Water Futures:
Assessing pathways, synergies & tradeoffs in alleviating poverty
through sustainable ecosystem services in Sub-Saharan Africa

Situational Analysis 1
Uganda & River Rwizi Catchment in the Lake Victoria Management Zone

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Preamble

The *Water Futures* consortium[1] comprises leading social and physical scientists from East Africa (Ethiopia, Kenya, Tanzania, Uganda) and the United Kingdom and proposes to work with key stakeholders from small-scale farmers to national ministries in an effort to develop, test and institutionalise an integrated, interdisciplinary, and scientifically rigorous methodology to identify and assess pathways toward more sustainable and socially just water futures in Sub-Saharan Africa (SSA). This region is characterised by substantial intra- and inter-annual climate variability and influenced by multiple, dynamic drivers of biophysical and socio-economic change that collectively pose an immense challenge to the sustainable management of water for a range of ecosystem products and services to alleviate poverty.

The *Water Futures* consortium was developed under a Partnership and Project Development (PPD) grant (Ref. NE/IOO386X/1) from the Ecosystem Services and Poverty Alleviation (ESPA) programme of the UK's Natural Environment Research Council (NERC), Economic and Social Research Council (ESRC) and Department for International Development (DFID). Under this grant in 2010, the *Water Futures* consortium conducted national and basin-scale *Situational Analyses* in Ethiopia, Tanzania and Uganda (Fig. 1) to assess local conditions, capacities and priorities and engaged in in-depth consultations with a diverse set of stakeholders concerned with the future management and allocation of water in a context of multiple pressures and competing demands. The following *Situational Analyses* is consequently one in a series of three *Situational Analyses* that were used to design the Water Futures that seeks to:

(i) generate new data on biophysical and socio-economic drivers and their impact on water availability, allocation and use;

(ii) integrate this information into an innovative suite of models to downscale climate projections and simulate dynamic hydrological-ecological-crop interactions under different climate and development scenarios; and

(iii) link these models to a Decision Support System through a deliberative, multi-stakeholder engagement and multi-criteria mapping approach that will inform policy and practice in order to give priority to water allocation pathways that meet poverty alleviation and sustainability objectives, particularly the needs of poor people who rely on water-based ecosystem services for their well being.

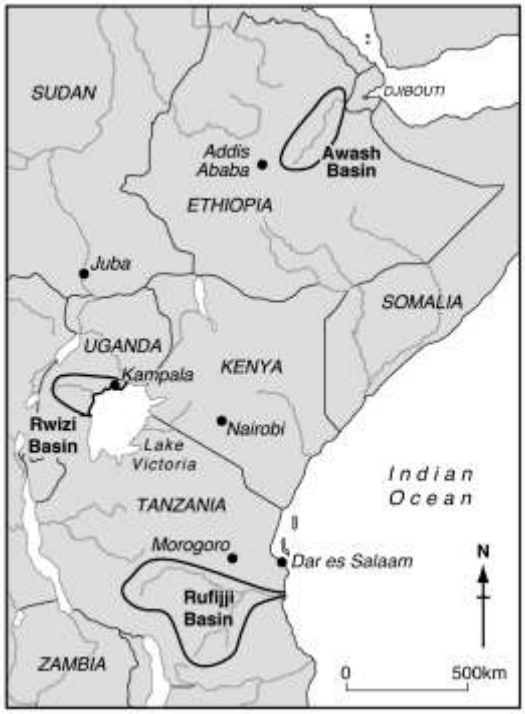

Figure 1. Water Futures study area including three focal basins

cover photo: Water Futures stakeholder consultation conducted in a headwater location of the Rwizi Basin in southwestern Uganda, October 2010 (R. Taylor)

[1] http://www.steps-centre.org/ourresearch/waterforfood.html

Overview

The Ugandan situational analysis is structured into two parts. Part A is at the national scale whereas part B considers a specific focal area, the River Rwizi catchment. Part A analyses base statistics that include: population trends; trade water resources; growth trends and their impact on natural resources; food production. It also reviews water policy and legal frameworks, national poverty reduction strategies and parallel initiatives and research projects for improving food security and food production. Part B analyzes the physical features; economic activities and their impact on the catchment; rainfall; major crops grown; land tenure and utilization; soils; and major water users. It also considers the socio-economic characteristics; strategies for food production and resource management; monitoring infrastructure and reporting; trends and patterns in catchment land use and water resources; and adaptations strategies to climate variability and change.

Uganda: The National Context

The 2010 population of Uganda is 32.7 million with a population growth rate of 3.2% per annum with a Total Fertility Rate of ~7. Uganda is engaged in both internal and external trade. The country lies in the Upper Nile Basin and has a total area of 235,880 km^2 of which 18% is occupied by lakes, rivers, and wetlands. The annual growth in food production is ~1.5% (whereas annual population growth is 3.2%). Estimated household poverty is 31%[2]. These statistics clearly indicate a trend toward food insecurity, and persistent poverty, hence the need to develop and implement programs aimed at increasing agricultural productivity and to improve food security. The pirncipal land tenure systems are: *(a) Mailo Land Tenure (b) Freehold Land Tenure (c) Leasehold Land Tenure and (d) Customary Tenure***.** The recent water Sector Policy and Legal Framework include: The *National Water Policy* (i) The Constitution of the Republic of Uganda, 1995 Local Government Act, 1997; The Land Act, 1998; The Water Statute, 1995; The National Environment Statute, 1995; and The Water Abstraction & Wastewater Discharge Regulations, 1998.

River Rwizi Basin: The Local Context

The River Rwizi Basin covers a total area of 8,346 km^2 that includes 240 km^2 of wetlands, 207 km^2 of forests, and 85 km^2 of open water area 85 sq km (IWRM Situation Analysis Report, 2007). Lowland areas are generally occupied by wetlands. The landscape is generally hilly especially in the south and northwest featuring rolling hills intercepted by wide and narrow elongated valleys. Economic activities within and along the River Rwizi include: cattle rearing; brick making; harvest of the papyrus reeds for making baskets; mats and art pieces; crop growing; and planting of eucalyptus trees. These income-generating activities have led to environmental degradation in the catchment. Major crops in the Rwizi catchment are perennial pulses, root crops; and vegetables and include: Bananas, Beans, Millet, Coffee and Ground nuts among others. Common land tenure systems in Rwizi catchment area are freehold, customary, and common property land ownership. The latter is the most common involving communal grazing on natural pasture. Socioeconomic changes include increasing human population density and in-migration by agricultural settlers. Both have affected the productivity of the land. The increasing brick making, sand mining and increasing human and livestock populations are putting pressure on the land with intensive degradation especially at watering points, along livestock paths and on hilltops. Most parts of Mbarara, Kiruhura and Isingiro districts are particularly affected by overutilization of land resources (NEMA, 2001). In order to unlock constraints in utilization and management of the catchment area, there is need for strong institutions and effective law enforcement mechanisms that can address conflicts in natural resource management in the catchment area. All stakeholders namely: local governments, central government, CSOs and the communities should participate in ensuring utilization and management of the catchment.

[2] Proportion of the population living on less than US $ 1 per day.

Part A: UGANDA - the national context

1. Base Statistics and Characteristics

1.1 Population

The 2010 population of Uganda is 32.7 million people, with a population growth rate of 3.2% per annum (UBOS, 2010). About 51% are females and 49% are males. Total fertility rate is ~7 children per woman. The proportion of the population living under US$1 per day is 31%. The level of literacy is 66.8%: 76.8% for men and 57.7% for women (*UBOS, 2002).* Uganda's GDP per capita is US$370 with an inequality (Gini) co-efficient of 0.46.

1.2 Trade

Uganda is engaged in both internal and external trade. Major exports include: coffee, tea, cotton, horticultural products, fish and fish products, gold, beans, dairy products, hides and skins, tobacco, fruits, vegetables, spices, and flowers among others. Uganda's export partners over the years have primarily been Germany (12.0%), Netherlands (10.2%), US (8.7%), Spain (8.0%), and Belgium (7.1). Others include Sudan (14.3%), Kenya (9.5%), Switzerland (9%), Rwanda (7.9%), and Democratic Republic of Congo (7.3%). Uganda's imports are mainly capital equipment, vehicles, medical supplies; cereals, chemical products, clothing, machinery metal & metal products, and various petroleum products mainly from Kenya (43.1%), US (7.0%), India (6.8%), South Africa (6.1%), Japan (3.4%), (Uganda Export Promotion Board, 2009)

1.3 Water Resources

Uganda has a total area of 235,880 km^2 of which 18% is occupied by lakes, rivers, and wetlands. Uganda lies within the Upper Nile Basin with perennial and seasonal rivers draining into Lakes Edward, Victoria, Kyoga and Albert, as well as the River Nile (Figure 2).

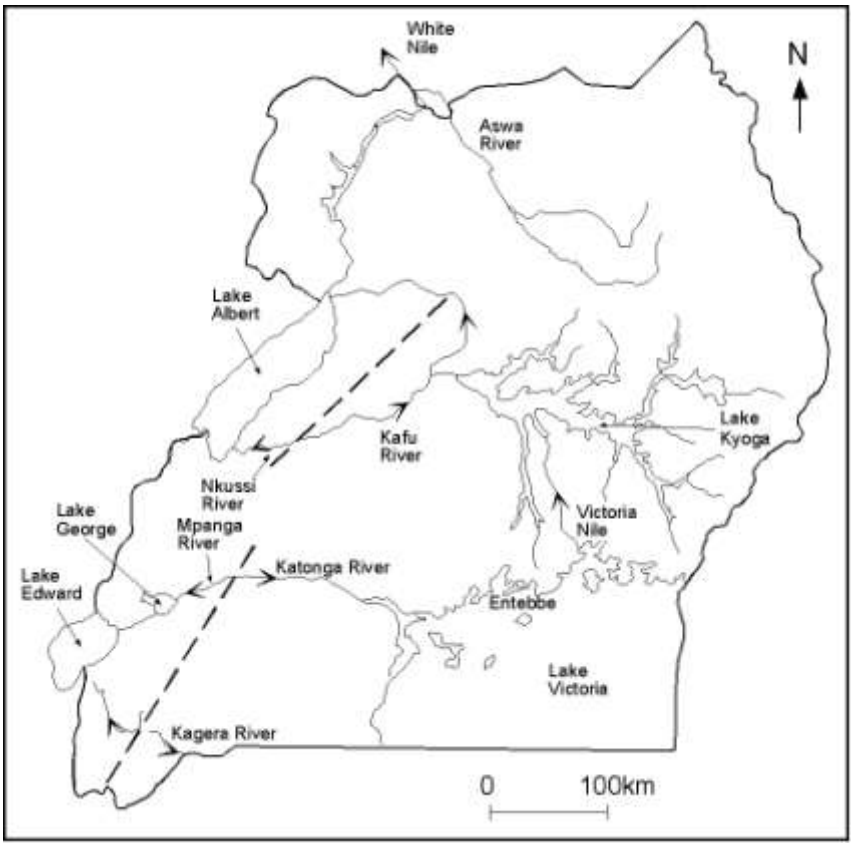

Figure 2. Map of Uganda showing the principal surface hydrological features.

The outlet of Lake Victoria is River Victoria Nile and the main input to Lake Victoria is the River Kagera which originates in the highlands of Rwanda and Burundi. The cultivable area is estimated to be 5,027,880 hectare out of which 30% is being cultivated. Uganda's freshwater resources include rivers, lakes, wetlands, groundwater, and direct rainfall. Renewable surface water resources are estimated to be 39 km^3/yr whereas renewable groundwater resources are estimated to be

27 $km^3 \cdot year^{-1}$. Total internal renewable water resources (IRWR) is estimated to be 39 $km^3 \cdot year^{-1}$; renewable external supplies of freshwater are estimated to be 27 $km^3 \cdot year^{-1}$ of which 25 $km^3 \cdot year^{-1}$ comprises inflow to Lake Victoria and 2 $km^3 \cdot year^{-1}$ drains from the Democratic Republic of Congo (Directorate of Water Development, 2005).

Total renewable freshwater resources in Uganda are estimated to be 66 $km^3 \cdot year^{-1}$ corresponding, in 2002, to a per capita water availability of ~2,800 m^3 per year. Per capita water availability has, however, steadily declined in response to rapid population growth and is currently (2010) just over ~2,000 m^3 per year. This value is, however, grossly in excess of estimates of per capita consumptive use of 21 $m^3 \cdot year^{-1}$ in 2008 (National Development Plan, 2010/11) – a figure that has nonetheless risen sharply from an estimate of ~12 $m^3 \cdot year^{-1}$ in 2002. At present, Uganda has the capacity to use just 1% of its current, renewable freshwater resources for consumptive uses (Directorate of Water Development, 2005).

The Ministry of Water and Environment in Uganda defines 'water for production' to include water for crops, livestock, wild life, aquaculture and rural industry. The land area considered to be economically viable for irrigation is estimated to be ~90,000 ha. The area currently under formal irrigation is ~7,600 ha of which 6,800 ha is irrigated for commercial sugarcane production. Approximately 53,000 ha is irrigated informally by farmers growing rice in swamps (PEAP, 2004/05-2007/08) as well as for sugarcane, vegetables and citrus. At present, ~10% of the total irrigable area is equipped for irrigation but only 65% of the irrigation-equipped land area is actually under irrigation (National Investment Brief: Water for Agriculture and Energy in Africa, 2008). Despite limited investment and capacity, there is considerable interest in irrigation but limited information about irrigation is currently available to farmers and agricultural extension staff.

The distribution of irrigated land in Uganda per region (Figure 2) is summarised in Table 1. Eastern Uganda has the greatest land area under irrigation, followed by Western Uganda. Table 2 summarises estimated water requirements for food production in Uganda in 2000/2002 and 2015. Table 3 reports estimated water demand versus water supply (i.e. water supply infrastructure). Water supplies in 2000/2002 were estimated to be smaller than the demand for water for production. For 2015, the government projects that water supply will be greater than water requirements though it is unclear how this increase in water supply will be achieved.

Table 1. Distribution of irrigated area in Uganda per region.

Region	**Irrigated area 1998 (ha)**
Central	850
Eastern	4,610
Northern	480
Western	3,210
Uganda, total	9,150

Source: National Water Development Report (2005)

Table 2. Water requirements for production in Uganda (2000/2002) and projections for 2015.

Sector	Water Requirements m^3	
	Year 2000/2002	Year 2015
Water for Crops and Irrigation	124,816,000	162,383,000
Water for Livestock and Wildlife	111,548,125	174,456,350
Water for Aquaculture	≈ 0	7,800,000
Water for Rural Industries	≈ 0	≈ 0

Source: Directorate of Water Resources Management, February 2008

Table 3. Summary of water resources and requirements of 'water for production'.

Sector	Water Requirements m^3	
	Year 2000/2002	Year 2015
Water Supply	224,700,000	364,200,000
Water for Production	236,364,125	344,639,350
TOTAL	461,064,125	708,839,350

Source: Directorate of Water Resources Management (2008)

Figure 3 shows the current (0.12 $km^3 \cdot\cdot year^{-1}$) and potential (2 $km^3 \cdot\cdot year^{-1}$) irrigation water use as a percentage of annual renewable freshwater resources (66 $km^3 \cdot\cdot year^{-1}$). Both estimates is quite small compared to the Annual Total Renewable Water

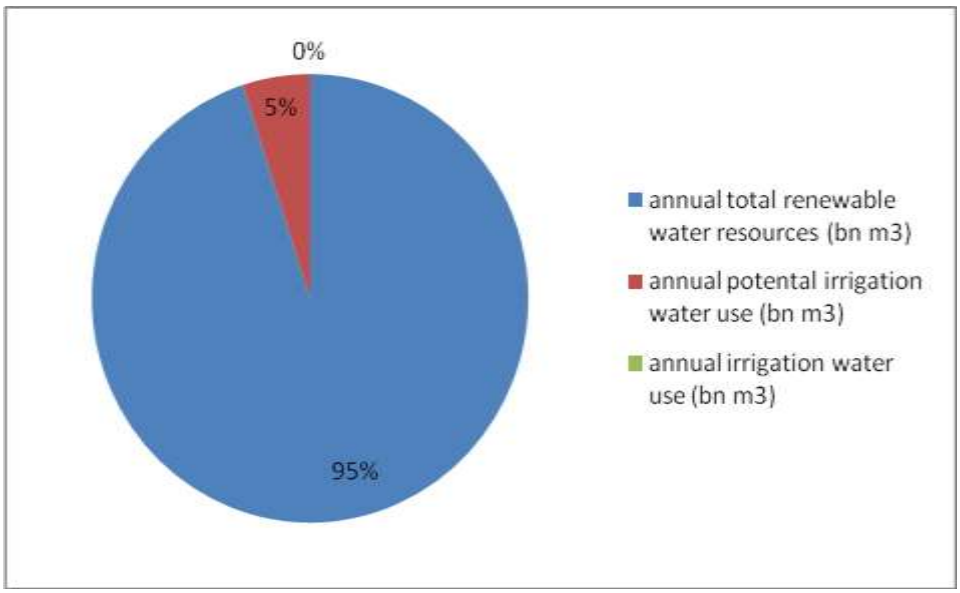

Figure 3. Irrigation Water Use in Uganda *(Uganda National Water Development Report, 2005).*

2. Post-1980 Growth Trends

2.1 GDP/Capita

Uganda's GDP per capita (purchasing power parity) rose from US$1,200 in 2007, to US$1,300 in 2008 but subsequently reduced to US$1,200 in 2009 (MoFPED, Background to the Budget, 2009). From independence in 1962 up to 1971, Uganda's GDP grew by an average of 5.2% per annum yet, between 1971 and 1979, GDP declined by 25% due to an unstable political situation and economic mismanagement. The inflation rate averaged 30% per annum. From 1981 to 1983, Uganda experienced GDP growth rate of 5.5% but again recorded negative growth rates between 1984 and 1986. This period

was characterized by state ownership of means of production and nationalization of private properties which led to a significant decline in the industrial and commercial sectors. Between 1987 and 1996, GDP grew at an average of 6.5% translating into 3.4% growth in per capita terms. There was a decline in monetary growth which together with growth in agriculture, especially food production, contributed to a reduction in inflation from 200% in 1987 to about 7.1% in 1996. Uganda registered impressive growth over the PEAP period, (1997-2004) with an average rate of growth in GDP of 7.2% per annum. The growth rate declined to 6.5% between 2000/01 and 2003/04 and increased to 8% over the period 2004/05 and 2007/08 (National Development Plan, 2010/11). The recent impressive GDP growth performance contributed to a significant reduction in poverty levels. The percentage of population living below the poverty line declined from 56% in 1992 /93 to 44% in 1997/98 and further to 31% in 2005/06.

2.2 Population Trends and Impact on Natural Resources

As indicated in section 1.1, Uganda's population growth rate is currently 3.2% per annum, the 3rd highest in the world after Niger and Yemen. The 2009 population of 30.7 million people is set to increase to 39.3 million in 2015. If this trends continues, the population will double to ~61 million in ~22 years (NDP, 2010) and could reach 103 million by 2050 (Figure 4).

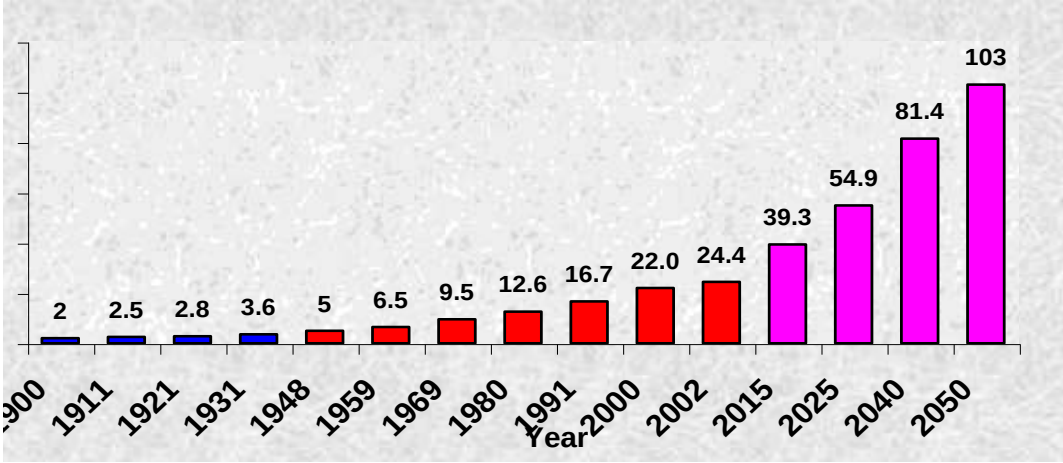

Figure 4. Estimated and projected population of Uganda in millions (*UBOS, 2002).*

Uganda's rising population has also become younger with the proportion of children under the age of 18 years increasing from 51% in 1969 to 56% in 2002. More than half of these children are below the age of 14 years implying high and growing proportion of dependent persons. The population of older persons (60 years and above) has decreased from 5.8% in 1969 to 4.6% in 2002. Population density in Uganda has increased from 64 persons·km^{-2} in 1980 to 123 persons·km^{-2} in 2002 (UBOS, 2002). Fertility has also remained high for the last three decades at an average of ~7 children per woman. This is attributed to low rate of contraceptive use (23%) as well as cultural and religious beliefs among other several factors. As 68% of Uganda's population depends on subsistence agriculture (UBOS, 2005), there is need to improve agricultural production without compromising other ecosystem products and services.

2.3 Food Production

Annual growth in food production is ~1.5% (UBOS, 2005), less than half of the rate (3.2%) of growth in population. These statistics clearly indicate a trend toward food insecurity. The need to develop and implement programs aimed at increasing agricultural productivity and to improve food security is clear.

3. Policy and Legal Framework

3.1 Land Tenure

The 1995 constitution of Uganda recognizes the importance of land to her development. It clearly states that land in Uganda belongs to the citizens and shall vest in them in accordance with the land tenure systems, namely: Customary, Leasehold, Freehold and Mailo. The constitution of the Republic of Uganda, Article 237(8) provides for the Uganda land commission, the district land boards and their functions. In Uganda, land is fairly distributed among households throughout the country with the average land holding being about 1.6 to 2.8 hectares in the south and 3.2 hectares in the north (NDP, 2010/11). The Land Act (Republic of Uganda 1998) provides for female inheritance rights over land, and requirements for spousal consent in all matters relating to land from which family derives subsistence. The land tenure systems in the 1995 Constitution of Uganda are explained below.

*(a) Mailo Land Tenure***:** This was created by the 1900 Buganda Agreement between Her Majesty's Government of Great Britain and the Kingdom of Buganda. By this agreement, areas of land were given to some individuals to own in perpetuity. The royal family of Buganda received 958 sq miles as private Mailo, chiefs and other notables received 8 sq miles each. Local peasants, previously on the land, were not recognized and became tenants. As such, they were then required to pay rent to the Landlord commonly known as "Busulu." The owner of Mailo land was and is entitled to a certificate of title. The creation of this form of tenure created Landlords on other peoples' land of which the latter statutorily became tenants on their own land. This issue created serious contradictions in land management as the same piece of land was granted dual ownership (i.e. the land title owner who may not be settling on the piece of land and the tenant who settles on the land but without legal title to it). It is this issue that constrains the land market in Uganda. A constrained land market with multiple tenure patterns restricts utilisation of such land for productive activities.

(b) Freehold Land Tenure: This form of tenure also existed in Uganda especially in the Western part of the Country. This is a system of owning land in Perpetuity and was set up by agreement between the Kingdoms and the British Government. Grants of land in freehold were made by the Crown and later by the Uganda Land Commission. The grantee of land in freehold was and is entitled to a certificate of title. Most of this land was issued to church missionaries and academic Institutions.

(c) Leasehold Land Tenure: This is a system of owning land on contract. A grant of land can be made by an owner of freehold or Mailo or by the government or Uganda Land Commission to another person for a specified period of time and on certain conditions, which included but not limited to payment of rent. The grantee of a lease for a period of 3 years or more is entitled to a certificate of title. Leasehold has drastically diminished as all land is slowly converting to freehold

*(d) Customary Tenure***:** This is the first tenure category specified in the 1995 Constitution and the 1998 Land Act. It has two broad classifications; Communal customary tenure predominantly in Northern and parts of Eastern Uganda and individual/family/clan customary tenure prevalent in central, Western, parts of the North and south Western Uganda. Before 1995, customary tenure though not legally recognized continued to exist as a system of holding unregistered land by customary rules. Customary tenants could be in occupation of Mailo-land, Freehold, Leasehold or Public land. They occupy such land by either growing various crops, exercising customary rights to look after animals thereon or by carrying out any other activity thereon as occupiers of such land. The term "Kibanja" became synonymous with occupants of land under customary tenure. Land, which was not owned either in freehold or by way of Mailo, was known as public land. The implication of customary land is the difficulty in modern utilisation of such land as the owner does not have registered interest in this land. As a result, it cannot be used as collateral to secure credit from financial institutions. Customary tenure is associated with land

fragmentation especially individual/family customary where land is divided among the generations or family members. Land fragmentation however discourages extensive agriculture due to small land holdings. This is worsened by the high population growth rate with a fixed amount of land that has to be shared. Communal land ownership is associated with land disputes and delayed investment decisions due to divergent investment interests among the community members.

Existing land tenure systems are associated with many problems. For example, Mailo land constrains the land market which has created a "land impasse." The problem with Mailo land is that it creates legal ownership of land which the owner does not occupy and occupation of land which the occupant does not legally own. This has led to constrained land transactions. The most secure way to acquire land is to buy from the Mailo landowner, but the buyer must compensate the tenants on the land he/she intends to sell. This has resulted in tenants, who need a lot of compensation from potential land developers, making property acquisition, ownership and development in Uganda a challenging task.

3.2 Water Sector Policy and Legal Framework

The Uganda government has put in place a comprehensive policy and legal framework for the management of the water sector. The framework comprises of a set of policies and laws the most notable of which include: The National Water Policy (1999); The Water Statute (1995); The National Water and Sewerage Corporation Statute (1995), and the Local Government Act (1997). Though most of the above policies and legislation have been in force for many years, a number of provisions are not yet fully operational, especially at the local government and local community levels. Furthermore, some of the legislation needs to be reviewed to address the emerging issues in this sector such as Private Sector Participation (PSP) and Decentralization.

a) National Water Policy

The National Water Policy (NWP), adopted in 1999, provides the overall policy framework for the water sector. The National Water Policy promotes the principles of Integrated Water Resources Management as a means to ensuring sustainable management and utilization of Uganda's water resources. The policy also emphasizes the recognition of water as being both a social and economic good, whose allocation should reach the various water users. The Policy is based on the principle of *"some for all, rather than all for some"* adopted from the 1990 "New Delhi Statement". It anchors operation and maintenance as an important and integral part of all water management programs to ensure their sustainability. The policy also highlights the key role played by women in all water management and development activities.

b) Guiding Principles

The National Water Policy adopts the guiding principles for Water Resources Management emanating from the United Nations Conference on the Environment and Development (UNCED, Agenda 21, Chapter 18) and listed below:

- Freshwater is a finite and vulnerable resource, essential to sustain life, development and the environment.
- Management of water resources at the lowest appropriate level.
- The role of Government as an enabler in a participatory, demand-driven approach to development.
- Recognition of water as a social and economic good with a value reflecting its most valuable potential use.
- Integration of water and land use management
- Recognition of the central role played by women in the provision, management and safe - guarding of water.
- The important role of the private sector in water management.

c) Legal Instruments for Water Resources Management

Legal instruments for Water Resource Management in Uganda are listed in Table 4.

Table 4. Major Legal Instruments relevant to the Water Sector

Instrument	Objective
The Constitution of the Republic of Uganda, 1995	Provides the broad legal and policy framework within which all water sector legislation, policies and development plans are developed.
The National Water Policy, 1999	Provides the policy framework for water resources management and development in Uganda.
The Water Statute, 1995	Provides the legal framework for the use, protection and management of water resources and water supply.
The National Environment Statute, 1995	Provides the framework for coordinated and sound management of the environment including environmental impact assessment of water resources related projects and setting water quality and effluent standards.
The Water Resources Regulations and Waste Water Discharge Regulations, 1998	Provide for the regulation of water abstraction and waste water discharge through the use of permits.
The Local Government Act, 1997	Provides for the decentralization of functions, powers, responsibilities and services including water development to Local Governments.

Source: Uganda National Water Development Report - 2005

(i) The Constitution of the Republic of Uganda, 1995

The Constitution of the Republic of Uganda lays the premise for all the laws that have a bearing on the water sector. The Constitution provides for the national objectives and principles of State Policy. Generally, the Constitution makes provision for natural resources of which water forms an integral part. It clarifies that water resources management is the duty of the state unless otherwise decreed by parliament. Government, local or central, holds natural resources in trust for the people of Uganda in accordance with the provisions of the Constitution in Article 237 (2). As trustee, government only has powers to grant concessions, licenses or permits in respect of the natural resources listed.

(ii) Local Government Act, 1997

The Local Governments Act defines roles for different levels of government in provision and management of water and management activities. The Act stipulates that provision of water and maintenance of facilities is a role of Local Governments in liaison with the Ministry responsible for Water. The Act empowers the different levels of government to plan and implement development interventions according to identified local priorities.

(iii) Land Act, 1998

The Land Act vests all rights to water resources in the Government. It empowers the Minister responsible for water to regulate the management and utilization of such water. The Act allows for reasonable use by the occupier or owner of a piece of land, of water for domestic and small-scale agricultural purposes. The Act provides that the government or local government holds land in trust for the people and protects environmentally sensitive areas such as natural lakes, rivers, groundwater, natural ponds, natural streams, wetlands, forest reserves, national parks and any other land reserved for ecological and tourist purposes for a common good of the citizens of Uganda.

(iv) Water Statute, 1995

The Water Statute, enacted in 1995, is the principle law for the water sector, which incorporates legislation for both water resources management and water supply and sanitation. The Water Statute is a modern water law, in that it is flexible, deferring details to regulations that can more easily be changed as conditions change and provides for delegation of powers and broad exemptions from regulation. At the outset, the Statute confirms that all water in Uganda is vested in the government and that rights to use water; to construct or operate any works; or to pollute water can only be conferred under the provisions of the Statute. Besides, general rights to use water for domestic purposes, fire-fighting, subsistence garden irrigation; the Statute does not authorize allocation of permanent water rights, but rather provides for the issuance of time-bound permits to abstract water, to construct hydraulic works and to discharge waste. The basic foundation of most of the Statute's provisions is the reconciliation between protecting the environment and ensuring the availability to the population of water of sufficient quality and quantity. The main objectives of the statute are:

(a) To promote the rational management and use of the waters of Uganda through:

- Progressive introduction and application of appropriate standards and techniques for the investigation, use, control, protection, management and administration of water resources,
- Co-ordination of all public and private activities which may influence the quality, quantity, distribution, use or management of water resources, and
- Co-ordination, allocation and delegation of responsibilities among Ministries and public authorities for the investigation, use, control, protection, management or administration of water resources.

(b) To promote the provision of a clean, safe and sufficient supply of water for domestic purposes to all persons;

(c) To allow for the orderly development and use of water resources for animals, irrigation, industrial, commercial and mining uses, energy, navigation, fisheries, preservation of flora and fauna and recreation in ways which minimize harmful effects to the environment; and

(d) To control pollution and promote the safe storage treatment, discharge and disposal of waste which may pollute water or otherwise harm the environment and human health.

The Water Resources Regulations (1998), Waste Discharge Regulations (1998), Water Supply Regulations (1999) and the Sewerage Regulations (1999) give effect to the provisions of the Water Statute.

(v) National Water and Sewerage Corporation Statute, 1995

The National Water and Sewerage Corporation (NWSC) Statute establishes the NWSC as a Water and Sewerage Authority and gives it the mandate to operate and provide water and sewerage services in areas entrusted to it on a sound commercial and viable basis. The Statute requires the Minister responsible for Water to enter into a performance contract with NWSC in relation to its operations in accordance with the provisions of the Water Statute. The Statute empowers the NWSC to own assets in its areas where it provides services without the need of compensation in respect of the transfer of such assets.

(vi) National Environment Statute, 1995

This National Environment Statute establishes the National Environment Management Authority (NEMA) as the overall body, charged with responsibility of coordinating, and monitoring all environment

management issues in the country. The Statute empowers NEMA, in consultation with lead agencies, to issue guidelines and prescribe measures and standards for the sustainable management and conservation of natural resources and the environment in general. The Statute also provides for mandatory Environment Impact Assessments (EIA) to be conducted for any activity likely to have a significant effect on the environment.

(vii) Water Abstraction & Wastewater Discharge Regulations, 1998

The Water Statute, 1995, provides for the establishment of regulations for controlling water abstraction and wastewater discharge through use of permits. The permit system ensures that use of water resources is environmentally friendly and promotes sustainable development. These controls also ensure that water is not treated as a free good but as a good with a value to be paid for. Different types of Permits are provided for under the Regulations :

1. Surface water Abstraction Permit.
2. Groundwater Abstraction Permit.
3. Drilling Permit – For persons involved in drilling of Boreholes.
4. Construction Permit - for a person who wishes to engage a driller to construct a borehole on his land for the purpose of using water or recharging an aquifer or fitting a motorized pump or borehole.
5. Construction Permit - for impounding, damming, diverting or conveying any surface water and or draining any lands.

3.3 National Poverty Reduction Strategies

Uganda has recognized the need to eradicate poverty and has therefore put in place various National Poverty Reduction initiatives aimed at improving economic and social welfare of the people. Prominent among these include the Poverty Eradication Action Plan (PEAP) which was first developed in 1997 and has undergone various reviews in 2000, 2004, and in 2008. In 2010, the PEAP was transformed into the National Development Plan (NDP) to make poverty eradication more achievable. As a result of poverty reduction initiatives, poverty declined from 56% in 1992 to 44% in 1997, to 34% in 2000, rose to 38.8% in 2003 and finally declined again to 31% in 2006 (Figure 5).

Trends in Figure 5 indicate reduced proportion of the population lives in poverty over the last two decades yet the absolute numbers of households living in poverty have increased due to population growth. In addition, there is variability in the proportion of poor household over time. These oscillations are characterised by a significant number of households living on the poverty margin and alternating between “poverty” and “vulnerability”. Apparent economic growth and poverty reduction have been characterised by growing inequality. Inequality (Gini Coefficient) has increasing from 0.37 in 1992/93 to 0.46 in 2006/7 (UNHC 2005/06, Table 5).

Table 5. Trends in Inequality (Gini Co-Efficient) in Uganda.

Region/year	1992/93	1999/00	2002/03	2005/06
National	0.37	0.40	0.43	0.41
Urban	0.33	0.33	0.36	0.43
Rural	0.40	0.43	0.48	0.36
Central	0.40	0.42	0.46	0.42
Eastern	0.33	0.35	0.36	0.35
Northern	0.34	0.34	0.35	0.33
Western	0.32	0.32	0.36	0.34

Source: UNHS and World Bank Report 2006

High rates of growth have not benefitted the majority as wealth remains concentrated**.** The Uganda government has implemented various National Poverty Reduction Strategies under the PEAP pillar which are: **a)** Economic Management, **b)** Enhancing Production, Competitiveness and Incomes, **c)** Security, Conflict Resolution and Disaster Management, **d)** Good Governance and **e)** Human Development with emphasis on Enhancing Production, Competitiveness and Incomes.

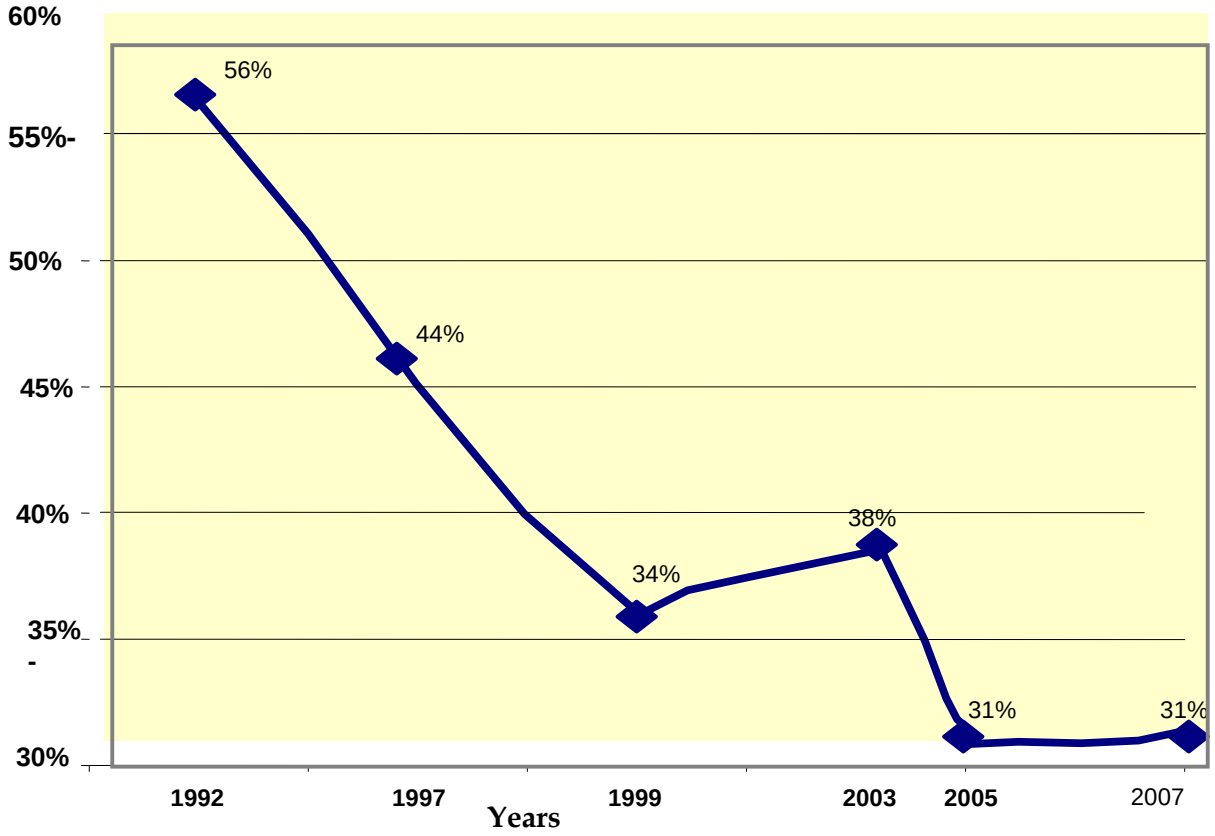

Figure 5. Poverty trends in Uganda (1992-2007) as a proportion of the total population.

One critical sector in Uganda that has a direct impact to household poverty reduction and rural transformation is the agriculture sector. This sector has unfortunately been marginalised with paltry budgetary allocations of 3.8% in 2008/09 and 4.8% in 2010/11 (Budget Speech FY 2010/11). Despite these meagre allocations, agriculture has remained a dominant sector in the Ugandan economy and its contribution to the national GDP has been significant. For instance, the relative contribution of the major agricultural products to the national GDP is highlighted in Figure 6. A comparison of national budget allocations for the agricultural and public administration sectors is given in Figure 7.

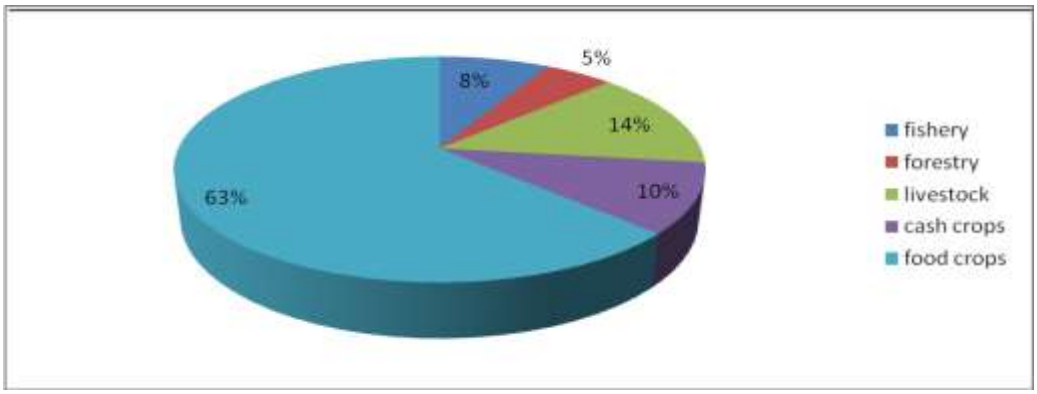

Figure 6. Relative Contribution to GDP by major Agricultural Products (UBOS, 2003).

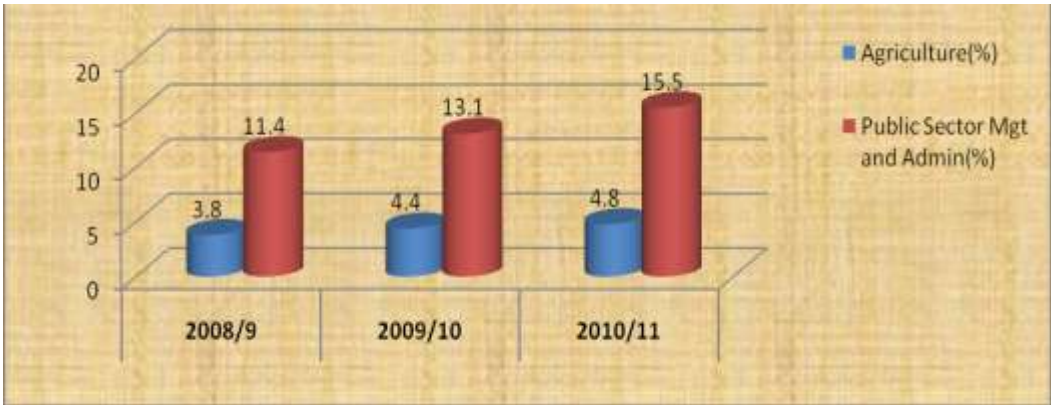

Figure 7. Budget allocations to Agricultural and Public Sectors **(**Republic of Uganda MoFPED, National Budget framework Paper (2010/11- 2014/15*).*

The government has undertaken Plan for Modernization of Agriculture (PMA) to address constraints facing agricultural-based livelihoods. The interventions under the PMA include advisory services under the National Agricultural Advisory Services (NAADS) programme, implemented in 2001, research and technology development, rural financial services (microfinance to improve household incomes), rural infrastructure and sustainable natural resource use and management. Water for production has also been given attention to improve agricultural production. In addition, energy has also been considered because of the realization that rural electrification plays a very significant role in poverty reduction. The Energy for Rural Transformation (ERT) programme has been developed to widen the access of rural areas to energy supplies to 10% by 2012 through grid extension and the promotion of independent power producers of solar or renewable energy. As a result, the proportion of rural households using electricity for lighting rose from 1% in 1999/2000 to 3% in 2002/3 (PEAP 2004/5-2007/8). The current budget allocation in 2010/11 for energy and mineral development is 5.4%. The revised target is to increase the proportion of rural households with electricity to 10% by 2012. In regard to improving competitiveness, the government formulated the Medium Term Competitiveness Strategy (MTCS) in 2000 which aims to create a favorable environment for the private sector to grow, become profitable, and compete both locally and abroad. The priority areas under MTCS include trade, investment and export promotion, financial sector reform, infrastructure and utilities, enabling environment for micro, small and medium enterprises (MSMEs) commercial justice, sector specific issues and creating an enabling environment.

4. Food Security

4.1 Parallel Strategies to Improve Food Security

Food security is a situation where all people have food at all times for a healthy and active life. It encompasses food availability, accessibility, vulnerability, and food utilization. Parallel strategies to improve food security include the 2007 Plan for Modernization of Agriculture (PMA). This is a framework setting out the strategic vision and principles upon which interventions to address poverty eradication through transformation of the agricultural sector can be developed. Under the PMA, a Non-Sectoral Conditional Grant (NSCG) was established to be administered by the PMA secretariat and allocated through Local Government.

An Irrigation Development Strategy has been established, which addresses key issues such as: irrigation economics, including the identification of suitable and high value crops; land ownership and accessibility to water resources; rural financing systems and financial services and agricultural marketing systems for small farmers and small industries; access to quality seeds, fertilizer and other inputs; technical and managerial capacity in water supply development and water use management at national, district, extension and farmer level; post-harvest management and marketing; research and demonstration, extension services, and farmer education. There is also the National Agricultural Advisory Services (NAADS) programme which intends to extend direct support to 100 farmers per parish that was planned to commence July 2010, by providing them with input kits consisting of seeds, fertilizers and herbicide for selected enterprises such as rice, wheat, maize, tea, coffee and cocoa, and some implements such as hoes, and spray pumps where they are needed, to address food insecurity and reduce poverty. (Budget speech, 2010/11**.)** The main focal areas for the PMA are shown schematically in Figure 8.

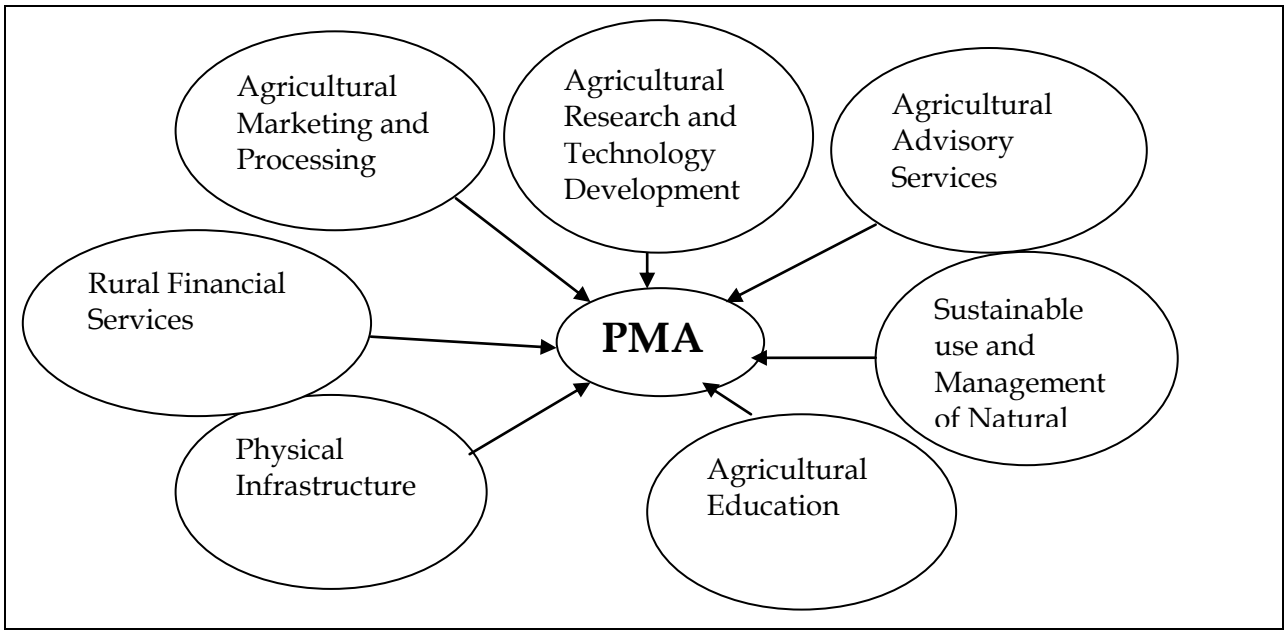

Figure 8. Main focal areas of the Plan for Modernization of Agriculture, PMA (Uganda National Water Development Report, 2005).

The government recognises the problems of persistent food shortages and critical nutrition deficiencies experienced in many parts of the country. These problems are partly attributed to poor harvests associated with erratic rainfall. In response to this, the Uganda Government has initiated several

national programmes aimed at addressing, among other issues, constraints to food production, processing, storage and marketing of agricultural products, and improvement of general national food security.

Under the Irrigation Development Strategy, the government constructed a number of Valley dams/tanks in several districts in Uganda, mostly for livestock and to a small extent, human consumption. The storage of these valley dams/tanks ranges from 6,000 m^3 to 400,000 m^3 (Uganda National Water Development Report 2005). As part of the IDSP, the construction of multi-purpose reservoirs (Valley dams and tanks) is promoted where water can be used for both livestock and small-scale irrigation. As part of this initiative, Government is promoting the use of efficient irrigation systems in an effort to sustain water sources throughout dry periods. Technologies include localised sprinkler and drag-hose irrigation systems. Small-scale water harvesting (from roof-tops, small springs and diversion of small streams) has been successfully conducted in various parts of the country predominantly for domestic supplementary irrigation for vegetable production, horticulture and small-scale irrigation of high value cash crops like clonal coffee and vanilla. Other initiatives include:

a) Wetland reclamation

Wetland reclamation for paddy rice production is very popular in many parts of Uganda, especially eastern Uganda. Over 53,000 ha of wetlands have been reclaimed for both small scale and large-scale paddy rice production in Uganda. Given the interest shown by many farmers to take up paddy rice production, the Government, with funding from Japan, has initiated a small-scale irrigation project to support and build capacity of the rice farmers to enhance rice production in the country and also ensure sustainable use of the wetland resources. To date, 13 districts from eastern Uganda are already benefiting from the project including Kamuli, Iganga, Mayuge, Bugiri, Busia, Tororo, Mbale, Pallisa, Sironko, Kumi, Soroti, Katakwi and Kaberamaido.

b) Implementation of Livestock Water Supply Programs

In order to address the plight of pastoralists living in the cattle corridor, Government has for many years implemented livestock water supply programs to try to contain nomadism. These interventions remain inadequate due to high livestock populations and poor maintenance of constructed facilities. According to an assessment carried out in 1999 (UDC/MoFPED, 1999) there are a total of 316 valley dams and 765 valley tanks in the country, out of which only 111 valley dams and 268 valley tanks are operational. As a long-term strategy, the Government has recently prepared comprehensive Water for Production investment plan which envisions, among other measures, the construction of one valley tank/dam in each sub-county in the cattle corridor districts, with capacities ranging between 6,000 and 10,000 m^3. This plan seeks to construct a total of 1,465 valley tanks/dams by 2015. The districts to benefit from the programme include: Luwero, Mbarara, Masindi, Nakasongola, Rakai and Sembabule.

c) Water for Production Strategy

In order to address the water for production challenges, Uganda government undertook Water for Production (WfP) sub-sector reform study, as part of the overall reforms taking place in the water sector. The study, which was completed in November 2003, was aimed at developing a comprehensive Strategy for the WfP sub-sector focusing mainly on improving rural household incomes through use of water for increased agricultural productivity and food security. The strategic interventions proposed by the WfP sub-sector reform study are:

- improving access to water for livestock, especially in the cattle corridor;
- promoting water harvesting for small-scale supplementary irrigation;
- promoting small-scale aquaculture and culture-based fisheries in existing reservoirs; and
- creating an enabling environment for private sector investment in the sub-sector.

The study also highlighted the following facts regarding the WfP sub-sector:

- the country has adequate water resources which could be harnessed to increase agricultural production;
- the existing policy and legal frameworks are conducive for promotion of Water for Production; in particular through appropriate policies described in the National Water Policy (1999) and the Plan for Modernization of Agriculture (2000);
- there is inadequate technical capacity at national, district and local levels to effectively undertake the water for production intervention measures and activities. This lack of capacity, especially at local level, is reflected in the poor management of existing water supply facilities and poor exploitation of existing potential;
- there is lack of effective coordination mechanisms regarding water for production activities due to institutional fragmentation at national and district levels;
- the absence of viable financing systems and financial services for small farmers and small industries is a major constraint for development of WfP;
- agriculture marketing infrastructure is key to realization of the WfP potentials;
- poor management of Government irrigation schemes has portrayed a negative image of the irrigation sector and served as a disincentive for the would-be actors in the sector.
- there is a general lack of appropriate mechanisms for assisting farmers/farmer's groups in irrigation system development;
- there is insufficient coverage of livestock watering facilities in the country resulting in unhealthy competition for the few existing facilities;
- poor planning, design, construction and management of livestock watering facilities has greatly contributed to the poor state of many of the existing facilities; and
- there are increasing cases of encroachment on wildlife protected areas by livestock keepers in search of water and pasture, especially during the dry season.

4.2 Parallel Initiatives and Research Projects

There have been a number of strategies and research projects in regard to water resources. Some have operated in Uganda whereas others especially the Nile Basin Initiative stretches across different countries within the Nile Basin.

Nile Basin Initiative (NBI)

The NBI was formally established in February, 1999 and seeks to bring all Nile Basin countries to work together to develop the resources of the Nile Basin for the benefit of all. It provides a platform for co-operation and for building working relationships between the riparian countries and promotes regional peace and security. It is a mechanism for the implementation of the *Shared Vision* through an agreed ***S***trategic_Action Program. The *Shared Vision* is: "*To achieve sustainable socio-economic development through equitable utilization of, and benefit from, the common Nile Basin water resources".* The Nile Basin Initiative is a multi-country /basin wide, multi-sectoral program of 8 projects that intends to:

I. Build trust across the basin
II. Build capacity within the countries
III. Create an enabling environment for implementing development projects
IV. Address the priority water-related sectors and cross-cutting themes identified by the Nile riparian countries
V. Long-term goal is to create the enabling environment for the Nile riparian countries to realize their vision-

Adoption of the Integrated Water Resources Management (IWRM)

Uganda has since the early 1990s adopted the principle of IWRM. IWRM is a process which promotes "the coordinated development and management of water, land and related resources, in order to maximise the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems". Uganda also prepared a Water Action Plan (WAP) in 1993-94. WAP expresses the need for an institutional framework within which priorities can be determined and optimal uses planned. If Integrated Water Resources Management is harnessed well, then through enhancing water for food and other ecosystem services has the potential to achieve economic development. Figure 9 shows conceptually proposed linkages between IWRM & Water Use Efficiency for Sustainable Development and Achievement of PEAP/MDGs. Figure 10 shows links between governance, available water resources and overall National Goals. Good water governance, mainstreaming water in the political economy, dealing with cross-sectoral management and focusing on demand management are considered to enhance Uganda's capability to achieve the National Development Plan goals.

Figure 9. Conceptual representation of IWRM & Water Use Efficiency – For Sustainable Development and Achievement of PEAP/MDGs **(**DWRM, 2008).

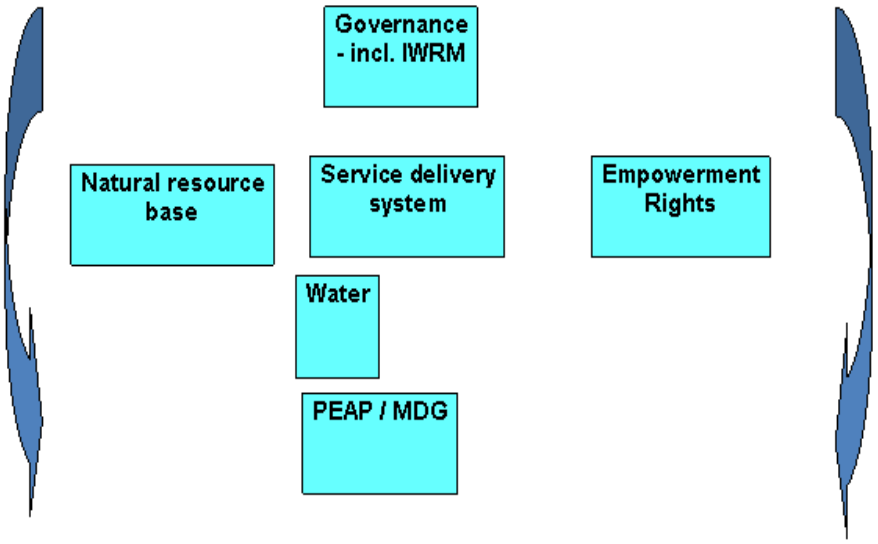

Figure 10. Links between governance-water-PEAP/NDP/MDG (DWRM, 2008).

4.3 Food Security and Food Production

The United Nations World Food Programme conducted a Comprehensive Food Security and Vulnerability Analysis (CFSVA) to gain a better understanding of household food insecurity and vulnerability at the sub-national level. This study was based on the analysis of a national survey of 2,987 households carried out in July-August 2005 that covered 55 districts (only the urban Kampala was not covered). The analysis was conducted in collaboration with the government of Uganda, UNICEF, The Institute of Public Health, and faculty of Agricultural Sciences of Makerere University and the National Bureau of Statistics. The CFSVA was prepared under the umbrella of the Strengthen Emergency Needs Assessment Capacity (SENAC) project and was made possible through funding and support of the Humanitarian Aid Department of the European Commission. Key findings are: ~1 million people (5% of the total rural population) were food insecure; ~6.7 million people (31% of the rural population) were highly vulnerable to food insecurity; and ~4 million people (9% of the rural population) were moderately vulnerable. Table 6 shows districts of Uganda with high percentage of food insecurity and vulnerable people.

Table 6. Districts of Uganda with high percentage of food insecurity and highly vulnerable people.

Districts	Number of food-insecure people (% of strata population)	Number of highly vulnerable people (% of population)
Northern Uganda		
Gulu, Kitgum, Pader, (Acholi Strata)	357,700 (33%)	411,400 (38%)
Apac, Lira (Lango Strata)	171,700 (12%)	527,300 (37%)
Kotido, Moroto, Nakapiriprit (Karimojong Strata)	168,500 (28%)	430,700 (46%)
Kaberamaido, Katakwi, Soroti, Kumi, Pallisa, Tororo (Teso-Dhola Atrata)	<70,000 (3%)	1,191,100 (53%)
South Western Uganda		
Kabala, Kisoro (Kiiga Strata)	<7,000 (1%)	407,000 (60%)
Rest of rural Uganda	About 434,000(1-7%)	About 3.5million (19-36%)
Total in the rural part of the country	About 1million (56%)	About 6.7million (31%)

Source: UNWFP Food Security and Vulnerability Report (2006)

4.4 Parallel Strategies to use water to increase food production

The government has put up over 1,000 dams and valley tanks for both aquaculture and livestock watering. The Government currently carries out a programme to construct valley tanks, and by the beginning of 2004, 30 out of the planned 50 of these surface water reservoirs in 6 districts had been completed (Ministry of Agriculture, 2009).

Irrigation and drainage development

Past estimates of irrigation potential varied between about 200,000 and 400,000 ha, with the largest potential within the Lake Kyoga catchment, the Western Region, the Albert Nile Valley and in the Jinja and Iganga districts on Lake Victoria in southeastern areas of Uganda (Figure 2). In contrast to the areas defined in the past, the latest study in 2003 identified only 90,000 ha of irrigation potential. Small-scale informal irrigation has been conducted in Uganda since the 1940s with the majority of the irrigated areas located on the fringes of swamps. Smallholder irrigation is considered 'informal irrigation' as smallholders developed it spontaneously without planning and with little or no technical assistance. The employed technology is often basic and sometimes inappropriate.

Formal irrigation development in the country commenced in the 1960s with the following schemes:

- The Mubuku irrigation settlement scheme in Kasese District was established as a settlement scheme with gravity irrigation and water intakes from Sebwe and Mubuku rivers. Its command area was 600 ha of which 430 ha were irrigated in 1998.
- The Kiige scheme in Kamuli District uses Lake Nabigaga as a water source for sprinkler irrigation of citrus fruits. Its command area was 150 ha of which only 10 ha were irrigated in 1998.
- The Labori and Odina schemes originally abstracted water from Lake Kyoga for sprinkler irrigation; at the Labori scheme which had a command area of 40 ha in Soroti District, no irrigation was taking place by 1998.
- The Ongom scheme in Lira District is a sprinkler irrigation scheme for citrus fruits with water from a reservoir with a capacity of of 4,500 m^3. The scheme had a command area of 40 ha of which ~10 ha were irrigated in 1998.
- The Atera irrigation scheme in Apac District was designed to abstract water from the Nile through pumping and subsequent gravitational flow through pipes and water hydrants to the fields. The scheme had a command area of 20 ha but by 1998 no irrigation took place.
- The Agoro self-help irrigation project in Kitgum District is a gravity-fed scheme with intake from the Agoro River. All of its 120 ha command area was irrigated in 1998.

In the 1970s the Chinese initiated the development of irrigated rice cultivation comprising the Kibimba rice scheme for rice technology development and the Doho rice scheme for seed multiplication and popularization of production. The Kibimba scheme is situated in Iganga District and has a command area of 600 ha, all of which was irrigated by 1998. The Doho scheme in Tororo District has a command area of 1,000 ha, all of which was irrigated by 1998. Floriculture private-sector farmers started greenhouses around Lake Victoria in the 1990s. The latest Government constructed and implemented irrigation scheme, the Olweny swamp rice irrigation project, has a command area of 50 ha and went into operation in 1997 (nucleus site) and 2001 (Itek and Okile).

Progress with formal irrigation has been very slow and with limited success. One reason is the top-down approach adopted in most schemes. The farmer-based schemes of Mubuku, Doho and Agoro were considerably more successful. On the other hand, informal small-scale irrigation has been increasing, especially for rice, vegetable and fruit production. The increased area of informal rice production is a result of technology adoption from the Chinese in the Kibimba Rice Scheme. Informal small-scale irrigation is practised mostly in the southeast of the country. Currently an FAO pilot project is adopting a

bottom-up approach at 7 small-scale irrigation sites with an area of about 36 ha and about 100 farmers (FAO, 2005).

In 1998 the land area equipped for irrigation was 5,580 ha, most of which is located in the southeast part of the country in districts between Lake Victoria and Lake Kyoga. Of this, 2,330 ha were actually irrigated. Surface irrigation is the main irrigation technique. 230 ha are equipped for sprinkler irrigation and localized irrigation is practised at a pilot-scale at three sites. Large schemes (> 500 ha) dominate the sector with 4,800 ha equipped, medium schemes account for 680 ha and small schemes (< 50 ha) for 100 ha. Surface water is almost exclusively used as water source. In 1998, about 53,350 ha of fringes of swamps were cultivated, of which 3,570 ha were equipped in 1987 (Ministry of Agriculture Report, 2000).

Part B: River Rwizi Basin – the local context

In Uganda, the *Water Futures* consortium intends to focus research in the River Rwizi Catchment of southwestern Uganda as this catchment is first in Uganda to have established a stakeholder-led Catchment Management Committee (CMC). River Rwizi originates from Buhweju, a mountainous county of Bushenyi and meanders through the bare hills of southwestern Uganda in Ntungamo and Mbarara (Figure 11). It continues to flow eastwards via several cattle grazing areas before draining episodically (acts as a closed basin during the dry season) into Lake Victoria. The River Rwizi Catchment runs through 5 districts including: Mbarara, Bushenyi, Ntungamo, Kiruhura and Isingiro. A cross-sectoral institutional framework for developing and managing transboundary water resources, represented by the CMC is considered essential and requires an enabling legal and policy framework.

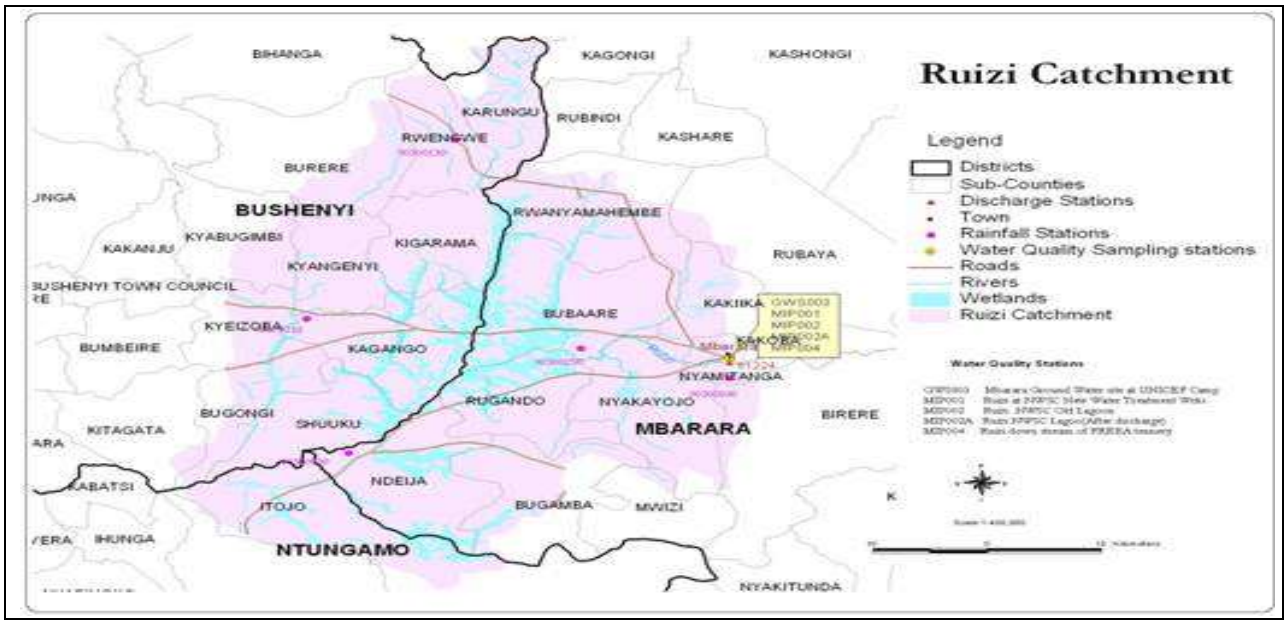

Figure 11. Map of River Rwizi Catchment (IWRM Regional Plan, 2010-2011).

5. River Rwizi Basin Characteristics

5.1 Physical Features

The River Rwizi Basin covers a total area of 8,346 km^2 that includes 240 km^2 of wetlands, 207 km^2 of forests, and 85 km^2 of open water area 85 sq km (IWRM Situation Analysis Report, 2007). Lowland areas are generally occupied by wetlands. The landscape is generally hilly especially in the south and northwest featuring rolling hills intercepted by wide and narrow elongated valleys.

5.2 Economic Activities and their Impact on the Catchment

Economics activities within and along the River Rwizi include: cattle rearing; brick making; harvest of the papyrus reeds for making baskets; mats and art pieces; crop growing; and planting of eucalyptus trees. These income-generating activities have led to environmental degradation in the catchment. Figure 12 shows livestock production as one of the major economic activities. Uncontrolled cattle rearing has especially contributed to degradation as overgrazing leaves bare ground and increases soil erosion. Subsequent silting of the river impacts water for production as it reduces the amount of water that would be used for irrigation and other production activities. There are also increasing development pressures on wetlands in the catchment associated with high population growth and related high demand for cultivable and settlement land (Figure 13).

Figure 12. Cattle rearing in Kiruhura District of the River Rwizi Catchment (10 August 2010).

Figure 13. Three examples of development pressures on wetlands in Ntungamo District within the Rwizi Catchment **(**August, 2010).

Agriculture and brick laying are common income-generating activities in the Rwizi catchment that also contribute to wetland encroachment. These activities are also considered to have affected the quantity and quality of river flow as there is evidence that wetlands have dried up along the river's course. Milk production plants, tea estates, and oil storage facilities within the catchment are also considered to have increased pollution of the River Rwizi as wastewater is not treated and discharges directly into water bodies yet households along the river's course depend on this source for domestic consumption.

5.3 Rainfall in the River Rwizi Catchment

The Rwizi catchment receives 905 mm·/year of rainfall that follows a bimodal pattern with "long rains" occurring from March to May and "short rains" from November to early January. Air temperatures vary with altitude with average maximum temperatures of 28°C and average minimum temperatures of 16°C. Dew-point temperature is 19°C and average temperatures are 24°C (UBOS 2000). January, February and March are the hottest months of the year. There is substantial variability in rainfall in time and space; reliability is low. Water shortages are highest from December to March. The vegetative cover is controlled by a number of complex interrelated factors such as climate, geological formation, soil type, and the presence or absence of groundwater. Isingiro, Kiruhura and northern parts of Mbarara Districts typically feature semi-arid rangelands that are dominated by shrubby habitats. Natural vegetation

mainly comprises shrubs and small trees that are used for grazing and fuel wood collection. The Rwizi floodplain area occurs centrally within the catchment area (Figure 11) and is predominantly covered by wetlands with many areas under cultivation.

5.4 Major Crops in Rwizi Catchment

The major crops grown in the Rwizi catchment are perennial pulses, root crops, vegetables and include: Bananas, Beans, Millet, Coffee, Ground nuts, Field Peas, Cassava, Irish Potatoes, Sweet Potatoes, Tomatoes, Cabbage, Amaranthus (Dodo), Carrots, Onions and Maize, among others. Commercial crops include coffee. Irrigation is conducted for cash-crops such as carrots, cabbage, tomatoes, and amaranthus.

5.5 Land Tenure and Utilisation

Common land tenure systems in Rwizi catchment area are freehold, customary, and common property land ownership which is the commonest, mostly for communal grazing on natural pasture. Socioeconomic changes in drylands including increasing human population density and in-migration by agricultural settlers have affected these systems. Land use in the catchment is diverse but agricultural activities (crop growing, livestock rearing) dominate. The princilap livestock is cattle but other animals are reared including goats, sheep, and poultry among others. Brick making and sand mining also occur in the catchment. Increasing human and livestock populations are putting pressure on the land with intensive degradation occurring especially at watering points, along livestock paths and on hilltops. Most parts of Mbarara, Kiruhura and Isingiro districts are particularly affected by overutilization of land resources (NEMA 2001).

There are four main livestock production systems found in the Rwizi catchment and these are:

a) Pastoral System

This is an extensive, subsistence–oriented production system where owners move with their herds in search of grazing and water. Indigenous breeds of cattle, goats and sheep are kept. The system is low–input low–output, and is found mainly in Mbarara, Kiruhura, Isingiro and Ntungamo districts.

b) Agro–pastoral System

This is a mixed farming system with emphasis on livestock production reliant on communal grazing, supplemented with crop residues grazed in situ. Cattle, goats, sheep and poultry are kept; productivity is higher than in pastoral systems. This system is common where land is owned under common property resource regime.

c) Sedentary Mixed Crop–Livestock System

The major source of food/income is derived from Cropping and there are smaller herds than in the agro–pastoral areas. Livestock grazing is supplemented mainly by crop residues. Small poultry flocks in layers and broilers are kept.

d) Commercially Oriented System.

This includes: ranching for beef production and intensive systems like zero grazing for dairy production; non-ruminant systems for pigs; and poultry**.**

Land under crops is cultivated primarily by small-scale farmers, with an average farm size of less than 2.5 ha. Approximately 80% of the catchment's population lives in rural areas and depends on agro-pastoralist for its source of food and income. Farms and individual fields are commonly divided among sons as land is inherited, leading to increasing fragmentation of land holdings. Farmers are mostly poor

with few resources and numerous production constraints leading to low yields. Women and children provide most of the agricultural labor by using simple hand tools such as hoes and pangas.

Rwizi catchment has many wetlands and the major ones include: Nyarubungo; Katerera; Nyaruhandagazi; Kizimbi; Kasaana; Kibaare; Katukuru; Rwemigina; Nyabikungu; Bujaga; Kicwamba; Rugaaga; Nyamuyanja; Nyakabaare; Mirama; Rukindo; Nakisharara; Kooga; Ruceece; Kyarutengura; Kalunyiga; and Mazinga. Lakes in the catchment include: Lake Nakivale in Isingiro district, and Lake Mburo, among others. The aquatic ecosystem services of the catchment include: tourism, food (tilapia, catfish, mudfish, and lung fish); local materials for the arts and crafts industry; and drainage as the Rwizi wetland system drains most of Rwampara and parts of Kashari and Nyabushozi counties. The narrow and wide valleys are occupied with permanent and seasonal swamps which drain into River Rwizi, Lake Nakivale and other inland lakes. However, the aforementioned systems have been greatly affected due to excessive encroachment and uncontrolled utilization.

5.7 Soils in the Catchment

Generally, the soils of the catchment area especially in the districts of Mbarara, greater Bushenyi and Kiruhura are sandy loams, clay loams and slightly lateritic loams. Sandy loam is found in the long and shallow valleys which favour aquatic flora and fauna as they are seasonally or permanently flooded. The soils in the wetlands contain peat derived from accumulated residual litter of the swamp flora mainly papyrus, sedges and Typha. Soils are generally black clays with sandy soils along the river line of river Rwizi.

5.8 Major water users and permit holders

Water is mostly used for agriculture (irrigation), domestic, industry, and livestock production. Major water permit holders in the Rwizi catchment are the industries especially GBK in Mbarara district (Water Bottling), National Water and Sewerage Corporation (NWSC), and the Coca-Cola Company.

6 Socio-Political Characteristics

6.1 Access to Markets

In Rwizi catchment, physical access of food to markets is affected by inadequate infrastructure in the form of limited transportation networks and market premises at local level. Most farmers are subsistence in nature with few commercial farmers. Main markets are located in the municipalities and the capital city Kampala to which farmers in remote areas of this catchment do not have easy access. Inadequate market infrastructure makes it costly to do business. High cost of transportation leads to high prices, hence, low demand. This has forced farmers to sell their produce at very low prices on their farms and small local markets in their localities.

6.2 Access to capital and credit

Farmers' access to capital is limited due to high risks associated with agriculture especially at the production levels of the value chains. However, the government has taken some initiatives to improve eligibility of farmers' access to capital. Some of these include: development of microfinance such as Savings and Credit Cooperative Organizations (SACCOs) for small production loans. This is because commercial banks in the catchment avail loans especially for advanced levels of the value chains like processing, transportation, packaging, although the interest rates are not favorable to small producers.

6.3 Stakeholders in Water Resources Management in Rwizi Catchment

There are several stakeholders in water resource management which include both local and central government. Stakeholders at the centre include: National Environment Management Authority (NEMA); Ministry of Water and Environment (MWE); Wetlands Inspection Division; Fisheries and Aquaculture departments. At the local level, stakeholders include: Local Government Departments; Traditional

Leaders; Farmers; Catchment Advisory Committees (CACs*);* District Councils; Water officers and production departments; Private sector (CSOs/NGOs); pastoralists; and Communities (Users). In Rwizi catchment, examples of stakeholders include Conservation Efforts for Community Development (CECOD), Mbarara District Farmers Association (MBAFA), Bushenyi District Farmers Association, and NGOs such as Advocates Coalition for Development and Environment (ACODE), which concentrates on the conservation of the environment in the catchment mainly through tree planting and awareness raising.

6.4 Water legislation

There is a comprehensive policy and legal framework for management of water resources in Uganda, under which River Rwizi basin operates. This framework encompasses, in addition to water resources, water supply, the environment institutions, a set of interrelated policies and laws (acts). However, the Local Government Act of 1997 is more applicable for the Basin context. This act provides for the decentralization of environmental services and establishes the District Environmental Committees and Local Committees charged with observance of all activities that may have an impact on the environment. Under the Local Government Act of 1997, district and city councils are empowered to make bylaws without reference to, or seeking permission from, the center, provided those bylaws do not conflict with the national constitution or existing laws. The lower units of local government (sub-county councils, town councils, city and municipal councils) can also pass bylaws provided they are consistent with other existing laws. Local authorities such as district, town and municipal councils play an increasingly important role in water resources management in the country. While many WRM issues can be addressed by the existing local governments (by enforcing existing laws and regulations), the responsibility and authority for WRM are increasingly being undertaken at the Basin or Catchment level through multi-district bodies such as Catchment Management Committees and Catchment-level Stakeholder Fora.

6.5 Enforcement of legislation

Local authorities have an important role to play in enforcing existing laws or improving enforcement of these through bye-laws. Local authorities can undertake activities that enhance the environment, such as tree planting, soil conservation or preventing burning of grass. However, decisions regarding harvesting commercial resources such as trees for timber and charcoal or brick making, the central government retains final law-making powers. Section 15 of part 2 of the second schedule of the 1997 Local Government Act provides that district councils are responsible for, among other things, assisting "government to preserve the environment through protection of forests, wetlands, lake shores, streams and prevention of environmental degradation". Elsewhere in the schedule, it is stated that district councils are responsible for environmental sanitation, forests and wetlands. Part 4 of the Local Government Act 1997 details functions and services that may be devolved by district councils to lower local government councils. These roles and functions include provision for control of soil erosion and protection of wetlands (section 3), the control of vermin in consultation with the ministry responsible for tourism and wildlife and any other relevant ministry (section 4), the taking of measures for the prohibition, restriction, prevention, regulation or abatement of grass, forest or bush fires, including the requisition of able-bodied male persons to extinguish such fires and to cut firebreaks, and general local environment protection (section 5), and the control of local hunting and fishing. However, there are Weaknesses in the legal & policy frameworks for IWRM.

6.6 Gaps in the enforcement of legislation

Inspite of the above legal and policy frameworks in place, there remain areas of weakness. There is a lack of effective policy framework and implementation mechanisms in place at district level. There is also the lack of effective implementation of existing legislation and regulatory mechanisms. There is also poor harmonization of policies, legislation and action plans of the multi-sectoral units through an

ecosystem approach. Most importantly the integration of the transboundary waters into the policies and legislative framework is deficient. In districts with significant valuable natural resources, local governments have conflicts with the central government over who issues permits and what resources generated from fees and taxes should go to local and central Governments. For environmental matters, there has been no effective devolution of executive powers. Instead, another kind of administrative decentralization, or "deconcentration" within line ministries in charge of particular resources, has been attempted. This administrative decentralization is often implemented through collaborative community management schemes, such as those proposed in the WRM Sub-sector Reform Strategy (2005). Rules and procedures for arbitration are not well developed. This causes confusion as to who should enforce what laws and regulations and how. At the local level, chiefs should implement laws, bylaws and decisions made by the district and sub-county executive committees. There are also central government officials (such as forestry officers and agricultural extension officers), the local governments' secretaries of production and environment, and finally district environmental officers, all with similar responsibilities.

Secretaries of production and environment are supposed to ensure that laws and bylaws are followed but it is not clear how these secretaries are supposed to relate to the other actors, including chiefs and the district environmental officer. Accountability and reporting procedures are equally unclear. For example, the law says, "any local council within whose jurisdiction an activity likely to degrade the environment shall in writing inform the local agricultural extension officer". However, it does not say what the officer is supposed to do about it. Lack of clarity regarding powers of sanction or arbitration has undermined good environmental practices. Local governments are also supposed to use their own resources to establish and support environmental institutions such as district and sub-county environmental committees, as stipulated in the law, and to prepare environmental plans. However, the required resources are usually not available given the capacity gaps in local governments in Uganda. Currently, only 20% of the National Budget is administered by Local Governments.

6.7 Unlocking Constraints in Enforcement of Legislation

There is therefore a need for strong institutions and effective law enforcement mechanisms that can address conflicts in natural resource management in the catchment area. Officials who have environmental decision-making and enforcement powers need to be subject to oversight. Local governments, therefore, should monitor and control central government officials and, equally important, central government officers must provide checks on local government representatives to ensure that they do not abuse their powers. The policies and legal framework both nationally and locally in relation to transboundary water resources is of limited awareness and needs to be emphasized at district level to create cooperation, equitable and sustainable utilization of shared resources. This would in the long run improve the governance of water resources nationally. National Water Policy and legislation is required to provide explicit provisions for the management of water resources at the local level. This would promote (i) interdistrict transboundary water cooperation as a tool for conflict prevention and benefit sharing, (ii) the promotion of joint water management and transboundary institutions in the basin, and (iii) promotion of improvement of intra-sectoral and inter-sectoral water use of the districts for sustainable utilisation of water in the basin.

7. Previous and Current Strategies for Food Production, Water and Other Natural Resource Management

7.1 Decentralizing Water Resource Management

Decentralizing Water Resource Management (WRM) is one of the initiatives that have been implemented in Rwizi catchment area, aimed at increasing participatory water resource management as identified by the Joint Sector Review (JSR) in 2006. A Thematic Team chaired by DWRM was established in late 2006 to oversee implementation of the Undertaking, i.e. to test participatory WRM in Rwizi catchment, and to serve as a forum for national-level. In addition, a core team was established in DWRM

to undertake coordination, planning and secretariat functions, as well as to select the pilot catchment. Following selection of the Rwizi as the pilot catchment, activities commenced with an inaugural workshop in Mbarara in April 2007, followed by the formation of the Catchment Management Committee (CMC) in August 2007. The CMC has held three meetings since September 2007 and has identified priority WR issues and critical areas for priority interventions in each district, mostly relating to human activities in or near wetlands, riverbanks and lakeshores. Preparation of a Water Resource Situation Analysis by DWRM is in progress. A stakeholder training session and field survey was undertaken and some of the results have been received and interpreted. An ecological survey and socio-economic study have recently been undertaken in the same area by Wetlands Management Department and information/data from these studies has recently been obtained. Groundwater mapping is ongoing in four of the five districts in the catchment.

7.2 Undertaking a Stakeholder Analysis

A stakeholder analysis was carried out in the Rwizi catchment in August 2007. It was designed by an individual consultant engaged by the Directorate of Water Resources Management (DWRM). Data were collected by technical staff from the five districts in the Rwizi catchment. Technical staff from the five districts received a one-day training course in stakeholder analysis and data collection in Mbarara on 8 August 2007. In October 2007, frequency tables were received and a preliminary analysis of the data was undertaken at DWRM. Key stakeholders with their expected roles and responsibilities in water resources management in the catchment area were identified. Identification of relevant stakeholders was done at primary, secondary and tertiary stakeholder levels. This process involved:

- identifying and defining characteristics of key stakeholders;
- assessing the manner in which they might affect or support IWRM;
- understanding relations between stakeholders, including an assessment of the real or potential conflicts of interest and expectations between stakeholders; and
- assessing the resources and capacities of different stakeholders.

Stakeholder analysis focused on vital relations between DWRM and its stakeholders and sustainability in implementation of an IWRM programme in the Rwizi catchment area. It is important to note that part of DWRM's strategy is to modify these relationships so that the community in the catchment area is empowered with sufficient capacity to effectively support water resources management within the framework of poverty eradication.

Activities continued between 2008 and 2009 in Rwizi catchment and included the operationalisation of the catchment-level Stakeholder Forum, completion of the Rwizi WR Situation Analysis, preparation of a WR Management Strategy and Action Plan, commencing implementation of priority WRM activities in the catchment and training CMC and stakeholder Forum members in IWRM.

8. Monitoring Infrastructure and Reporting

8.1 Poverty Monitoring

Poverty monitoring both at local and national levels is vital. At the basin context, poverty is monitored through by the Ministry of Local Government through Local Economic Development (LED) (Focal person) under Local Governments. Under LED. Key areas which are emphasized are: Local Economy, Regulatory Environment, Economic Infrastructure and Social Services, Business Development Service Providers, Financial Services, Public Private Partnerships (PPP), and Civil Society Organizations (CSOs). In regard to this, greater Bushenyi and Isingiro districts were surveyed in 2009 and reports submitted to the Ministry of Local Government. Apart from LED. At present, there are no other surveys undertaken at the local level (catchment level) for poverty monitoring.

8.2 Food production monitoring

There is a paucity of data on food production and food security situations in the Rwizi Catchment area. The available information exists at the sub-county and the district departments of agriculture. However, there are no statistical records available at both levels. This is attributed to a large subsistence sector (68%) where production is not recorded. The little data that exist are reported by the Agricultural Extension Officers and sub-county Chiefs to the department of agriculture at the district (UBOS 2002).

8.3 Hydrometeorological stations

There are many meteorological stations in Rwizi Catchment and these include: Mbarara Kakoba Station; Bushenyi District Station; Gayaza Station in Isingiro District and Ntungamo District Station. These stations have data concerning Rain fall (Actual and Simulated rainfall data). Other meteorological stations are no longer functioning and they therefore need refurbishing. These mainly include; Bugamba Forest Reserve Station, Rwoho and Kimono meteorological stations.

9. Trends and patterns in catchment land use and water resources

9.1 Rainfall patterns

There is anecdotal evidence that rainfall patterns and rainfall intensity have changed over the past 10 years. The Rwizi Catchment used to have two (2) rainy seasons from August to December and from February to April/May. The rainy season presently starts in October and has ceased by Decemeber (Mbarara District Water Office, 2009).

9.2 Water resources

There is anecdotal evidence of the drying of springs and boreholes that were used in the past especially in the sub-county of Kashari. Deeper drilling is required to exploit ground water and water levels in lowland swamps have reduced to the extent that people and even animals walk through the catchment swamps with ease when previously this was not possible. Spring-fed gravity schemes are running out of water more quickly than anticipated (Mbarara District Water Office, 2009).

9.3 Land Use Change

In the catchment, land has been fragmented to meet the demands of a rapidly growing population. Soil erosion has led to the erosion of fertile soils causing siltation of the River Rwizi and other water bodies. Cultivation has then intensified in lowland areas and competes with livestock rearing. This is common in areas of Bubare, Kashari and Rwampala in Mbarara district. Within the catchment, the infestation of Banana Bacterial Wilt (BBW) has led people to abandon banana growing and sold off their land mainly to livestock owners and this land has been turned into pasture hence a change in the land use. Uplands and lowlands are increasingly being developed for agriculture (Figure 14).

Figure 14. Increased Pressure on land in River Rwizi Catchment (Ntungamo District).

10. Adaptation Strategies to Climate Variability and Change

Various strategies (both traditional and modern) have been put in place to respond to climate variability in the catchment. For instance, Rainwater Harvesting Technologies have been implemented both at community and household level. Soil and water conservation structures in the gardens for example mulching interventions have also been implemented to mitigate drought and to sustain crops through the dry seasons. In addition, agricultural support workers also play a big role in the adaptation of the climate variability. Examples of these agricultural support workers in the catchment include: Namalele research station that provides consultation of irrigation technology, Hydronet Engineering (U) Ltd that engages in installation of drip irrigation systems and the National Agricultural Advisory Services (NAADS) that provide advice to farmers in addition to drought resistant crops. Extension Support Workers provide advice on use of organic farming especially backyard gardening on small farms that are easy to irrigate to sustain food production even in dry seasons. Tree planting has also been practiced in the catchment to mitigate climate change and enhance development. Projects like Nyakayojo Farm Income Enhancement Forest Conservation Project has encouraged tree planting through provision of free Eucariptus, Pine and Fruit tree seedlings to farmers. This project is being funded by the World Bank, African Development Bank and the Government of Uganda. This has not only helped to restore the environment but also enhanced people's incomes as a requirement for poverty reduction.

10.1 Failed strategies and why they have failed

Strategies like crop rotation, dam construction and partly tree planting have failed due to various reasons. Tree planting failed because of the limited land availability so people preferred to grow crops rather than plant trees. In addition, poverty has forced people to cut down the available trees for fuel wood or charcoal burning as an income generating activity. Bush fires have also claimed many trees in the catchment especially on the hills. Dam construction has also failed in the catchment due to inadequate initial sensitization of the communities and inadequate government support. Crop rotation has also failed of recent because of the current forces of demand and supply (market forces), that is to say; if prices of a certain product is high, then farmers are attracted to grow that very crop even for consecutive seasons, neglecting crop rotation and its benefits.

10.2 Experience in the Rwizi Catchment

A recent study carried out and managed by Advocates Coalition for Development and Environment (ACODE, 2007 "Auditing the Effectiveness of Government in Protection and Restoration of Water

Catchments System[3]," revealed a deepening water crisis in Uganda. The study gives an explanation to prolonged droughts, acute water shortages, poor, erratic and intermittent rains. The study explains a nexus between land use, environmental degradation and subsequent deepening water crisis. ACODE study observes that the rate at which natural resources are encroached upon and consequently depleted is higher than the rate at which they are restored.

10.3 Initiatives to improving Farmers' access to markets

Initiatives put in place to improve farmers' access to markets in the catchment remain a major challenge. Farmers produce but they encounter problems of low prices, poor road infrastructure resulting in offers of very low prices by middle men who exploit this situation. This has been worsened by the poor functionality of the Local Government Commercial Office. The government enacted a NAADS Programme whose objective was among others to improve agricultural marketing but this programme has bedeviled with serious bottlenecks namely corruption resulting in lack of value for money. Through micro-finance institutions and commercial local banks, some farmers have, however, been enabled to process and market their produce.

[3] ***Rwizi Catchment in Mbarara was part of this study carried out in February, 2009.***

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