water, and the need for strategic water storage facilities. Governments, people from the private sector, and financing institutions have roles in the development of irrigation schemes and this role could be enhanced and further strengthened through provision of basic information and advisory services by a responsible body like a River Basin Organization.

In the integrated use of land and water resources or watershed management, and the development of irrigation schemes, governments with some technical assistance from the future Nile River Basin Organization should assume the responsibility of developing the necessary and critical basic infrastructure for water and other supportive services (road, power, and communication). Putting in place some of the

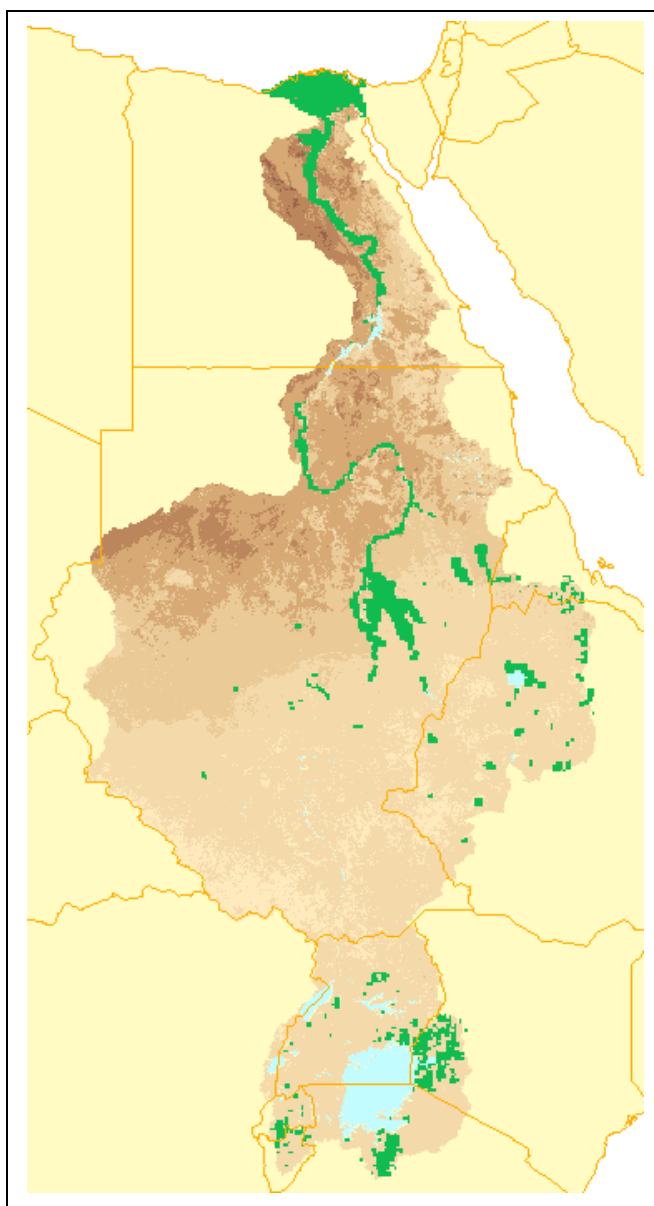


Figure 5 : Potentials areas for irrigation in NBI

very basic enabling environments (infrastructure, policy and access to funds) will encourage people with knowledge and capital to invest resources and effectively participate in the development of irrigation schemes. Accordingly, the development and availability of basic facilities in strategic locations will create conducive environment for investors to actively participate not only in the development and management of irrigated farms and watersheds but also in the delivery of basic services required by other small holder farmers located in the vicinity of such schemes.

The future River Basin Organization can play a critical role in the identification of such potential sites by looking in to the needs and requirements of upstream and downstream countries and that way minimize issues of environmental degradation, pollution and minimum water flow requirements. Some interventions that might be considered by the future River Basin Organization along this include but are not limited to the information provided above (see inserted boxes):

## **IMPROVING IRRIGATION MANAGEMENT**

Management and operation of irrigation schemes can be upgraded and improved with time and with adoption of better practices. Availability of good quality irrigation water is becoming increasingly limiting as more and more marginal lands are being developed and irrigated. This will cause unnecessary competition and stress on the limited available water resource. Under such critical conditions, there is no alternative other than improving efficiency and productivity of existing irrigation schemes with the objective of saving and increasing availability of water. Hence, looking in to the development of better and multi-purpose storage facilities with increased capacities and minimized losses, improved operation and maintenance of reservoirs, efficient distribution systems equipped with control structures, and use of more responsive management system might be essential.

Improvement along these areas will contribute to the availability of reliable water sources and this in return will allow farmers invest on better and improved on-farm water management systems which might include proper land leveling, improved and efficient field canals and drainage outlets, timely maintenance of feeder and field canals, establishment of manageable furrow lengths and plot sizes, practice of minimum tillage activities, use of pressurized irrigation systems, and others. Improved management requires support from appropriate institutions that can provide information, advice and improved technologies. Delivery of water on a continuous and sustainable basis alone is only part of the solution to the overall performance of irrigated farms. Other necessary and required inputs must be made available parallel to the delivery of irrigation water if productivity is to be improved. The irrigated farms in Egypt receive a holistic support as part of an integrated irrigation improvement program and so inputs like improved seed, fertilizers, pesticides, credit facilities, management practices and extension services, and access to markets have contributed significantly to the realization of the kind of productivity levels attained in the irrigated farms. So, addressing every effort must be made at improving the productivity of the agricultural sector (land and water) in a holistic matter as opposed

to isolated treatment of components. The future River Basin Organization must have an arm that looks in to such kinds of support activities.

When water is the main limiting resource, supply of measured amounts of water using metered gates and based on actual evapo-transpiration demands becomes necessary. This requires close collaborative work among interested groups and institutions such as governments (gate keepers) and management groups, private farmers and WUAs (consumers of water). This might be a better option in terms of effective use of and the saving of water.

On the other hand, introducing new techniques and upgrading of existing practices can also play an important role. Changing from flood or furrow irrigation systems to sprinkler, sub-surface and drip irrigation systems can also contribute to the efficient utilization of water resources. The future River Basin Organization has to provide advisory services and some of the required information in terms of investment costs, water savings and improved productivity so that decisions could be made accordingly.

## **5 Agriculture program in other international River Basins**

Effort was made to assess and review the activities of other selected and relevant River Basin Organizations on the kind of interventions they support in agriculture and agricultural water sectors. Attempt is made below to briefly highlight and share some of the approaches and activities of other River Basin Organizations in resources management and agriculture.

### **5.1 Mekong River Commission:**

The Mekong River Commission (MRC) comprising the countries China, Myanmar, Laos, Thailand, Cambodia and Vietnam has an objective of ‘to promote, support, cooperate and coordinate in the development of the full potential of sustainable benefits to all riparian States and the prevention of wasteful use of Mekong River Basin waters, with emphasis and preference on joint and/or basin-wide development projects and basin programs through the formulation of a basin development plan, that would be used to identify, categorize and prioritize the projects and programs to seek assistance for and to implement at the basin level’.

Accordingly the MRC has an “Agriculture, Irrigation and Forestry” support program within the broad framework of an IWRM-based Basin Development Plan comprising three elements:

- *Development Scenarios*, which assess the potential and constraints for the further development of some of the water resources in the various parts of the Mekong Basin. The results will guide the formulation of the IWRM-based Basin Strategy and the project portfolio.
- *An IWRM-based Basin Strategy*, which provides a long-term view of how the Mekong Basin may be developed in a sustainable manner for poverty reduction. The strategy will also guide the implementation of the IWRM at

basin, national and sub-basin levels, and assist line agencies with preparation of plans and projects that are sensitive to resource protection issues.

- *A project portfolio of structural* (investment) projects and supporting non-structural projects, to develop some of the Mekong Basin's water and related resources and minimize harmful effects that might result from natural occurrences and man-made activities.

Within its broader mandate as a commission, the MRC has identified medium-term goals which include:

- (i) Establishment of the "Rules" of minimum flows on the Mekong River and the review of proposed water uses.
- (ii) Formulation of Basin Development Plan to be used as a general planning tool for Sustainable management and development of the Mekong Basin.
- (iii) Establishment of MRC environmental management policies and guidelines.

Agricultural sector is part of the institutional framework of the MRC with a sector objective of safe food production, high value and high employment generated by agricultural water use. The sector features prominently under the operations division of the commission as agriculture, irrigation and forestry program.

The agriculture and agricultural water issues addressed by the MRC include an integrated management of natural resources (catchment's approach) and agriculture. The MRC has a plan to improve efficiency of water use in the agricultural sector and as a result bring down use by the sector from a high of 96% in 2001 to 87% by 2010.

Some of the key agricultural water use issues being addressed by the Mekong Basin Commission include but are not limited to the following:

- Increased irrigation water use efficiency;
- Land suitability / capability studies to identify the most promising areas for irrigation expansion;
- Expansion and development of irrigation in priority areas;
- Restoration and modernization of existing irrigation schemes;
- Assessment of the feasibility of inter- and intra-basin transfer of water to priority areas;
- Higher returns from irrigated and rain-fed agriculture, through improved farming practices, promotion of high quality production (rather than mass production), intensification and diversification of crop types and livestock, and support to processing, distribution and marketing.

Among the concerns and priorities of the MRC, the following priority activities are relevant to the concept note which deals with resources management and improved productivity in the agricultural sector.

- i. Since both water and agricultural lands are finite, development should aim at quality and value, as much as on quantity. Water allocation should be managed

- with a view to the value generated by water productivity, within different sectors, and in terms of selection of crops, particularly secondary crops.
- ii. An urgency of scope for (i) forest protection in general; and (ii) protection (against erosion) of headwater areas of reservoirs in particular (watershed / catchment's management).
  - iii. Preservation of groundwater quality, considering the long time required for natural restoration (if once polluted), and the scope for future utilisation for domestic and industrial supplies, as well as for irrigation (watershed and wetlands management)

In line with this, the scope for rehabilitation of existing irrigation structures and networks, and for efficiency improvement (by structural as well as non-structural) means, and review and further adjustments of the cost recovery schemes that have already been implemented in relation to the irrigation services was highlighted.

## **5.2 Indus Water Treaty**

Involves the Indus River System and is mainly between India and Pakistan and treaty appears to focus on sharing of water based on geographic location. After signing of the treaty, Pakistan began an extensive and rapid irrigation construction program, partly financed by the Indus Basin Development Fund of US\$800 million administered by the World Bank. Several immense link canals were built to transfer water from western rivers to eastern Punjab to replace flows in eastern tributaries that India began to divert in accordance with the terms of the treaty. Construction of a dam provided the first significant water storage for the Indus irrigation system there by contributing to flood control, to regulation of flows for some of the link canals, and to the country's energy supply.

A second phase of irrigation expansion with US\$1.2 billion fund also administered by the World Bank was established and key to this phase was another huge dam on the Indus River, which is the world's largest earth-filled dam, reduced the destruction of periodic floods and provided major power supply. Most important for agriculture, however, the dam increases water availability, particularly during low water levels.

## **5.3 Organization for Development of Senegal River (OMVS):**

The main objective of the OMVS is the promotion of inter-country co-operation and the co-ordination of technical, economic studies and other activities related to the Senegal River development in navigation, irrigation, hydropower generation, environmental protection, and conservation. One of the two conventions signed by the concerned parties addressed rational management of natural resources in the basin, environmental protection, conservation and water quality management, as well as agricultural and industrial activities in the basin. Addressing the issues of natural resources management at basin level provides foundation for development of agriculture.

## 5.4 Niger Basin Authority:

The Niger Basin Authority (NBA) comprising Chad, Cameroon, Benin, Cote d'Ivoire, Burkina Faso, Guinea, Mali, Nigeria and Niger aims at promoting cooperation among member countries and ensures an integrated development of the basin in all fields through development of natural resources, notably energy, agriculture, forestry, transport and communications. Specific objectives of NBA include: (i) promoting cooperation and harmonization of water resources policies and programs, (ii) planning sub-regional and bilateral projects and, (iii) designing, implementing and maintaining common projects.

Review of the mandates and experiences of selected relevant River Basin Organizations clearly shows that integrated natural resources management (a watershed based management of resources) and support to agriculture and irrigation in particular are important areas of interventions. This might be indicative of the need for adoption of a similar approach and, hence, the establishment of a pillar supporting an integrated land and water resources (watershed) management and agriculture (rain fed and irrigated).

## 6 Immediate actions required by Nile SEC/ISP project

The Efficient Water Use for Agricultural Production (EWUAP) project will soon be phased out after the implementation of limited capacity building activities and the documentation / description of best practices and action plans. This will require follow up in terms of dissemination and updating some of the data/information generated using Remote Sensing and GIS tools through additional data collection if the findings are to be sustained. Most importantly, however, the initiated activities need to be streamlined and continued if the desired end result of efficient water use, increased availability of water, and above all the objective of improved productivity of the agriculture (land and water) sector is to be realized.

In view of the above, there is a need to establish a focal point or desk within the ISP which will be responsible for activities related to agriculture including Water Harvesting and Irrigation, and resources management in general.

The focal point will be responsible for developing and supporting some activities at national level, further refinement of the draft concept note and most of all using the services of consultants and other resource persons to develop a basin wide program or strategy for the sector in couple of year's time. Such a task/assignment could also be assumed by the newly established Regional Agricultural Trade and Productivity (RATP) project of NELSAP.

On the other hand, since the riparian countries are also implementing national agricultural development programs it would be quite prudent to clearly differentiate and demarcate the responsibilities between what could be undertaken by the future River Basin Organization and the national programs.



## 7 Outcome of Regional Workshop

The ideas of a future agriculture program put forward in this ‘Concept Note’ were shared with representatives of selected relevant institutions<sup>1</sup> from the Nile Basin in a regional workshop. The main objective of the regional workshop was to discuss contents of the Concept Note and create an understanding on the approaches and overall principles with regard to a future agriculture program. The EWUAP team presented the main highlights of the Concept Note and shared with participants’ background information on the current EWUAP project, status of implementation of project interventions, and the potential gaps identified in truly addressing the problems of efficient use of water for agricultural production.

Second day of the regional consultation workshop was devoted to group discussions on two thematic areas related to the concept note. One group discussed on the technical aspects of the future agriculture support program (watershed management, rain-fed, and irrigated agriculture) while the other group deliberated on issues related to capacity building and technology development services required to support and sustain the future agriculture program. Findings and recommendations of the group sessions reflecting the consensus of the plenary sessions as recorded in the minutes of the regional workshop are presented as follows:

### 7.1 Group I: Agriculture in a future River Basin Organization

The group identified the need for a pillar of support for the agricultural sector and highlighted some specific areas of support to be provided by the future RBO. The group also identified major interventions that might be considered with regard to improving performance of rain-fed and irrigated agricultural program and watershed based management of natural resources.

**The group recognized the importance of agriculture in the lives and livelihoods of individuals and communities and the overall socio-economic development and as a result recommended that agriculture should become one main pillar of the future River Basin Organization and this was strongly supported during the plenary.**

### Justification for RBO support to Agricultural development

The recommendation of the group for a future support to an agricultural development program was based on global and local conditions related to the following issues:

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<sup>1</sup> The following institutions took part in the workshop: Makerere University of Uganda, Sokoine of Tanzania, ISAE from Rwanda, Arba Minch of Ethiopia, ERHA of Ethiopia, faculte des sciences Agronomiques du Burundi, Institute superieur d’agriculture du Burundi, Jomo Kenyata University of Agriculture, KARI, Water Management Research Institute.

- Agriculture and agricultural productivity improvement is one of the main agendas of the Millennium Development Goals (MDG) goals;
- Most of the population in the basin relies on agriculture for livelihood and for income;
- Management of agricultural water could become more effective if a basin wide approach is followed and support is provided to the overall development of the agricultural sector , main consumer of water, and this will have a great impact;
- Management of watershed is very critical – but farmers need to share benefits for their efforts;
- There are needs for shared principles and policy guidelines in the sector.

**Areas of support by a future RBO:** The future RBO should consider the following as areas of possible interventions:

- Support research and development: Common research programs, regional ecological areas;
- Focus on strategy development, planning on transboundary agendas, provision of advisory services on sector related policy formulations and revisions, and institution building;
- Trade and markets: Look at strategic areas / localities / sites of production (Production specialization based on potential and cost of production) with respect to markets;
- Documentation and dissemination of best practices;
- Support linkages between existing agriculture organizations;
- Look at issues related to climate change and effect on agriculture and availability of water and use such information for planning purposes

Besides, in the areas of planning and development, it was stressed that the future RBO should consider:

- A farm and watershed planning and development approach: In line with this, the RBO should focus on the principles of Integrated Water Resources Management (IWRM) approach and harmonization of efforts at all levels.
- Establishing and operating pilot demonstration sites for applying the principles of IWRM within the framework of watershed management approach.

**Key areas of involvement:** The group identified and recommended three priority areas of support within the agricultural pillar.

**a) Rain fed agriculture:**

- Development of strategies, programs, incentives and other mechanisms for the improvement of the productivity of rain fed agriculture
  - Drainage: control and management of flood waters

- Management of watershed, in situ techniques for maximizing the retention of water
- Appropriate structures of WH: define a road map on how to upscale technologies that already exist, move beyond demonstrations

**Main component:** The main components for rain fed agriculture as proposed by the group include:

- Strategic planning: support services for policy formulation, dissemination of best practices.
- Conservation based agricultural development
- Green water management
  - In situ farming
  - Up scaling of Water harvesting technologies
- Non-traditional agriculture

### **b) Irrigated agriculture:**

- Strategy development – Define roles of stakeholders, development of appropriate guidelines, description or clarification of institutional arrangements, identification of funding mechanisms;
- Look in to funding mechanisms and arrangements for research and training;
- Formulation and establishment of guidelines for development of new irrigation schemes and management of ongoing irrigations activities;
- Identify issues and problems of Community Managed Irrigation and privately managed small scale irrigation;
- Public Private Managed Irrigation schemes (Large Scale irrigation) – Issues of management, financing, institutional arrangements and others

### **c) Watershed Management component**

- Strategy: Development of standards, guidelines, criteria, institutional arrangements, principles and approaches integration, policy issues;
- Planning unit: Provides data / information and dissemination;
- Establishment of network and monitoring;
- Development: Identify sources of funds and participation in fundraising activities;
- Stakeholders forum at various levels ( regional, national)

## **Mission Statement for RBO**

Proposed mission statement for the agricultural sector, one of the pillars of the RBO, is:

**“Improved agricultural production and productivity in the Nile basin through the efficient use of land and water resources and other necessary inputs”**

## 7.2 **Group II: Capacity Building and Research Services:**

Group 2 identified and described some of the functions to be undertaken, the partner institutions to be considered for technology development and dissemination, mechanisms for partnership, areas of focus with respect to training and areas of support from the future RBO.

**Capacity building:** Future River Basin Organization has to:

- Coordinate identification of capacity needs through national governments;
- Organize tailored training (short, long term; formal and informal). Emphasis should be at basin level and focus on Training of Trainers (ToT), and use existing centers of excellence, partners, and experts to train to grassroots;
- Support research and technology development in partnership with other appropriate organizations.

### **Potential Partners for future RBO in TDD and training**

- Institutions of Higher Learning;
- Research Institutions;
- National Water Harvesting Association / Regional WHA;
- Local and international NGOs;
- CBOs (like the ones engaged by NTEAP in its micro grant activities);
- Private companies;
- Government Ministries and training centers;
- National Service providers.

### **Mechanisms for establishing desired Partnership**

- Mobilize resources and coordinate;
- Memorandum of Understanding (MoU) between RBO and partners;
- Joint proposals to mobilize resources (RBO+ partners);
- Partners provide staff time, networking support, and physical space/logistics.

### **RBO focus on training**

- RBO to do ToTs and individual riparian countries to train down to communities (lead institutions to be involved);
- Knowledge sharing products and policy briefs;
- Conflict management and other trans-boundary issues to be handled by RBO

### **Areas of support by a future RBO**

- Coordination / harmonization of cross border activities;

- Institutionalization of watershed development approach to resources management;
- Facilitation and development of necessary enabling environment for scaling up of Best Management Practices (BMP);
- Influence / harmonize policies in riparian countries;
- Establish methodologies for data collection, planning + management

## **Support Programs for Water Harvesting and Irrigation**

- Soil and Water Conservation;
- Irrigation Water Management;
- Determine the irrigation potential of each country and assessment of impacts on available water at regional level;
- Provide guidelines/manuals/standards on efficient use of water for agricultural production that should be followed by national governments;
- Develop methods for data collection.

## **8 Concluding Remarks:**

In almost all Nile basin countries, agriculture and agriculture based activities remain the most important in terms of influencing and affecting the lives and livelihoods of significant segments of the population. It is also true that agriculture still remains as the main consumer of water resources and will continue to be so for some time to come. However, the NBI's vision of equitable and efficient utilization of water resources of the Nile for productive purposes will continue to be a major challenge since amount is not compatible with development needs of all riparian countries. Aside from this, there are growing demands for more water resources from other sectors and uncertainties of climatic conditions to support reliable production and consequently the need for improved productivity and the efficient use of water resources.

Experiences from other selected appropriate River Basin Organizations, as shared above, indicate that the management of natural resources and development of agriculture, more specifically irrigated agriculture, are some of the priority areas of interventions. Accordingly, the institutional arrangements and organizational structures of some of the river basin organizations include a pillar or an arm for agricultural development as stand alone support program or as part of a broader Integrated Water Resources Management.

In view of the above and the fact that agriculture is the most dominant sector in the region, any future Nile River Basin Organization should be considerate enough to support management of natural resources (watershed based) and agricultural development programs along the following lines either independently or as part of an Integrated Water Resources Management (IWRM) program:

- **Watershed management:** Productivity improvement, whether under rain-fed or irrigated agriculture, has to be viewed in a holistic and integrated manner (integrated use and management of land and water resources). An integrated management of natural resources at watershed level will contribute significantly to improved and increased availability of soil moisture, groundwater recharge, better and sustainable use of land and water resources, continued and improved flow of springs, streams and river systems, well managed and well protected environment, and ultimately improved productivity of the agricultural sector. In general, proper and effective planning, development and management of micro-watersheds and/or catchments will have significant implications to sub-basin and basin level development activities. In view of this, activities that are focused on data analysis and compilation, and up-scaling of best practices could become quite important. Conservation based agriculture and integration of crop, livestock, forestry and agro-forestry, and wildlife activities within the principles and approaches of watershed/catchment's management will contribute positively to improving productivity and addressing the issues of environmental degradation. An effective management of watersheds will contribute significantly to reduction in soil erosion, minimization of flooding hazards, prevention of the silting up of dams, weirs and canals, and eventually lead to better use of water resources.
- **Rain-fed agriculture:** This is an area where the greatest opportunities exist and where a major break through is possible in terms of improving productivity by two, three or even four fold and there by increase total production with minimum efforts related to provision of inputs and introduction of best practices from already available technologies. This will improve effective use of rainfall there-by alleviating pressure on what ever water is available for irrigation purposes.
- **Irrigation:** The ever growing number of population in the basin has to be supported and compensated from a parallel increase in overall agricultural production and productivity and this has to come from improved and efficient irrigation schemes, both small and large scale. If complemented by increased and improved productivity in rain-fed agriculture coupled with better management of resources at watershed levels, there will be adequate water resources to support irrigated agriculture in arid and semi-arid areas where availability of land resources might not be a problem. The future Nile basin organization has to look in to the comparative advantages of geographic localities to support sustained production, cropping system, crop water requirements, efficient production methods, saving of water, the problems of salinity and drainage and finally into the issue of strategic storage and distribution of water.

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