4. Peoples of the Kagera River Basin

In this *socio-demographic* thematic chapter, the following plan will be adopted.

History of peoples of the Kagera River basin: Who are the people of the Kagera River basin? Is it socially relevant to discuss socioeconomic development in the context of the Kagera River basin?

Demographics: What are the main demographic trends and characteristics of the Kagera River basin?

Social development in the Kagera River basin: Why are peoples poor in the Kagera River basin?

4.1 History of the peoples of the Kagera

4.1.1 The *Peoples of the Kagera River Basin* are the same peoples with a common history

The people of the Kagera River basin are descendants of the ancient kingdoms of the Great Lakes Region. These kingdoms were situated to the southwest of Lake Victoria, on both banks of the Kagera River and in the surroundings tributaries of the Nile River. Their history is little known, mainly because their oral literature does not have the same value as the written history of western civilizations. Historical details, recounted by explorers, missionaries and colonials, rarely date back further than the 15th century whereas the Kagera people were a complex people, controlling agriculture, livestock and metallurgy since at least two thousand years [Chrétien, 2000]. The peoples of the region did not live in isolation but engaged in trade, fought battles to enlarge their territories and made alliances and reconciliations for peace and prosperity.

“In the mid-nineteenth century, the region was split into four trade zones (ref. Figure 4.1):

- the Bunyoro-Busoga Circle from Lake Albert to Mount Elgon, via the banks of the Nile and Lake Kyoga;
- the Kivu Circle, incorporating the salty lakes of western Uganda and Rwanda and reaching the edge of the Congolese forest;
- the Tanganyika Circle, from the Rusizi valley to the Malagarasi valley, including the Kasiba marshes, the Uvinza saltworks, and Burundi; and
- the Victoria Circle, including Buganda, the Bahaya, the Bazinza and the Bakerebe.”

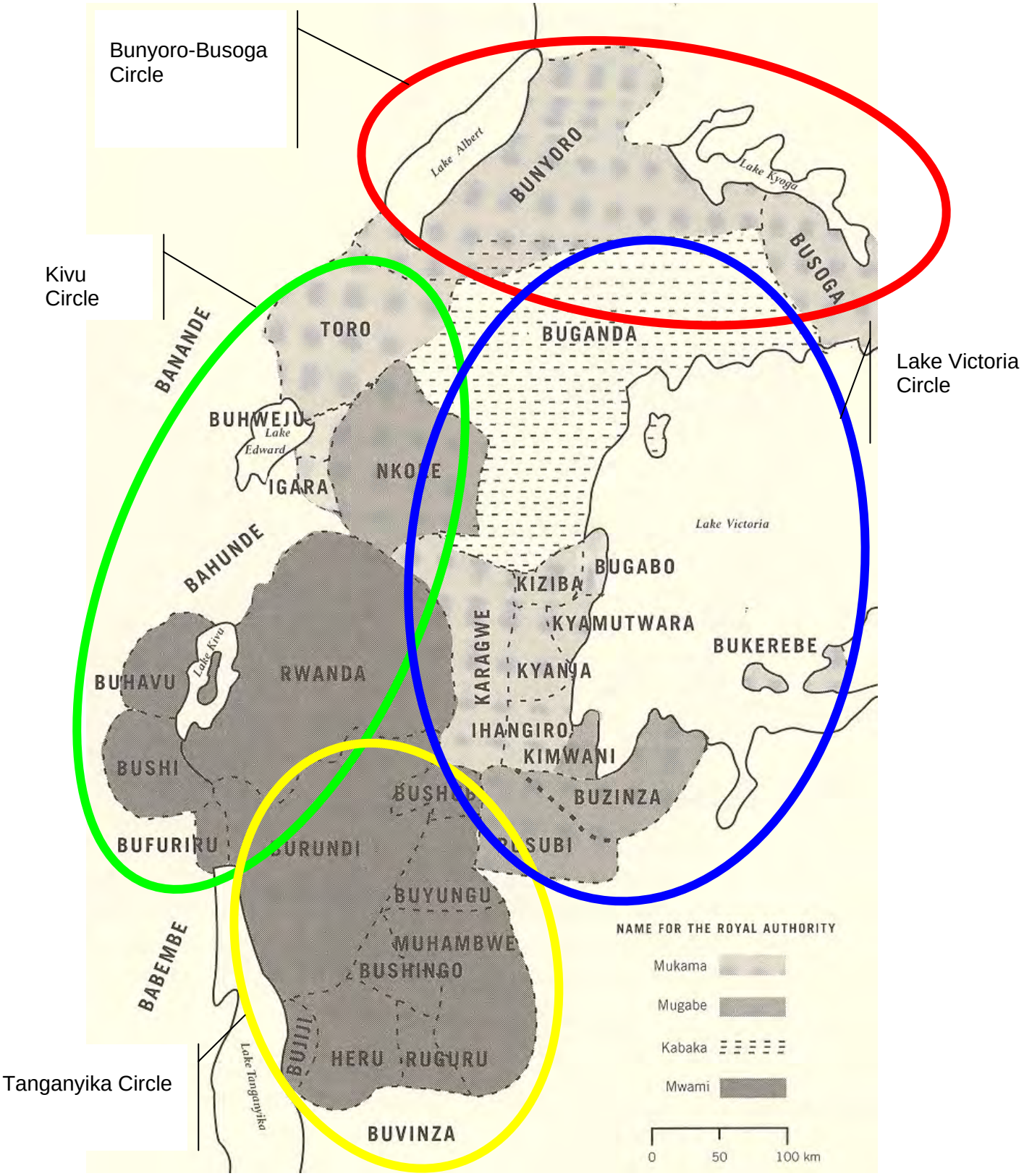


Figure 4.1 - Mid-nineteenth century trade zones in the Kagera River basin region (ref. Chrétien, 2000)

The people of the Kagera River basin had the same religions

The people of the Kagera River basin had the same religions and very similar cults even if tales of certain legendary characters (or spirits) are not quite the same everywhere. An example of one such character is Mukasa (a god, the hunting hero of Lake Victoria) in South Uganda in Nkole and in Karagwe in Tanzania, found again in Rwanda and Bushi (Congo) in the Lyangombe cult. He is also present in Buha and Burundi in the Kiranga cult (the same cult as the Lyangombe cult).

The same languages

The languages and dialects of the ancient kingdoms (Kinyarwanda, Kirundi, Runyankore, Rukiga, Ruganda, Runyambo, Ruhaya, Rushubi and Ruhangaza) are still used today in addition to the official languages of English, French and Kiswahili. It is interesting to note that Kinyarwanda and Kirundi are still the official languages in their respective countries and that they are used beyond their national frontiers. Kiswahili, the main language in Tanzania, is the second official language in Uganda. It is more and more widely spoken in Burundi and in urban spheres in Rwanda. It is the most widely used regional language for business.

The same social and clan-based organisation

The people from the Kagera River basin have the same patriarchal lineage system, their families inheriting property and responsibilities from father to son. Male children are a guarantee that the clans can continue to exist. They form the clan's ability to defend itself and compose its workforce. This means that they are better looked upon than girls who will be the bearers of children for other clans. Girls do not belong to a clan; they ensure alliances between clans.

The organisation of land occupancy is also the same: housing is scattered; each household has an enclosure (a group of houses around which hedges have been erected) surrounded by fields of subsistence crops. Their slightly more distant kin live in enclosures in the immediate surroundings. Then come those belonging to the other people in the clan. This enables people to be at home and at the same time close to their "families" for mutual protection and support. Also, the larger the number of members in a clan, the more respect is given by other clans.

Cropland is usually located near housing because it reduces distances, facilitates work and makes it easier to keep pilferers, prowlers and other enemies at bay. Keeping their fields close to their homes was also a sort of protection against wild animals: people were safer because the dangers of the forest were kept away. The only limits on grazing land are how much of it the neighbours use. Watering places are built, organised and run on a community basis.

The same economic activities

The Kagera River basin is well known for its good climate and environment, suitable both for farming and for livestock rearing. Agriculture and livestock have always been the main activities and they are extensive. Among the people in the same local area, some prefer farming and others livestock, farmers being more sedentary and herding families less so, except for times when transhumance[29] is necessary. They stayed in their environment as long as their crops were satisfactory and there was enough grass for their livestock. When yields dropped severely or herds were devastated by disease, they would move on to a better place. Disasters affecting crops or livestock often led to a move because "the gods no longer looked favourably upon them being or staying where they were".

Freedom to choose where to settle was hampered more and more by the growth of the population and people becoming more and more sedentary. In some cases, e.g. in the centre of present-day Rwanda, laws began to be introduced on pasture land in the 18th century with the formation of the cattle armies - because land was becoming scarce. At the beginning of the 19th century, Gikingi land institution was created - a land-grazing estate reserve. But this institution had nothing to do with the predominantly agricultural zones, nor with areas where there was still had plenty of space.

Commercially speaking, everywhere in the region, people barter food, livestock, animal hide and oil products but most of the trade in the area is metal work, jewellery, salt and ivory[30] .

Population movements

Frequent and regular population movements have brought the people of the river basin closer together. There has always been a lot of movement among the populations in the Kagera basin:

- Herdsmen looking for new pastures;
- Farmers extending their land (migrations due to lineage-based descent) or because they could not produce enough crops (too much rain, drought, locusts, etc. thus causing famine, or
- Entire populations fleeing epidemics. Even today, the Kagera River basin people still have to migrate for their own safety (food security, political safety, refugees).

Voluntary movements linked to natural resources

Farmers frequently moved on to find more fertile, larger pieces of land as their clans gradually got too big for their places of settlement. Their movements were restrained by their tilling methods (hoes) which limited the amount of land they could cultivate in a season.

Herdsmen moved according to the quality and quantity of grass and water and the climate depending on the season. Their moves also depended on the prevalence of disease, especially for cattle. Rumour is that certain herdsmen's families would move on because they had lost one cow. Herdsmen's moves are different from those of farmers because they are not irrevocable. The same groups of herdsmen can sometimes settle temporarily several times in the same places. The central authorities have gradually settled the population in geographic zones which are either predominantly agricultural or predominantly pasture zones. Herdsmen therefore dropped their nomadic habits and adopted transhumance instead.

[29] The seasonal changing of grazing lands: the practice of moving livestock between different grazing lands according to season, especially up to mountain pastures in summer and back down into the valleys in winter.

[30] Ivory is a more recent trade engagement in since contacts with the Eastern coast.

Political reasons imposing migration

When people were obliged to move, it was either due to clan or family conflicts (disputes with the head of the family or the clan chief) or to conflicts with the political or administrative powers. Their moves were likely to be due to punishment (banishment) or their refusal to remain under the influence of the chief.

People were also forced to migrate to the Kagera River basin to work in the mines or quarries (Congo and Tanzania), on export crop producing farms (in Uganda, mainly coffee and cotton farms) or building railways or roads for the colonial authorities.

Since their independence, the peoples of the Kagera countries have welcomed refugees from neighbouring countries, especially the Banyarawanda and Barundi. Also, many refugees have left the Kagera River basin countries, especially after the genocide. The following table gives the number of refugees per basin country and shows (although the accuracy of the figures is unknown) the amount of politically imposed moves.

Table 4.1 - Estimates of displace people and refugees in the Kagera region (2005)

2005	Internally displaced people (*1000)	Refugee (*1000)	
		by country of asylum	by country of origin
Uganda	1740	257	34
Rwanda		45	100
Burundi	117	21	439
Tanzania		549	2

Sources: UNDP, 2006.

Migration imposed by famine and disease

There have been several famines in the Kagera River basin. Some were due to drought; others to too much rain and flooding; and others were due to hail and swarms of desert locusts and the like (e.g. in 1917, 1923, 1931, 1933, 1943 and 1958).

Epidemics (cattle plague, sleeping sickness, smallpox, etc.) threatening man or livestock also forced people to migrate from time-to-time.

Individual migration for economic reasons

The first economically motivated migrations occurred when all men over the age of 18 had to pay taxes. Tax had to be paid in cash and the only way to find money (if one is not already a salaried worker) is to go out to find a job that will earn money. The few possibilities in that case were to work in the mines, quarries or export-producing farms. This type of migration affected young people more than others. As minor trades and other income-earning activities gradually developed in urban areas, migrational movements diminished.

What is more, the development of urban areas also caused a slight trend for migration from country areas towards towns. The lack of or insufficient circulation of money, the absence of basic socio-economic infrastructures and the lack of economic opportunities in the rural world all tended to urge people to abandon the countryside for the town.

4.1.2 Changes brought by colonization

At the end of the 19th century, the whole Kagera River basin was under colonial rule. The Protectorate Treaties (1884-1885) signed by the King of Belgium and Carl Peters on behalf of the Deutsche Östafrikanische Gesellschaft, led to the occupation of German East-Africa, including today's Rwanda and Burundi as well as Tanganyika, by the German Empire. Leopold II's frontiers with Congo were established in 1910. The Versailles Peace Treaty, signed in France on 28 June 1919 deprived Germany of its colonies transferring them to the winners of the First World War. The United Nations gave Belgium a mandate for *Rwanda-Urundi* – as it was then called. Great Britain received a mandate for Tanganyika.

Under colonial administration, the people in the Kagera River basin found themselves in four different countries (Burundi, Ruanda, Tanganyika and Uganda). Their social and political organisations were dislocated by the political and administrative organisation of the colonies and the "civilisation" brought by new religions.

Political and administrative changes

All the populations in the Kagera River basin experienced colonisation followed by a wave of independence, which also brought about another lot of changes. Formerly, when the people did not like the powers that were, they would flee in search of better lifestyles elsewhere. Anyone taking such a liberty nowadays would be immediately considered to be on the wrong side of the law or at the best an objector.

The end of the 19th century and the beginning of the 20th were times during which the major political and administrative references of the Kagera region fundamentally changed. The kingdoms were broken up and shared out between the areas of influence of the powers (Germany, Great Britain and Belgium). The power of the kingdoms was shared among the colonising countries. The local populations could do nothing but accept the situation. The frontiers of the countries were established without consulting the kingdoms. Peoples, clans and families, found themselves separated, in different countries. And not because they had moved. They were to continue their social and family lives across new frontiers.

They were often classified ethnically and by nationality while they saw themselves as clans; and once they had been listed, they were "given" an official language. The official languages in the Kagera River basin (except for Kinyarwanda and Kirundi[31] are administrative languages also used to communicate with foreigners. They are generally only spoken by people who have studied for a long time. The following table shows the different languages and their use in Rwanda as an example. We can see that the colonial languages are relatively little used.

Table 4.2 - Languages used in Rwanda[32]

Languages spoken	Men	Women	TOTAL	%
Kinyarwanda	3 424 153	3 996 632	7420785	99.92%
French	1 416	1 616	3032	0.04%
English	435	403	838	0.01%
Kinyarwanda – French	63 478	63 967	127445	1.72%
Kiswahili	2 249	2 460	4709	0.06%
Kinyarwanda – English	7 746	7 412	15158	0.20%
Kinyarwanda – French – English	39 713	35 733	75446	1.02%
Kinyarwanda – French – Swahili – English	22 385	11 218	33603	0.45%
Kinyarwanda – Other languages	21 106	19 856	40962	0.55%

Source: 3rd general population and settlement census of Rwanda, 2002.

31 Swahili is a language spoken on the eastern coast which spread with trade. In the 19th century, it moved to inland Africa: to Kenya, Uganda, Rwanda, Burundi, Congo-Kinshasa, Central Africa and Mozambique.

32 There are more men than women who speak the three official languages, which is another inequality along with those highlighted in the section on Education further on in this chapter.

Economic change

Colonisation modified the traditional economic organisation and developed the forestages of economic globalization: the introduction of money and taxes, cash crops and means of communication.

The 1905 monetary reform introduced the Rupee (1.33 Mark) divided into 100 Hellers. The same reform introduced the "Hut Tax". It was first levied in 1906 in Tanganyika, then from 1914 onwards in Rwanda and Burundi at a rate of one Rupee per enclosure. In 1912, the tax was converted into 3 Rupees per male adult.

The new powers then began to organise production to develop trade with Europe. They introduced cash crops and new farming techniques including tea, coffee, cotton, sugar cane, terraced crops and marshland drainage. Some of the agricultural practices they taught did increase productivity, but as they were directly linked to the production of imposed crops. The inhabitants were not really inclined to adopt them; rather, they considered them as a sort of tiresome duty. These new farms often caused the labour force to migrate.

Along with the expansion of the agricultural market, the road system was also developed along with the railroad in Tanganyika and Uganda, and later the postal services.

Religious change

New religions came with the new powers and the people became Christians (Protestants and Catholics) or Muslims, depending on the influence of the colonial powers. But despite these changes, some of the people from the Kagera River basin, now free to choose their own cults and religions, still kept up their traditional cults - informal interviews imply that the official statistics are lower than reality.

Table 4.3 - Religions in the Kagera basin countries (% population)

Religion	Burundi	Rwanda	Mainland Tanzania	Uganda
Catholic	65.0%	57.0%	45.0%	42.3%
Protestant[33]	14.4%	34.0%		42.5%
Muslim	1.6%	1.8%	35.0%	11.4%
Traditional	0.3%	0.3%	20%	1.9%
No religion	18.7%	3.6%		1.9%

Sources: for Rwanda, Institut National de la Statistique, 2005; for Burundi, Institut de Statistique, 2004; for Tanzania, CIA, the World fact book 2000; for Uganda, Ugandan Bureau of Statistics, 2007.

[33] Adventism and the Pentecostal Church included.

Changes in housing

The traditional structure of clan housing was modified with (i) the ways crops were organized (e.g. coffee, a compulsory crop, had to be planted on land near roads so it was easier to pick) and (ii) the introduction of urban area communities.

Urban communities are composed of semi-permanent and permanent constructions, rectangular houses instead of round huts, and then rammed earth houses with corrugated iron roofs, a sign of *"adjusting to the modern world"*. The houses are closer and closer together which also means a series of typical problems (conflicts with neighbours, contagious diseases, sewerage and waste collection problems, etc.) which are still a worry in towns today, especially in urban areas where there is no sanitation.

The modifications in housing have also stabilised settlement. But even so, migration has always been one of the factors in the demographic evolution in the Kagera River basin.

4.2 Demographics

Population increases are a major government concern in modern times. The people themselves still believe that to have a lot of children is a blessing of the gods or of God. In the past, natural elimination, famine, epidemics and wars contributed to slowing the demographic growth rate.

For instance, between 1890 and 1929, the Kagera River basin region was hit by plagues that its people still tell tales of:

- 1891: an epidemic of cattle plague decimated their herds;
- 1892: smallpox was rampant in the region;
- between 1893 and 1897, the crops were devastated by desert locusts;
- 1916-1917 (World War I): restrictions and requisitioning led to serious shortages and famine; and
- 1925-1929: the great famine.

From 1880 to 1920, the region was characterized by a palpable population decrease. A fragile resurgence took place between 1930 and 1940 as the economic and heath effects of colonial policy slowly shrank mortality rates. But growth only resumed after 1950: the growth rate went from 1.5 % around 1950 to 2.5 % in the 1960s. But not until 1950 did the size of total population reach what it had probably been in 1880. [Chrétien, 2000].

But demographic disturbances and migration continued until today due to poor political and economic management. In the 1970s and 80s the people of Uganda suffered from many deaths and refugees movements. In Rwanda, population persecutions from 1959 until the 1994 genocide and following, caused many deaths and migrations within and out of the country. In Burundi, conflict has been going on since 1966 and there has been a crisis situation for the last 14 years. Conflict in the eastern regions of the Democratic Republic of Congo (DRC) has also paid its toll leaving the adjacent Kagera River basin region insecure, especially the parts of the DRC situated near Burundi, Rwanda and Uganda.

The high population densities of some parts of the Kagera River basin began with the rigorous establishment of frontiers and the improvement of health and nutrition (prevention of epidemics such as smallpox, sleeping sickness, cattle plague, the introduction of subsistence crops to bridge the gaps of the lean periods, etc.).

4.2.1 Population density in the Kagera River basin is very high

Current situation

As shown on the two following tables, in the Kagera River basin, the mean annual demographic growth rate is 2.7% and the fertility rate per woman is 6[34]. These rates are higher than in Sub-Saharan where the mean population growth rate is 2.5% and the mean fertility rate is 5.4 [World Bank Health, Nutrition and Population indicators, 2007]. Those basin figures have to be used with caution as they are estimated from comparisons between national censuses of population more or less recent.

Table 4.4 - Kagera River basin population density and growth rate

Projection July 2007	Kagera River Basin Population (million)	Kagera River Basin Population Density (p/km²)	Mean annual growth rate (%)
Burundi	4.6	337	2.75
Rwanda	7.8	363	2.75
Tanzania	1.6	79	2.5
Uganda	0.8	191	2.5
Basin	**15.0**	**247**	**2.7**

Sources: see methodological note at the end of this demographic section.[35]

Table 4.5 – Kagera River basin fertility rate

2004	Total fertility rate (per woman)
Burundi	6.8
Rwanda	5.6
Tanzania	4.9
Uganda	7.1
Basin	**6.0**

The mean estimated population density is 248 peoples/km² in June 2007, which is more than 8 times the 28 peoples/km² average for Sub-Saharan Africa. According to the demographic growth rate, this gap is even getting bigger every year). However, this density is not equally shared on the Kagera River basin: the population density is 4 times higher in Burundian and Rwandan hills (those two countries share the highest population density in Africa) than in Tanzanian lowlands, as shown on the following map.

[34] This fertility rate may be nuanced by the high child mortality, see below.

[35] This methodological note concerns all the tables and figures of the section.

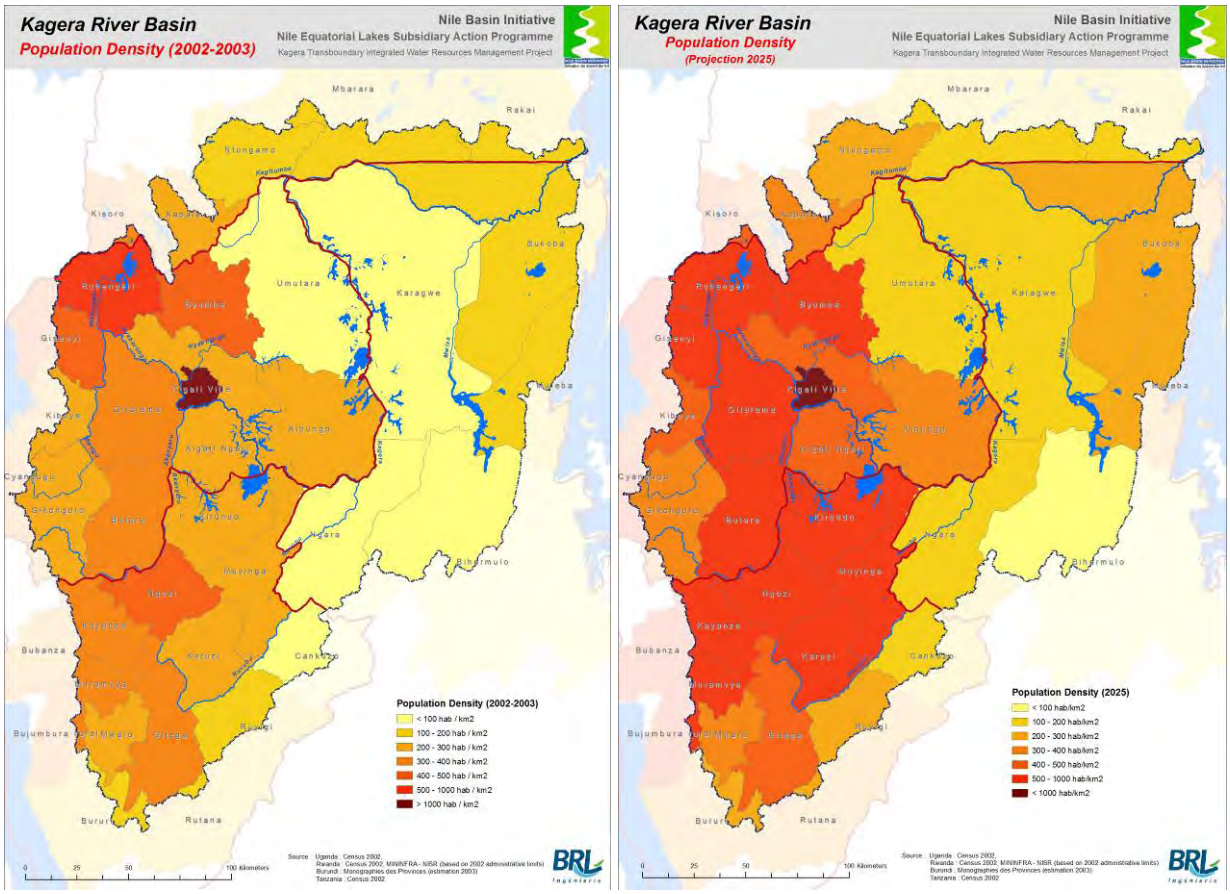


Figure 4.2 – Kagera River basin population density - 2003 and 2025 forecast

For the many reasons described in this entire monograph (climate, water related diseases, soil fertility, etc.) people have always preferred to settle in the upper Kagera River basin. There are also some density variances inside the upper basin also linked to the soil fertility, to polygamy practice (e.g. Ruhengeri or Byumba district) or to urbanisation (for instance, Kigali city district, the Rwandan capital, has more than 1000 inhabitants/km²).

Future Projections

If one considers that the mean annual growth rate will not change during the following decades, the population density on the Kagera River basin will be 395 peoples/km² in 2025 (close to the Rwandan population density today) and the Burundian and Rwandan population densities will be more than 540 peoples/km².

Table 4.6 - Demographic projection for 2025, with constant population growth

Projection January 2025	Kagera basin Population (million)	Kagera basin Population Density (p/km²)	Mean annual growth rate (%)
Burundi	7,5	542	2,75
Rwanda	12,6	558	2,75
Tanzania	2,5	125	2,5
Uganda	1,3	290	2,5
Basin	**23,9**	**395**	**2,7**

In fact, the different projections already made by the different national population policies consider that the growth rate is decreasing and they plan it to be around 1.5 % in 2025. This optimistic projection is based on some current tendencies such as the fact that the second drop in fertility in Sub-Saharan Africa is found in Rwanda from 7.4 (1990) to 5.6 (2004). However, as shown in the following table, even in this projection, the population density will be very high in 2025 (compared to the 70 unhabitants/km² in Europe for instance).

Table 4.7 - Demographic projection for 2025, with progressive decreasing population growth

Projection January 2025 with growth rate decrease	Kagera basin Population (million)	Kagera basin Population Density (p/km²)	Mean annual growth rate (%)
Burundi	6,6	482	2.75 in 2007 to 1.5 in 2025
Rwanda	11,2	519	
Tanzania	2,3	111	2.5 in 2007 to 1.5 in 2025
Uganda	1,2	268	
Basin	**21,4**	**353**	**1.5 in 2025**

However, given the following figure, which shows the growth rate evolution from the recent past, the proposed future decreasing population growth is probably too optimistic.

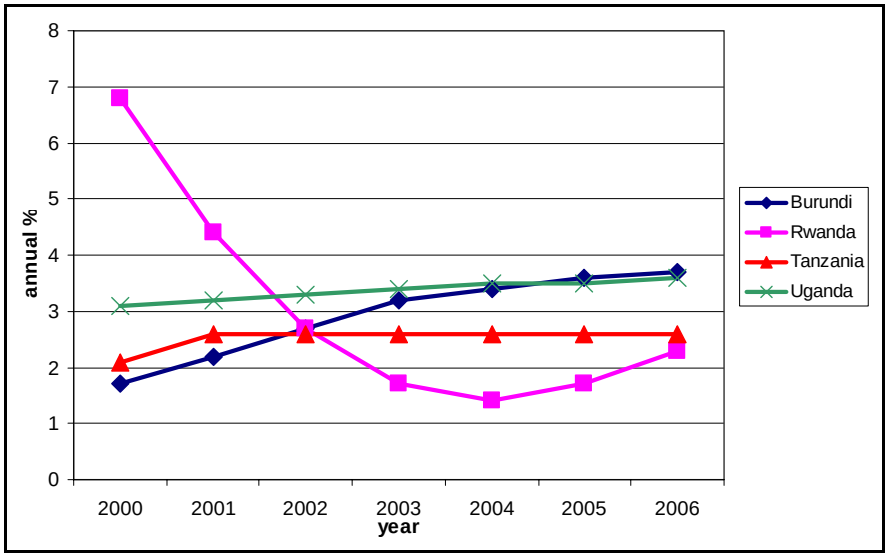


Figure 4.3 – Recent evolution of national annual population growth rates (2000 – 2006)[36]

[36] World Bank, 2007. World Development Indicators.

4.2.2 A very young population

The age-sex pyramids for the four Kagera River basin countries are given below. They show that the basin's populations contain a large proportion of young people.

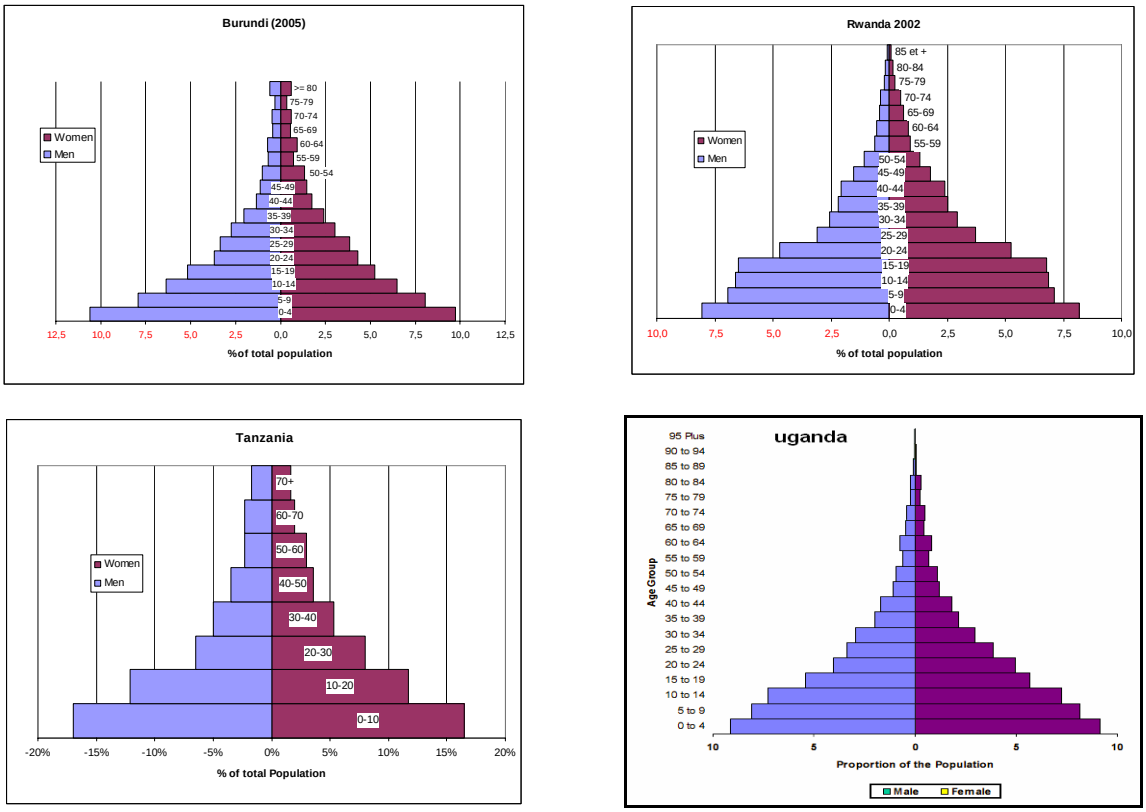


Figure 4.4 – Age-sex pyramids for the four Kagera River basin countries

Rwanda, in particular, is different from its neighbours. The genocide is probably the explanation for this break in the age pyramid in Rwanda.

Table 4.8 - Population layers and age groups

Country	0-14 years-old (%)	15-64 years-old (%)	over 65 (%)
Burundi	48.9	47.2	3.9
Rwanda	43.8	53.3	2.9
Tanzania	44.5	50.2	5.3
Uganda	47.0	44.0	4.0
Basin	**45.6**	**50.5**	**3.5**

Children under 15 represent 45.6% of the Kagera River basin's population. If the 3.5% representing the over 65 age group are added, the community burden is 49.1% of the population. The young and the old indeed represent a heavy burden in terms of basic needs, including education and health.

The young generation would have to carry on the development of the Kagera River basin. But this population class is particularly concerned by threats such as HIV, agricultural land fragmentation, illiteracy and lack of professional qualifications. One of the challenges of the young generation will be to get professional qualification out from the agriculture, where lands can not be fragmented anymore.

4.2.3 More women than men

Table 4.9 - Population layers by gender and by country

	Men (%)	Women (%)
Burundi	48.6	51.4
Rwanda	47.7	52.3
Tanzania	49.4	50.6
Uganda	49.0	51.0
Basin	**48.3**	**51.7**

There are more women than men but they are economically weaker than men. The majority of the population lives in the rural world where agriculture and livestock rearing are extensive and where women are neither landowners nor livestock owners. In urban areas, they are in the minority among salaried workers and their jobs are usually the least paid ones.

Methodological note

It is often not easy to extrapolate national data or regional data to Kagera River basin data. But the purpose of this monograph is to deal with basin data, so that some calculations and methodological adjustments have to be done. Such “methodological notes” are used in this monograph to explain the adjustments made, in a wish of transparency.

The sources used for the demographical data are

- for Burundi: MININTER, DEPARTEMENT DE LA POPULATION, from the general population census of 1990, in national monographs, 2006;
- for Rwanda: from the general population census of August 2002, in provincial monographs;
- for Tanzania: from the general population census of 2002, in "National Population Policy" of 2006, in National website (www.tanzania.go.tz/census), in NBS Website (www.nbs.go.tz);
- for Uganda: from the general population census of 2002, in "Analytical report / Dynamics Population" from UBOS, in UBOS website.

The number of inhabitants in the Kagera River basin part of a given country has been estimated by using provincial or regional demographical data and applying a surface ratio.

For a given commune, province or region, the growth rate used in order to estimate the current population, is the mean growth rate estimated by the riparian countries governments.

Projections in 2025 are built upon scenarios and calculations from BRLi: one scenario without any growth rate change and one scenario with a progressive growth rate decrease.

4.2.4 A rurally rooted population

The country with the least urbanized population in Sub-Saharan Africa is Burundi, at 11 percent. The urban population represents around 18% of the basin population, which is by far less than Tanzania and entire Africa, both at 38%. This urbanization rate is however increasing and, for instance, it should be 30% in 2020 in Rwanda [governmental statistics].

Table 4.10 – Urbanization in the Kagera River basin (2004)

2004	Urbanized population (%)
Burundi	11
Rwanda	22
Tanzania	38
Uganda	12
Basin	**≈18**

Sources: WHO, 2006.

The average proportion of urbanization is around 18% in the Kagera River basin. With urbanization, the basic socio-economic infrastructure has developed: water and sewerage, health services, education, communications, energy, markets, administrative authorities, etc. There are also more economic opportunities in towns. Consequently, the low rate of urbanization in the river basin is a synonym of poor access to various services especially in the rural areas. This means that living standards between urban and rural areas are not balanced at all.

4.3 Social development in the Kagera River basin

4.3.1 Introduction - Human Development Index[37]

The four countries in the Kagera River basin are among the world's poorest countries. Uganda is 145, Rwanda 158, Tanzania 162 and Burundi 169 (out of 177 countries listed by the UNDP in 2006). Their situation is roughly the same as the average situation in sub-Saharan Africa (though the per capita GDP is much lower in the Kagera River basin countries).

Table 4.11 - The Kagera River basin countries and East African community countries and their situation compared to the human development index indicators

	HDI rank (177 countries)	Human Development Index (HDI)	Life expectancy at birth (years)	Adult literacy rate (% ages 15 and older)	Combined gross enrolment ration for primary, secondary and tertiary schools (%)	GDP per capita (PPP USD)
Uganda	145	0.502	48.4	66.8	66	1 478
Rwanda	158	0.45	44.2	64.9	52	1 263
Tanzania	162	0.43	45.9	69.4	48	674
Burundi	169	0.384	44	59.3	36	677
Kenya	152	0.491	47.5	73.6	60	1 140
Sub-Saharan Africa		0.472	46.1	63.3	50	1946
World		0.741	67.3	…	67	8 833

Source: Poverty HDI ----> UNDP 2007

4.3.2 Subsistence agriculture and nutritional requirements

The per capita GDP in the Kagera River basin is very low since agriculture there is mainly subsistence farming (cf. chapter on Agriculture). The small mean cultivable area per household (0.8 ha) and the low agricultural productivity means that there is not even enough food to satisfy the basic nutritional needs of most of the households, so that in most of the case, no monetary surplus from off-farm sales are possible. This situation is illustrated by the coverage of nutritional needs in Rwanda, presented in the table below. Moreover, the infant malnutrition rate that found out in 2002 was 24%. In some provinces such as Gikongoro, Kibuye and Butare, the malnutrition rate reaches 40 to 50% [figures for Rwanda, SPAT, 2004].

Table 4.12 - Coverage rate of nutritional needs in Rwanda (% of basic nutrition requirement)

	1984	1986	1987	1988	1989	1990	2000	2001	2002	2003
Energy	92	90	79	81	74	71	78	80	96	93
Proteins	83	82.5	65	68	61	59	61	71	74	76
Lipids	14.5	15	12	13	11	10.5	12	17	25	27

Sources: Busokeye, 2004.

[37] When the sources are not mentioned, the figures are taken from the United Nations Site for Millennium Development Goals Indicators, 2007: http://millenniumindicators.un.org

4.3.3 Low life expectancy at birth: health issues

Life expectancy of about 45 years in the Kagera River basin is low, ranging from 44.1 to 50.0 for Rwanda and Uganda respectively. It is slightly below 46 years which is the average for sub-Saharan Africa and well below the world average of 67 years. In the last decade Rwanda and Uganda have made the greatest gains in life expectancy: 12 and 7 years respectively (World Bank, 2007). The children, adult and maternal mortality rates are high in the Kagera riparian countries, especially in Rwanda and Burundi, whereas the figures are lower in Uganda. The situation is close to the WHO African region ones.

Table 4.13 - Children under five mortality rate per 1 000 live births

	1990	1995	2000	2005
Burundi	190	190	190	190
Kenya	97	111	117	120
Rwanda	173	209	203	203
Uganda	160	156	145	136
Tanzania	161	159	141	122
Africa				167

Sources: United Nations site for Millennium Development Goals Indicators, 2007.[38]

Table 4.14 - Children under five mortality rate per 1 000 live births (urban-rural)

	Rural	Urban
Burundi	184	164
Kenya	117	93
Rwanda	216	141
Uganda	164	100
Tanzania	166	142

There is a difference in the infant mortality rate in urban zones and rural zones. Among others, this reflects the inequality of access to health care, drinking water and sanitation and to the other basic services. Sanitary structures with qualified personnel are rare in rural areas.

Table 4.15 – Maternal mortality rates and births attended by skilled health personnel

Maternal mortality rate per 100,000 live births

	1990	1995	2000
Burundi	1300	1900	1000
Kenya	650	1300	1000
Rwanda	1300	2300	1400
Uganda	1200	1100	880
Tanzania	770	1100	1500
Africa			910

Births attended by skilled health personnel (%)

	1999	2000	2002	2004
Burundi	25,2			
Kenya			41,6	
Rwanda	31,3			38,7
Uganda		39,0		
Tanzania				43,4

In addition to what has already been said, ignorance is also a factor which prevents pregnant women from understanding the need to consult health care providers. This is partly due to barriers and traditional beliefs, the importance of customs and the absence of decisional and economic power for women.

[38] For the tables in this sub-section, when no source is mentioned, it is the United Nations site for Millennium Development Goals Indicators, 2007.

Table 4.16 - Probability of dying per 1,000 population between 15 and 60 years (adult mortality rate)

2004	Men	Women
Burundi	593	457
Kenya	477	502
Rwanda	518	435
Uganda	525	446
Tanzania	551	524
Africa	519	465

As is the case on average in Sub-Saharan Africa, living until the age of 15 does not mean one is sure to live until the age of 65. Even after 15, the chances are about fifty-fifty that a person will live longer than 65 years. This is because after the age of 15 years, people are particularly exposed to HIV/AIDS, there are always wars and malaria is a constant threat…

Disease

Disease is the top life-expectancy reducing factor in the Kagera River basin. Disease is prevalent as health and hygiene conditions are not satisfactory and cause numerous diarrhoeal diseases, malaria and cholera. HIV/AIDS is the top cause of death in the Kagera River basin. Many deaths are due to water-related factors. Diarrhoea and malaria are the main water-borne diseases in the Kagera River basin.

Table 4.17 - Distribution of causes of death among children under 5 years of age

2000-2003	Neonatal causes	HIV/AIDS	Diarrhoeal diseases	Malaria	Pneumonia
Burundi	23%	8%	18%	8%[39]	23%
Kenya	24%	15%	16%	14%	20%
Rwanda	22%	5%	18%	5%	23%
Uganda	24%	8%	17%	23%	21%
Tanzania	27%	9%	17%	23%	21%

Table 4.18 - Top causes of death, all ages (excluding natural deaths)

2002	All causes (people)	Part of the population	HIV/AIDS	Lower respiratory infections	Diarrhoeal diseases	War	Perinatal conditions	Malaria
Burundi	120000	1.93%	22%	11%	8%	7%	6%	3%
Kenya	376000	1.08%	38%	10%	6%	5%	5%	4%
Rwanda	130000	1.38%	18%	12%	10%	6%	4%	2%
Uganda	380000	1.35%	25%	11%	10%	8%	4%	4%
Tanzania	583000	1.48%	28%	11%	10%	5%	4%	3%

[39] This must be kept in proportion. It seems too low compared to the World Bank figures for the same group – 48%

Malaria

In the Kagera River basin, malaria is endemic in the plains. On the upper plateaus, it is more often found in epidemics [Vermylen, 1967; Ivorra, 1967]. An estimated 80% of the population is exposed to the risk of catching malaria [The World Bank, 2005].

Malaria is still a major public health concern in the Kagera River basin, especially among pregnant women and children under five years of age. It is a leading cause of morbidity and mortality in the Kagera River basin in both outpatient attendance and inpatient admissions, accounting for more than 40 percent of overall outpatient attendances (MOH, 2002). Most parts of the basin, including uplands have reported malaria transmission throughout the year, though it increases during and soon after the rainy season.

Health care

The lack of health care is particularly flagrant in rural areas, which partly explains the high effect of certain diseases in the Kagera River basin.

Sanitary infrastructure is insufficient, often lacking equipment and understaffed with under-qualified personnel. This is particularly the case in the rural areas, where purchasing power is very low and general living standards (basic socio-economic infrastructure such as drinking water, energy, markets, schools, health care centres and leisure centres, etc.) do not encourage health professionals to settle there.

Access to safe drinking water and sanitation

The lack of water, especially safe potable water is responsible for many of the precarious health conditions in the basin. The important links between water and sanitation, and poverty alleviation, including proposed programmes and investment scenarios for the Kagera basin are fully discussed in Section 10 of this monograph

4.3.4 Low adult literacy rate: Education

In the Kagera River basin countries, the literacy rate is approximately the same as the average for sub-Saharan Africa: ranging from 58.9 % in Burundi to 69.4 % in Tanzania. Women's literacy is of crucial importance in addressing wider issues of gender inequality. Yet, women still account for the majority of the Kagera River basin adult illiterates, with only around 80 literate women for every 100 literate men. Indeed, most sub-Saharan countries show substantial gender disparities in literacy as indicated by the gender parity index (GPI) figures below.

Table 4.19 – Adult literacy

Adult literacy rate (%) in 2004[40]

Burundi	58.9
Kenya	73.6
Rwanda	64
Tanzania	69.4
Uganda	68.8
Sub-Saharan Africa	63.3

Sources: United Nations Site for Millennium Development Goals Indicators.

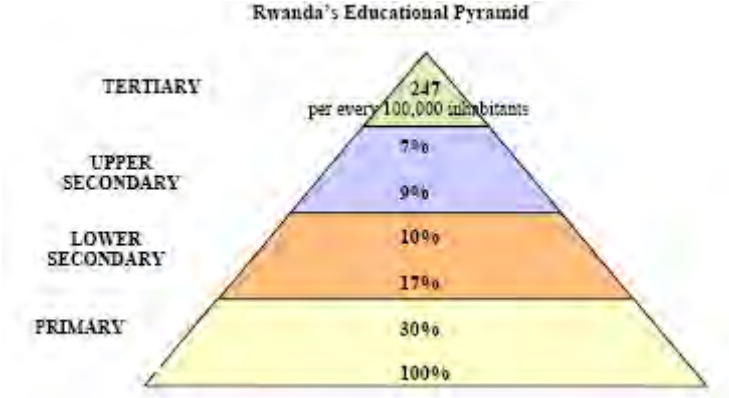
Adult literacy rate: Gender Parity Index (F/M)[41]

Burundi	0.78
Kenya	0.9
Rwanda	0.84
Tanzania	0.8
Uganda	0.75
Sub-Saharan Africa	0.76

Sources: UNESCO, 2006.Literacy for life.

Among the difficulties encountered in the education system, some of the most notable are the lack of teachers, the lack of school books and the lack of infrastructure.

There are not enough schools, especially in the rural parts of the basin. In towns and large enough urban communities, even schools for the very young exist, while in rural areas all types of schools are rare. Some children start primary school only at the age of 7 because of the distance they have to travel to attend school. The fact that housing is so scattered does not make geographical access to schools an easy matter. The lack of infrastructure partly explains the low rate of transition to the next level of schooling, as shown in the following figure on Rwanda. For 100 pupils starting at primary school, only 30 finish primary school and only 17 go on to secondary school.



Sources: OKECH, TORRES, 2005.

Figure 4.5 – Rwanda's Educational Pyramid

Some regions further away from urban areas, i.e. without basic socio-economic infrastructure such as drinking water, roads, communications facilities, electricity, book shops, libraries, leisure activities, etc., find it difficult to attract competent, well-trained teachers.

[40] Those figures need to be used with caution because they also depend on the sources used. For Rwanda, for instance, some literacy rates are given in the following table:

Population above 15 years of age	- 52.4%, according to Household Living Condition Survey (2000). Women's literacy rate (47.79%) is lower than men's (58.06%). - 69.2%, according to UIS (UNESCO Institute of Statistics)
Population between 15 and 24 years of age	- 84.9%, according to UIS (UNESCO Institute of Statistics) - 64%, according to UNESCO-BREDA (2005).
Population aged 6 years and over	- 51.4%, according to the last population census (2003).

[41] Inequality between rural and urban population illiteracy should also be taken into account but data to clarify the disparities are not available.

However, primary education seems to be improving (about 70% enrolment in the river basin) and the gap between the number of boys and girls attending school has narrowed, even if it is still very high for tertiary education.

Table 4.20 - Education levels per country in the Kagera River basin

	Primary education		Secondary education		Tertiary education	
	Total (%)	GPI	Total (%)	GPI	Total (%)	GPI
Burundi	57.4	0.81	11.1	0.73	2	0.45
Kenya	66.5	0.94	32.9	0.92	2.9	0.53
Rwanda	86.7	1	16.1	0.81	2.5	0.46
Tanzania	77.4	0.96	…	…	0.9	0.44
Uganda	…	0.98	19.7	0.8	3.2	0.52
Sub-Saharan Africa	63.5	0.86	28.4	0.78	2.5	0.46

4.3.5 Other basic socio-economic services

Electricity: There is a serious lack of electricity availability in the equatorial lakes region in general and the Kagera basin in particular. It is estimated that access to electricity is between 2% and 7% (ref. Section 9). Improving the access to electricity at a reasonable cost is essential for poverty alleviation.

4.3.6 Gender

Historical inequality

The people in the Kagera River basin all had the same mode of social organisation: patriarchy. Marriage was a contract and the future husband was expected to pay a dowry. The dowry gave a man the right to be the head of the household and the family and an absolute right over the children born of the marriage. Women did not inherit, even if they were widowed. Male children were the inheritors and it was an inherited duty to look after their mother and sisters. Traditionally, polygamy meant a comfortable existence, enough land and livestock, and usually, integration into the spheres of power. This and the need to have enough labour, combined with the high mortality rate, forced most men to take several wives, and obliged women to compete to have the most children, preferably boys.

The pre-defined roles of men and women are always different, as the way they are put across as part of the education or socialization:

- The supreme role of a woman is to give birth. She must also take care of her children, her husband and his kin. Having children and looking after a household are not really part of what is taught at school.
- The supreme role of a man is to meet all the needs of his family, mainly to feed his children and to honour his kin.

So, since women are in charge of running the household, they were kept from school, while men (even if there is a difference between urban and rural areas) usually went to school and broadened their outlook so that they could better adjust to the modern world.

Disease - HIV/AIDS

There are also differences between men and women in terms of rates of infection with HIV/AIDS among other diseases. The factors which make women more vulnerable to HIV/AIDS infection can be summarized as follows: A combination of biological, social, cultural and economic factors contributes to women's increased vulnerability. In particular, gender inequalities prevent women from asserting power over their own lives and controlling the circumstances that increase their vulnerability to infection. And women are physiologically more susceptible to becoming infected with HIV than men.

Water resources

Water fetching for domestic use is generally a duty for women and children; once again, girls rather than boys. The lack of water or the distance of homes from sources of water make women's lives difficult, have a strong influence on their availabilities for other tasks and limit their ability to take part in other activities. It is such a serious problem that some women don't go to antenatal appointments and don't give birth at health centres. *"They can't be seen in public, they can't go to meetings, etc. if they haven't done their washing and they won't dare go to any healthcare appointments…"* said one 76 year-old lady who lives near Rusumo.

Water fetching also affects girls' schooling: if it is a long way to fetch water, water supply is incompatible with school attendance. Women would tend to school too late and be punished. Children would rather avoid this, so absenteeism is high.

Boys are usually in charge of small livestock grazing and sometimes gathering fuel-wood. Both of these activities can be done in the afternoon after school. Boys usually find it harder to attend school regularly when they have to look after livestock or when they are older pupils and are chosen to go fishing, drive the livestock to their pastures or take products to market.

An improvement today?

Today all the countries in the Kagera River basin have expressed their agreement with the conclusions of 1) the 1995 international conference on women held in Beijing and 2) the Millennium Development Goals. Emancipating women is one of their fundamental priorities for sustainable development.

Traditional community culture and women's own lack of self-confidence are severe impediments to initiatives targeting an improvement in women's living conditions and greater female participation in the development process.

4.4 Social water-related opportunities

This monograph is oriented towards water resources management, so that it is therefore focussing on development opportunities linked to water use and management. As we have seen above, there are direct links between water and socioeconomic aspects, such as health, which should be addressed in any future water resources management plan of the Kagera River basin, which should not only be oriented towards revenue increase.

4.4.1 Health

Water related diseases may often be avoided or their impact reduced through better education or improvement of heath services (financial and geographical access). Rwanda, for instance, has recently introduced community private health insurance systems even in rural spheres: community-based health insurance schemes were introduced in 1999 in Rwanda; in 2007, 27% of the population has coverage under these systems. In general, they cover a minimum amount of care and health services and indicators now show that their influence is positive: more women are attending ante-natal consultations and giving birth in health centres or hospitals; and fewer people are consulting unrecognized traditional practitioners.

Water related diseases may also be avoided through better wetlands management. On the Kagera River basin, populations living close to marshlands (marshlands are there used for irrigation or brickworks) are the most affected by malaria or other water related diseases. Drainage infrastructure development, as proposed in the “agriculture” section, could lead to a noticeable decrease of these diseases.

4.4.2 Education

Education is the first step in improving water resources management. Illiteracy is a barrier to dissemination through written information. Teaching adults to read and write enables them to share their own knowledge and to gain access to written information. This would bring some relief to social isolation. Schooling is now a driving force for socialisation and education. Schools are potential partners and players who can promote good use of water "management" because the concept can be integrated in the learning process from a very early age: respecting water, learning about hygiene and how to use water properly.

Schools should also be some of the first infrastructures to benefit from rain water collection systems, taps, so that they can teach children to wash their hands frequently and toilets that are up to modern sanitary standards.

4.4.3 Gender and water

Women are first in line when it comes to making water available for their families. They are the key targets to be involved in potable water supply related activities. The promotion of women's rights and their integration at different decisional levels (from water committees to higher levels) must therefore be consolidated.

Men are above all concerned when it comes to provision of agricultural water for crops and animals, but also the related land and water resources conservation problems resulting from deforestation for charcoal production among others uses. It is essential for men to understand their responsibilities in terms of sound management of water and land resources under their control.

4.5 Conclusions

4.5.1 Demographic trends

As seen above, the population density in the Kagera River basin is the highest in such a basin in Africa and population growth remains high (around 2.75%/year). And such high population densities and growth rates are a real issue for a region suffering from high levels of poverty. As shown in the paragraphs above, and partly shown by the table below, the Kagera population is very poor. Indeed, the high rate of population growth has not been matched so far by any increase in economic productivity - notably in the agricultural sector upon which most people are dependent. Consequently, the proportion of poor people continues to increase among an ever increasing population.

Table 4.21 - Population below 1 USD (PPP) per day (%) in the Kagera riparian countries

	Population below 1 USD (PPP) per day (%)	Year
Burundi	54,6	1998
Rwanda	60,3	2000
Tanzania	57,8	2000
Uganda		
Kenya	22,8	1997

Sources: United Nations site for Millennium Development Goals

The following sections of this monograph will address the possible development of various beneficial uses of the water and related resources, especially the agricultural sector (ref. Section 6), which is expected to be the main pillar to fight poverty. Only in combination with reduced rates of demographic growth, e.g. with family planning, we could expect an increase in the positive impacts of productivity growth.

4.5.2 From a common history to a common future

As we have seen from the preceding discussion, the people of the Kagera River basin in common:

- their culture and history, even fissured by globalization,
- their languages,
- their family and clan relations,
- their economical activities (mainly agriculture, livestock and forestry),
- the population displacements, still ongoing, and
- the same rich natural environment.

Kagera peoples have also in common the challenge of escaping from the threats of: "…political chaos, [which] might lead to state disintegration and to permanent "warlords" more or less controlled by external regional power or by massive international intervention." [Chrétien, 2000]. The challenge facing the equatorial lakes region, including the Kagera River basin, "… clearly involves a concerted and broad-based reconstruction that would consist of population flows, economic growth, security, environmental management, and real democratic practice. The institutional forms this will take are waiting to be invented, and they might cut across current borders without necessarily redrawing them." [Chrétien, 2000]

Positive factors have already taken root in the way of transboundary cooperation towards poverty reduction. For example, the Kagera riparian countries have all recognized the urgency of achieving the United Nations Millennium Development Goals as social and economic development goals. They also have joined different regional and international economic and resource management development institutions, including the EAC (and the LVBC), COMESA or AU, and they are also participating in the NBI process.

The countries sharing the Kagera River basin have all adopted various national strategies and action plans that address sustainable management of natural resources, biodiversity conservation, agriculture, forests, desertification, and climate change mitigation. Land degradation is recognized by all stakeholders as a major threat to the natural resource base and to livelihoods. Ratification of the Convention to Combat Desertification (UNCCD) in the late 1990s by the four countries and subsequent development of National Action Programme (NAPs) for its implementation has led to raised awareness from regional to local levels, including of the close links between degradation and poverty.

Integrated management and development of the Kagera River basin's water and natural resources through effective national and transboundary institutions has the potential to contribute to this effort building social and economic capital of the region for the benefit of all its citizens.

5. Transboundary Management and Cooperation in Water and Related Resources of the Kagera River Basin

5.1 History and links to Nile basin agreements and cooperation arrangements

5.1.1 Introduction

The history of the Kagera River basin is intricately linked to the history of the Nile River basin to which it belongs. Many previous agreements between the countries which consider themselves to be the "owners" of the Nile River, underlie the historical legal frameworks presently considered to be governing its water resources. For example, during the European colonization of Africa, the General Act of Berlin passed on 26 February 1885 rendered only the Congo and Niger Rivers as international. This was established according to the criteria set out in the Final Act of the Congress of Vienna, dated 9 June 1815, i.e. *the navigability of the river and its adjacent or successive location*[42] (Majzoub, 1998). The Nile River was not declared international because it could be used for other purposes than navigation. *Historical will* to *nationalise* the Nile only more latterly became bilateral *joint management* by Sudan and Egypt thanks to the 8 November 1959 agreement. It was then gradually transformed, through various, mainly technical frameworks for cooperation, into genuine basin-wide IWRM now finally under the activities of the Nile Basin Initiative (NBI).

5.1.2 Historical agreements on Nile Basin water resources management

The constant urge to *nationalise* the Nile Basin can be seen in a whole series of agreements signed between 1891 and 1959. The first agreements covered the downstream portions and are above all bilateral agreements (Phillips, 2006) witnessing the interest of Egypt and Sudan in the river.[43]

They were signed by the European countries present in the territories concerned[44], and mainly involved agreements not to build infrastructure that would affect the flows of water in the river.

[42] The Act of Vienna established that a river is international if two conditions are met: one physical:- the watercourse is navigable, and the other legal:- the river forms a separation or passes through more than one country.

[43] Egypt depends one hundred per cent on the water from the Nile. Almost all the hydropower and irrigation potential is already exploited. The other Nile countries are way behind because economic and political problems, especially in Sudan and Ethiopia, have delayed water resources development and the construction of dams and other infrastructure. These countries, especially Ethiopia, the "water tower" of the basin, are having to face increasing demands for water. They therefore wish to find different ways of using the water from the Nile (El Dahshan, 2004).

[44] Great Britain/Italy, 1891; Great Britain/Ethiopia, 1902; Great Britain/Congo, 1906; Great Britain/France/Italy, 1906, United-Kingdom/Italy, 1925, United-Kingdom/Egyptia, 1929.

These historical agreements on water-related issues are listed here chronologically for the Nile Basin as a whole, as well as for the Kagera River basin (Phillips, 2006):

- An exchange of notes between Great Britain and Ethiopia dated 1902 and relating to the Blue Nile and other watercourses;
- An agreement between Great Britain, France and Italy of 1906 relating to Abyssinia, modified and extended by an exchange of Notes between the United-Kingdom and Italy in 1925;
- The 1929 agreement between Egypt and the Sudan, represented by the United Kingdom, including extensive technical detail and pertaining to the use of the Nile waters for both irrigation and navigation;
- An agreement between the United Kingdom and Belgium dated 1934 concerning trans-boundary river flows and water rights in Tanzania, Rwanda and Burundi;
- An exchange of Notes and memoranda between the United-Kingdom, representing Uganda, and Egypt between 1946 and 1953;
- The Agreement of 1959 between Egypt and the Sudan on the utilization of waters of the Nile River;
- An agreement between Burundi, Rwanda and Tanzania in 1977 to form the Kagera River basin Organisation, which Uganda joined also in 1981;
- An agreement from 1994 between Kenya, Tanzania and Uganda on the establishment of the Lake Victoria Environmental Management Program;
- The Protocol for Sustainable Development of the Lake Victoria Basin, signed by Kenya, Tanzania and Uganda in November 2003.

Some of the more important agreements illustrate what status the dominant riparian countries give to the river. They confirm the difficulties encountered in establishing a cooperative framework that can be managed in a comprehensive, equitable manner.

The agreement signed in 1902 suggested that the Great British and Sudanese governments be consulted prior to any construction works carried out by Ethiopia affecting the flow in the Blue Nile;

The 1906 agreement imposes Sudanese government consent for the slightest use of the water likely to modify the flow in any way[45].

One section of the 1925 agreement between the United Kingdom and Italy refers to the notion of water rights for the local populations;

As for the 1929 agreement[46] between Egypt and Sudan —represented by Great Britain— on the sharing and allocation of the Nile water to Egypt and Sudan, it granted Egypt a real **right to veto** upstream territories[47] (Majzoub, 1998) and allocated a **volume-based share** to Egypt. The quota for Egypt was 48 billion cubic metres while Sudan got 4 billion. Furthermore, Mahmoud Pacha's note stressed that no irrigation or hydropower facilities could be built, either in Sudan or

[45] Article 3 stated that the Independent State Government of Congo would not build or authorize the construction of any facilities likely to reduce the volume of water reaching Lake Albert on or near the Semliki or Isango Rivers, unless prior approval from the Sudanese government had been issued.

[46] The 1929 agreement is nothing more than acceptance of the Nile Commission's recommendations in 1925, which was confirmed by an exchange of notes between Mohamed MAHMOUD PACHA and Lord LLOYD on 7 May 1929. The notes were nevertheless recorded as forming an agreement between the Government of the United Kingdom (on behalf of Sudan and the other countries under British rule) and the Egyptian Government.

[47] "Except with the prior consent of the Egyptian Government, no irrigation works shall be undertaken nor electric generators installed along the Nile and its branches nor on the lakes from which they flow if these lakes are situated in Sudan or in countries under British administration which could jeopardize the interests of Egypt either by reducing the quantity of water flowing into Egypt or appreciably changing the date of its flow or causing its level to drop".

in the territories under British rule, without **"prior consent"** of the Egyptian government[47]. On the other hand, Egypt could undertake works on the Nile and its tributaries in Sudan and elsewhere without the consent of their governments as long as the local authorities had **already agreed** to the measures taken by way of safeguarding local interests. In addition, the agreement entitled the Egyptian irrigation authorities **the right to have a say/be involved** in Sudanese hydraulic works by the possibility of **"inspecting"** Sudanese works,[48] "*so that the Egyptian government can ensure that water is distributed and the dam controlled as stipulated in the agreement signed*" (Majzoub, 1998). Thus, the agreement on the Nile waters can be considered to be a precedent in international law; Sudan did not obtain the right to use the Nile water according to its demand for irrigation and its arid zones; and cooperation between Egypt and Sudan was unilateral and was to remain so until November 1959.

From the beginning of the 1930s, the water demand in Sudan increased and the agreement was re-negotiated to share the water still on a volumetric basis but in new proportions. This agreement entered effect on 8 November 1959 between Egypt and Sudan after a whole series of bitter negotiations.[49] The agreement attempted to redress the severe inequality of the 1929 agreement by allocating 18.5 billion cubic metres of water to Sudan against 55.5 to Egypt. In essence, the 1959 agreement adds nothing new to pave the way towards a general legal framework for sharing international river water (Majzoub, 1998).

It was only much later that the notion of hydrological units in the Nile Basin, mentioned in the 1929 agreement, was confirmed to take account of the concerns of the other countries along the river:

The first agreement specific to water allocation within the Kagera River basin was signed by the United-Kingdom and Belgium on 22 November 1934[50]. It bans all works likely to modify the natural course of the Nile River. For example, article 6 prohibits the use of boundary river water by the riparian countries of the Kagera River unless they give six months notice before commencing the works so that the other government has time to examine any objections it might want to raise. Article 1 further states that any water withdrawn from part of a watercourse that is entirely located in one country must be returned to the natural river. Also, the first article stipulates that all measures must be taken to preserve the intrinsic quality of the Kagera River water before the water reaches the frontiers that are common to the three countries – Burundi, Rwanda and Tanzania.

In the agreement signed on 31 May 1949[51] between the United Kingdom —on behalf of Uganda and Sudan— and Egypt concerning the construction of the dam at Owen Falls[52], the financial contribution of Egypt, proportionate to the benefits it was to derive from the dam, was also a condition. Egypt also agreed to compensate for losses caused by the flooding of the area around the lake and to pay the Uganda Electricity Board a sum of money to compensate for the reduction in its hydropower production capacity due to certain works that were exclusively in the interests of Egypt (Egypt also had the right to inspect the dam). Through this agreement, Egypt and Sudan admitted that the other riparian countries also had certain rights[53]; and each time one of the non-signatory countries brought forward a claim, the contracting parties would give it

48 While the Sudanese irrigation authorities were only working on the Sudanese branch of the Nile, the Egyptian authorities had a large staff of civil servant employees enjoying permanent positions in which they were equipped with all the amenities necessary to perform "complete surveys" on the "hydrology of the Nile in Sudan"

49 All the negotiations between 1955 and 1957 failed. They seemed to be at a dead end, when in July 1958, Sudan began to divert water from the Blue Nile with Managuil Canal to irrigate the Gezira region, despite Egyptian protests.

50 This agreement was ratified by the contracting parties in May 1938.

51 This agreement materialised in an exchange of notes between the Great British government and the Egyptian government (19 January 1949, February 1949, May 1949).

52 This agreement planned the set up of an operating company to run the dam.

53 Article 3.2 of the 8 November 1959 agreement.

due consideration and come to an agreement on the most appropriate common policy towards those countries. This clause was the first to open up a possibility of multi-lateral rules for the basin-wide management of the water resources in the Nile Basin.

Several times during this period, the British government confirmed the interests of its East African territories, i.e. Kenya, Uganda and Tanzania, in the use of the Nile water for irrigation purposes. In September 1959, they notified the governments of Egypt, Sudan, Ethiopia and Belgium that in the 25 years to come, the demand for water from these countries would be some 1 750 million cubic metres per annum (Majzoub, 1998).

After becoming independent, Tanzania declared that the 1929 agreement was incompatible with its own sovereignty. Kenya and Uganda followed on in Tanzania's footsteps[54]. A bilateral agreement on sharing a river when the river basin is in territories belonging to nine different countries is not an absolute rule and the two countries signing such an agreement cannot claim that the agreement forces third parties to accept its rules just because of the *pacta sunt servanda*[55] principle of international law.

Hence the opposition between the concepts of "natural rights" and "acquired rights" to use river water. Ethiopia, and today, all of the other riparian countries, are claiming their "natural rights" to use the river which are based on receiving a "fair share" of the water, consecrated in international agreements such as the 1966 Helsinki Rules. Egyptian claims regarding the country's "acquired rights" and "historical rights" are based on the precedent that Egypt has always, unrestrictedly used the Nile. Moreover, those claims are endorsed by the previously mentioned agreements. For the other States, the rights they have acquired are only inheritance from earlier times under the British colonies and Emperor Menelik.

5.1.3 The first types of "cooperation" for the management of the Nile River and Kagera River basins

The Kagera River riparian countries have a certain amount of experience in cooperation for the management of shared natural resources, both in the management of the Nile Basin as a whole and specific to the management of the Kagera River basin.

In the sixties, a few attempts to cooperate among Nile countries emerged but they did not manage to achieve any real structure for cooperation (El Dahshan, 2004).

Hydromet

Egypt, Kenya, Sudan, Tanzania and Uganda launched the Hydromet project in 1967 in cooperation with the United Nations Development Programme (UNDP) and the World Meteorological Organisation (WMO). The goal was to provide hydrometeorological studies including a baseline set of measurements of water availability and future needs affecting the White Nile in and around lakes Vicotia, Kyoga and Albert. It was hoped that shared information would encourage joint planning. Political disruption in some basin states ensured that the necessary follow-up activities never took place. Rwanda and Uganda joined the organisation in 1977. Ethiopia was never involved in this project and there was finally never any basin-wide agreement (El Dahshan, 2004).

[54] Independence of Tanzania: 1961, Uganda 1962 and Kenya 1963.

[55] "…every treaty in force is binding upon the parties to it and must be performed by them in good faith".

Kagera River Basin Organization – and lessons learned

The Republics of Rwanda, Burundi and Tanzania reached an important milestone in terms of cooperation on the management of the Kagera River basin's on 24 August 1977[56] in Rusumo establishing the Organisation for the Management and Development of the Kagera River Basin, known as the Kagera River Basin Organization (KBO). Uganda acceded to the KBO in 1981.

The purpose of the KBO was "*to address all matters relating to the activities carried out in the Kagera River basin*" in the fields of electricity production, fisheries, agriculture, mining, industry and tourism. Article 2 defines these activities[57] along with a definition of the transboundary nature of the infrastructure, projects or programmes concerned. Article 7 sets the broad scope of activity under its mandate for the Basin, based on unanimous votes for decisions.

The Organisation was composed of a *Commission for the Management and the Development of the Kagera River Basin*, the entity representing the member countries and a *Secretariat* in charge, under the direction of the Commission, of preparing, refining and maintaining a comprehensive plan for the development of the Basin.

The Secretariat was composed of three departments: Research and Statistics; Projects, Planning and Execution; Management and Administration.

The Commission was composed of three Representatives of each country. Its role was "to decide which projects, works or programmes of inter-state scope affecting the development of the Kagera River basin will advance to the stage of feasibility, final design and financing, and to approve the said projects"[58].

Regional Offices of the Secretariat were established in the territory of each Member State.

The financial contribution of the member States to the running of the KBO was proportionate: 25% for the Republic of Burundi, 35% for the Republic of Rwanda and 40% for the United Republic of Tanzania.

The Heads of State of the four countries finally signed the agreement of dissolution of the KBO on 7 July 2004 following a decision taken at the January 2000 extra-ordinary KBO Council of Ministers meeting, that KBO activities be transferred to the EAC when it is reactiviated and Burundi and Rwanda are admitted as members (Mbaziira et. al., 2005). An agreement to liquidate the Organisation was signed on 18 February 2005 at the Council of Ministers of Foreign Affairs of each State.

Mbaziira et. al. (2005) assessed the rise and fall of the KBO and drew the following lessons:

Political stability and political support at the highest levels are essential for effective river basin governance through transboundary river basin organization such as the KBO. The period of the 1980s and 90s was fraught with instability in the region and management and development of the water and related resources of the basin were not considered to be high priorities.

Adequate financial resources must be mobilised and sound management employed for effective support to a transboundary river basin organization, such as the KBO.

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56 Treaty. Entered into effect on 5 February 1978.

57 Hydropower resources development, the furnishing of water and water-related services for mining and industrial operations, potable water supplies for other needs, agriculture and livestock development, forestry and land reclamation, disease and pest control, transport and communication, trade, tourism, wildlife conservation development, environment protection, exploration and exploitation of peat.

58 Along with all the other functions entrusted to this type of transboundary entity such as approving budgets, supervising the work of the Secretariat, signing international agreements on behalf of the Organisation, etc.

A projects, rather than programmatic approach: The KBO was focussed on project based planning without developing a stratefy for identifying and evaluating investment opportunities. The result was wasted time and resources studying projects that had little chance of being implemented.

Ownership: Local decision makers and communities must have a sense of ownership and see a role for themselves in implementation of the programme and project activities overseen by a river basin organization.

Collaboration through *benefit-sharing*: Through the life of the KBO, and especially as the NBI process is being implemented, there has been a paradigm shift by water managers in looking a negotiation on water use and sharing from the perspective of *benefits-sharing* as compared with *water (allocation) sharing.* This shift has created a more positive enabling environment where trust and confidence can be built between riparian partners – an important element missing in the KBO experience.

UNDUGU

UNDUGU - meaning *brotherhood* in Swahili, was created on Egyptian initiative in 1983 to encourage the member countries to develop economic, social, cultural and technical links in order to create a regional economic organisation. All the basin countries joined UNDUGU except Ethiopia and Kenya who remained observers. The success of this cooperation lay in the creation of a forum for discussion and a meeting place for exchanging technical experience for the whole Nile Basin (El Dahshan, 2004).

TECCONILE

TECCONILE (Technical Committee for the Promotion of the Nile Basin) was created in December 1992 after a meeting in Kampala (Uganda) between the ministers of Egypt, Sudan, Rwanda, Tanzania, Uganda and Congo. TECCONILE was a technical committee within which Ethiopia, Kenya and Burundi were observers (Swain, 1997). The TECCONILE meetings from 1993 to 1995 rewsulted in the creation of a *Nile River Basin Action Plan* with all Nile Basin states involved in the development of this plan and which the Council of Ministers for Water Affairs of all Nile Basin states fomally approved in February 1995 (Brunnée and Toope, 2002). This Action Plan was superceded in 1999 – the same year the Nile Basin Initiative (NBI) was launched - by a revised programme, the *Nile River Basin Strategic Action Programme*.

Nile 2002 Conferences

The *Nile 2002 Conferences* were a parallel series of more informal “technical’ annual forums started in Aswan, Egypt in 1993, designed to promote basin-wide cooperation on shared freshwater resources and played an important role in changing the political climate in the region. Although the Nile 2002 Conferences produced few tangible results, these more informal, technical discussions are viewed as having contributed importantly to the understandings of the benefits possible through collaboration and finally the breakthrough in 1999 resulting in the creation of the NBI (Brunnée and Toope, 2002).

5.1.4 Evolution towards cooperation on the Nile River Basin – the Nile Basin Initiative

Those historic relationships between key actors in the Nile Basin form the point of departure of the co-operative framework. In March 1998, in Arusha, Tanzania, the Council of Ministers in charge of Water in Nile Basin Countries came to agreement on the joint management of the Nile.

In 1999, pending a convention to instate a cooperative entity, the same countries set up a transitional mechanism doted with its own legal identity — the Nile Basin Initiative (NBI), formed by the formed by the Governments of Burundi, the Democratic Republic of Congo, Egypt, Ethiopia, Kenya, Rwanda, Sudan, Tanzania and Uganda (with Eritrea as an observer)[59]. From then on, the Secretariat of the NBI, whose office was at Entebbe in Uganda, replaced TECCONILE (El Dahshan, 2004). Significantly, unlike any of the previous initiatives, the NBI engaged all key state actors in the Nile basin. Morever thje NBI is consciously designed to engage parallel technical and political processes, with regular communications between the two (Brunnée and Toope, 2002).

On 14 February 2002, during the 9th Council of Ministers in charge of the Waters of the Nile Basin (Nile-COM), a declaration was signed investing NBI with the task of *"creating a legal framework for cooperation for joint management of the water resources from the Nile".* The NBI is supposed to be a transitional arrangement until its members come to an agreement as to the permanent institutional and legal framework for the basin's development (Swain, 1997). It was the first time that all the Nile Basin countries expressed the desire to work together.

The NBI's mandate is "to develop the river in a cooperative manner, share substantial socio-economic benefits, and promote regional peace and security to achieve its shared vision of sustainable socioeconomic development through the equitable utilization of, and benefit from, the common Nile Basin water resources".

The field of application of the NBI includes all nine countries who share the Nile Basin. It is composed of:

- the Council of Ministers responsible for Water Affairs (Nile-COM),
- the Technical Advisory Committee (Niles-TAC),
- the Secretariat (Nile-SEC), located in Entebbe, Uganda,
- the World Bank coordinates the International Consortium for Cooperation on the Nile (ICCON) which is in charge of seeking the funding necessary for the project. The ICCON was inaugurated on 26 June 2001 in Geneva.

NBI activities and programmes are implemented through a Shared Vision Programme and Subsidiary Action Programmes:

- The Shared Vision Program focuses on building regional institutions, capacity, and trust, to lay the foundation for unlocking the development potential of the Nile, which can be realized through concrete investments carried out under the subsidiary action programs. The Shared Vision Project Coordination Project established at the Nile-SEC oversees the effective implementation of the seven projects to ensure the overall program coordination, synergies are captured among the projects and that the projects operate within the NBI framework. The project is responsible for developing generic procedures to ensure quality control and fiduciary responsibilities, conducting Monitoring and evaluation at the program level, and facilitating information sharing within the NBI as well as with the public.

[59] The Nile Basin Initiative Act, 2002, Uganda

- Two Subsidiary Action Programs[60] (SAP) initiate concrete investments and actions in the *Eastern Nile*[61] *(ENSAP)*; and the *Nile Equatorial Lakes*[62] *(NELSAP).* The NELSAP have identified a number of projects to promote poverty alleviation, economic growth, and the reversal of environmental degradation in the sub-basin. The projects are grouped into two major areas: *Natural Resources Management and the Environment* and *Hydropower Development and Trade*, and target investments in agricultural development, fisheries development, water resources management, water hyacinth control, hydropower development and transmission interconnection. The Nile Equatorial Lakes Council of Ministers (NEL-COM) has decided to implement the project by a project management unit (PMU) located in Kigali, Rwanda, established under the NELSAP-Coordination Unit (NELSAP-CU), in collaboration with the NBI Secretariat.

5.2 National and transboundary institutional arrangements

5.2.1 Overview of the International and Regional agreements and Institutions involved in the Kagera River Basin

The Kagera River Basin is a sub-basin in the Lake Victoria Basin (LVB) which in turn is a sub-basin of the Nile River Basin (ref. Figure 5.1). If the natural resources in these three cross-boundary basins are to be managed sustainably with reasonable and equitable use of their water resources, cooperation between the riparian States is a must.

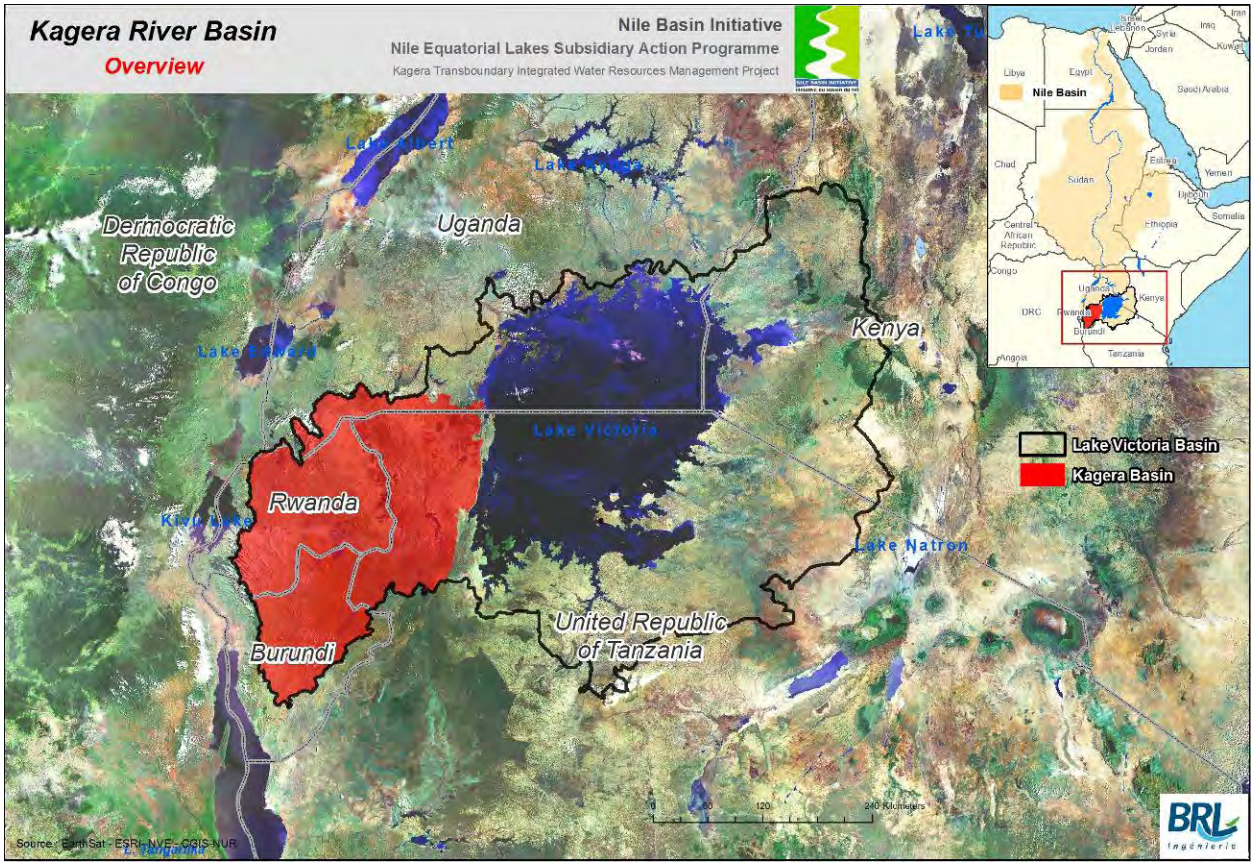


Figure 5.1 – The Kagera River, Lake Victoria and Nile River basin context

60 The SAPs split the Nile basin into two management projects.

61 The East Nile Region which includes Egypt, Sudan and Ethiopia

62 The Equatorial Lake region, which includes Burundi, Rwanda, Tanzania, Uganda, Kenya and the Democratic Republic of Congo. Egypt and Sudan are observers in this programme.

The countries sharing the Kagera River basin have signed various international conventions which lay down the principles for comprehensive, integrated management of the transboundary waterbodies and watercourses and are more generally parties to regional agreements which organise the socio-economic development of the region.

5.2.2 International water law principles

International water law has recently set forth a number of principles that guarantee sustainable development for planet Earth at major conferences and through the Declarations of Stockholm (1972), Dublin[63] and Rio[64](1992). Recently, the Millennium Declaration of the United Nations (2000) and the Johannesburg Plan of Implementation (2002) "*emphasized the need to accelerate progress towards poverty eradication, universal access to basic services (education, health, water, sanitation, etc.) and sustainable use of natural resources*".

Governments are urged to develop policies to transform these principles into effective action. Watershed management concepts and methods have an important role to play in this. In particular, sound watershed management is essential for achieving Millennium Development Goal (MDG) 7, ensuring environmental sustainability, particularly its two targets of:

- Integrating sustainable development principles into country policies, and
- To stop unsustainable exploitation of water resources by developing water management strategies at the regional, national and local levels, which promote both equitable access and adequate supplies.

More specifically, the purpose of international law is to lay down the rules for the relations between countries using shared water resources.

International water law is in permanent evolution: from the first Helsinki convention of 1966, which defines an "international river"[65] and consecrates the principles of "solidarity" and "common interests"; to the Agreement on the *Laws governing the utilization of international watercourses for non-navigational purposes* adopted by the United Nations General Assembly (1997), celebrating four solemn principles which are decisive in international water law:

- *Reasonable and equitable use* of the water by all the countries along the river, i.e. the countries in the river basin have the right to use the water in their own territories, in optimal conditions, taking due account of all the natural factors, the socio-economic requirements of the countries, the effects of the use of the watercourse on other States, nature conservation, the protection and development of the water resources provided by the watercourse, and the cost of the measures taken to this effect (articles 5 and 6);
- *The obligation not to cause significant harm* to the other States due to the use of the river by any one State;
- *The duty to notify* the other states about all the projects likely to have an impact on the watercourse; and

63 The 1992 Dublin Principles emphasised the economic value of water, gender, participation and the need for the integrated management of water.

64 The 1992 Earth Summit (Rio) moderated the emphasis on the economic value of water by asserting that water is a social good as well as an economic good and both were equally important. Integrated water resources management was put firmly on the international agenda. Earth Summit +5 called for greater attention to IWRM of international basins through co-operation, and stressed the role of technical transfer and financial support from developed countries to assist with the development of IWRM at country and inter-country levels. At the same time, it emphasised the important role of greater cost recovery in developing countries with respect to water and sanitation services.

65 It defines "an international drainage basin" as being "a geographical area extending over two or more States determined by the watershed limits of the system of waters, including surface and underground waters, flowing into a common terminus"(article 2). This concept is based on the fact that geographic units fully support each other and share common interests.

- *The duty to consult one another and exchange information* about the likely effects of measures planned on an international watercourse.

All of these principles lead to the deliberately limited sovereignty of the States who share water resources. If any country is to take sovereign action regarding the flow of water through its own territory, it must not deprive any of the other countries of the same rights because water is a shared natural resource. This means that it is necessary to harmonise the requirements of each respective State wanting to exert its sovereignty if those requirements are contradictory. This confirms that national sovereignty is one of the major obstacles in an integrated approach (Sironneau, 1998).

Furthermore, these agreements must be respected in good faith according to the legal principle of *pacta sunt servanda.* i.e. "…every treaty in force is binding upon the parties to it and must be performed by them in good faith".[66] This principle entitles states to require that obligations be respected and to rely upon the obligations being respected. This good faith basis of treaties implies that a party to the treaty cannot invoke provisions of its domestic law as justification for a failure to perform.

The principles of IWRM international watercourses can be summarised as follows:

- Cooperation between riparians,
- Sustainable development,
- Subsidiarity,
- Equitable and reasonable utilization, i.e. benefit-sharing,
- Prevention of the causing of significant harm and notification,
- Right of national basin states to use water within their territories,
- Protection and conservation,
- Information concerning planned measures,
- Community of interest,
- Exchange of data and information,
- Environmental impact assessment and audits,
- Peaceful resolution of disputes,
- Water as a finite and vulnerable resource,
- Water has social and economic value, and
- Water security.

[66] From the Vienna Convention on the Law of Treaties, signed at Vienna on May 23, 1969, entered into force on January 27, 1980, art. 26, and the Vienna Convention on the Law of Treaties between States and International Organizations or between International Organizations, signed at Vienna on March 21, 1986, not yet entered into force, art. 26.

5.2.3 Overview of Kagera River basin agreements

There are two main institutional and legal pillars that can be considered in support of the integrated management of the Kagera River basin: 1) the Nile Equatorial Lakes Subsidiary Action Programme (NELSAP) of the Nile Basin Initiative (NBI) and 2) the East African Community (EAC). Both of these organizations share projects and programmes in the same territories, for the same populations and they target the same goals. These organizations and their relationship and agreements are schematically portrayed – especially as they pertain to the Kagera River basin - in Figure 5.2:

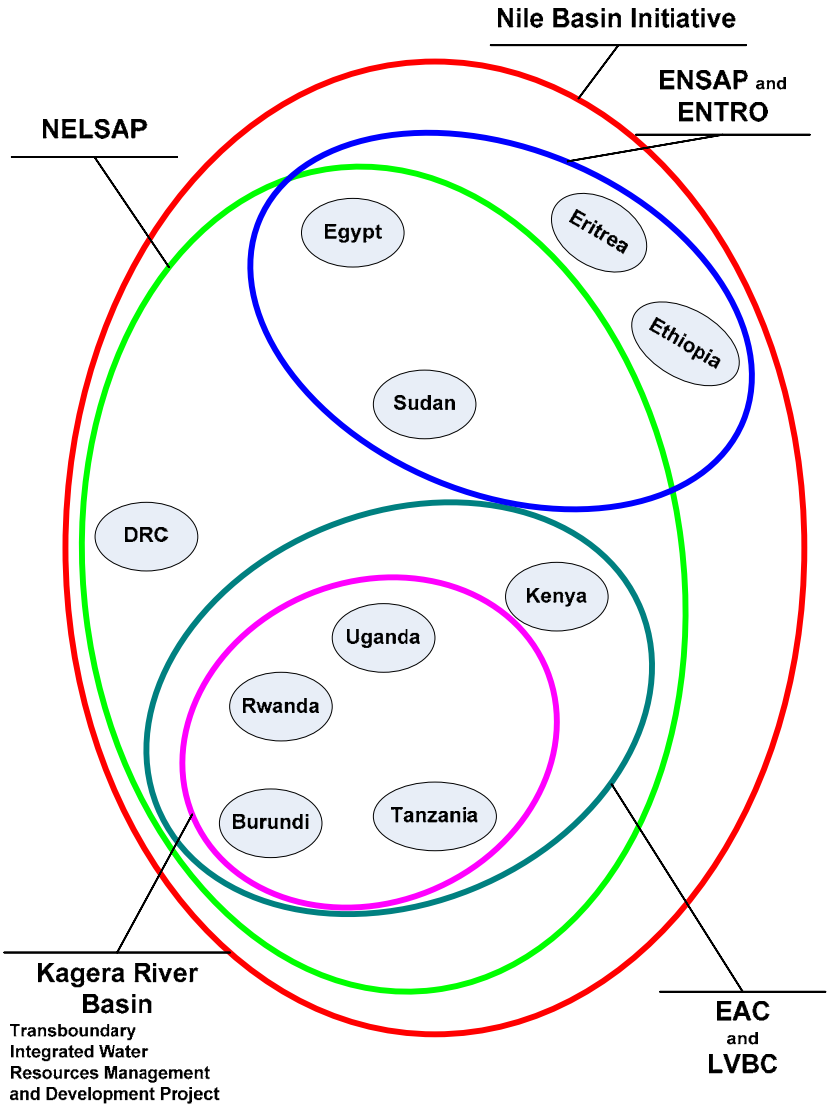


Figure 5.2 – Relevant Nile River Basin Agreements and Cooperative Relationships

The Nile Equatorial Lakes Subsidiary Action Programme (NELSAP of the Nile Basin Initiative (NBI)

The Nile Equatorial Lake Subsidiary Action Programme (NELSAP) is project of the Nile Basin initiative. It covers the six states of Burundi, Rwanda, Tanzania, Uganda, the Democratic Republic of Congo and Kenya. It includes two observer states which are Egypt and Sudan.

The goal for NELSAP is to achieve sustainable socio-economic development through equitable utilization of, and benefit from, the common Nile Basin water resources. The objective of NELSAP is to contribute to the eradication of poverty, to promote economic growth, and to reverse environmental degradation. The focus area for activities will be the following:

- Agriculture Development ;
- Fisheries Development ;
- Water Resources Management ;
- Water Hyacinth Control ;
- Hydropower ;
- Development and Transmission Interconnection.

Some of the objectives of the NELSAP projects are summarised below:

- Guarantee good hydrological conditions in the Basin,
- All river countries take part in sub-basin projects,
- Organise cooperation and coordination;
- Guarantee reasonable use of the basin's water resources;
- Select projects according to the needs of each State and its geography;
- Share the risks, costs and benefits in an equitable manner.

NELSAP has no international legal status. It is a facilitative framework in charge of implementing NBI projects launched in its territory and mobilising the resources necessary. The project is coordinating itself with other NBI programmes and as all programmes are approved by the countries' governments and ***they should also be in line with countryies' strategies.*** It also cooperates with other regional initiatives such as the forthcoming LVEMP2 and EAC (SIWI, 2005).

The NELSAP governance structure comprises:

- Nile Equatorial Lakes Council of Ministers of Water Affairs (NEL-COM) is the forum for overall policy guidance and direction;
- Nile Equatorial Lakes Technical Advisory Committee (NEL-TAC) coordinates joint activities and establishes working groups as required to accomplish specific tasks;
- NELSAP Coordination Unit (NELSAP-CU) is the executing arm for the NEL-TAC and NEL-COM. The office of the Programme Management Unit (PMU) is in Kigali, Rwanda.

Two sub-programs of NELSAP concerned "Power Trade and Development", and "Natural Resources Management and Development". Natural resources management projects include the three transboundary IWRM projects of 1) Mara River basin, 2) Sio-Malaba-Malakisi Rivers basin and 3) Kagera River basin, under which this monograph is prepared.(Olet, 2007). The development objective of the Kagera project is *to develop tools and a permanent co-operative institution for the joint, sustainable management of the water resources in the basin in order to prepare for sustainable development-oriented investments to improve the living conditions of the people and to protect the environment* (SIWI, 2005).

The project has four components, each with a distinct objective:

- to create a co-operative framework for the development of a joint integrated water resources;
- to develop a management strategy for the Kagera River Basin;
- to develop water management scenarios for the optimal use of scarce water resources for productive uses and sustainable investments in sectors such as agriculture, hydropower development, domestic water supply and tourism; and
- to build capacity for sustainable implementation of the strategy and its subsequent upgrading.

The Kagera project is supervised by a Regional Project Steering Committee, constituted by the relevant government agencies from the four countries, and the NEL-CU. A prerequisite for implementation of the project is that Rwanda, Burundi, Tanzania and Uganda agree on a joint mechanism to steer and guide the project at the central Government level. The members of the Steering Committee must be empowered to take decisions on behalf of each country. Support at the level of each of the basin countries and of their respective government departments is essential for the successful management of water resources in the basin. Project execution is carried out by Project Management Units (PMU) based in Kigali.

The four Kagera River basin countries signed a Memorandum of Agreement (MoA) with NBI-SEC for the implementation of the Kagera River Basin transboundary IWRM and development project, to facilitate its implementation.[67] They have further signed individual MoAs with NELSAP agreeing to share data and information freely in the implementation of the project.

Funding for the project would be channelled through responsible Government institutions[68]. Sida/NORAD and the European Union fund the project. The supplemental grant financing for the Kagera Transboundary IWRM project is channelled through the East African Community, while the LVBC is implementing preparation studies for the Lake Victoria Environmental Management Program 2 (LVEMP2) for Burundi and Rwanda through the Kagera Project (SIWI, 2005).

The East African Community (EAC) and the Lake Victoria Basin Commission (LVBC)

The East African Community is a regional intergovernmental organisation with its headquarters in Arusha, Tanzania. Cooperation between the East African countries began in 1993 with the signature of a *Declaration on Closer East African Cooperation*. It was a declaration of intent to cooperate in economic, social and political areas. The EAC treaty was signed on 30 November 1999 by Kenya, Tanzania and Uganda.

The vision of EAC is to “widen and deepen economic, political, social and cultural integration in order to improve the quality of life of the people of East Africa through increased competitiveness, value added production, trade, investment”[69].

[67] MoA Tanzania/NBI-NELSAP, signed February 2006; MoA Uganda/NBI-NELSAP signed February 2006; MoA Rwanda/NBI-NELSAP signed April 2006; MoA Burundi/NBI-NELSAP signed August 2006.

[68] Funding for NELSAP projects are sought through the International Consortium for the Cooperation on the Nile (ICCON 1).

[69] EAC Development Strategy 2006-2010, final draft,

Its main areas of activity are trade, investments and industrial development; agriculture and food security; industry ; tourism and wildlife management; environment and natural resources management; infrastructure and services; health, social and cultural activities; education, human resources, science and technology; urban development and housing; legal and judicial affairs; monetary and fiscal affairs.

The EAC is composed of:

- EAC Council / EAC Summit;
- EAC Secretariat;
- East Africa Legislative Assembly (EALA);
- East Africa Court of Justice (EACJ);
- LVBO;
- LVBC;
- East Africa Development Bank; and
- Inter-university Council of East Africa.

The EAC adopted a *Development Strategy* to facilitate the implementation of the treaty in a systematic manner. The first *EAC Development Strategy* (1997-2000) was succeeded by the second (2001-2005) and the third (2006-2010) is now on going. The first EAC Development Strategy (1997-2000) defines Lake Victoria as an area of economic growth that is important for East Africa and encourages the creation of a structure for cooperation in the Lake Victoria Basin. The Lake Victoria Basin Commission (LVBC) was founded in 2003 as the EAC basin managing entity in parallel with the Lake Victoria Fisheries Organization (LVFO). Operational since 2005, the LVBC is based at Kisumu, Kenya.

The agreement to form the LVBC was signed by Kenya, Tanzania and Uganda on 29 November 2003 and is entitled the *Protocol for Sustainable Development of the Lake Victoria Basin.*[70] It puts in place a framework for cooperation so that the basin's natural resources can be jointly managed by the LVBC. The EAC clearly has in mind that the LVBC would manage the entire basin, including the Kagera River basin. Article 48 clearly states that "*The provisions of this Protocol shall take precedence over any other existing agreements relating to Lake Victoria and in case any other agreement is inconsistent with this Protocol, it shall be null and void to the extent of its inconsistency*".

The tasks and duties of the LVBC are to implement the various programmes and projects on the Lake Victoria basin and its sub-basins and to ensure that the framework for action to develop the basin is consistent.

The protocol adopts IWRM principles (Article 4), stipulating the obligations of each country by way of application of these principles.

The LVBC is composed of four entities:

- Sectoral Council, responsible for matters created under the Protocol (article 35),
- Coordination Committee, responsible for linking the Sectoral Council and the Sectoral Committees (article 36),
- Sectoral Committees (article 37), and
- a Secretariat (article 39).

The LVBC's policy is based on the *Vision and Strategy Development project for LVB*[71] adopted in 2004 in a decision of the 7th EAC-Council. Its aim is to define strategy to harmonize the sector policies affecting each basin country's water resources and to establish action plans for the development and sustainable management of the basin.

[70] The Protocol was ratified in 2004.

[71] drawn up during a participative process under the study entitled "Vision and Strategy framework for Management and Development of Lake Victoria Basin", 2004

The LVBC Vision is based on five concepts in order to formulate joint sustainable development strategy for the basin countries:

- Ecosystems, Natural Resources and Environment (resource management, protection and conservation);
- Production and Income Generation (natural resources utilization);
- Living Conditions and Quality of Life (income and poverty, social services, health and education);
- Population and Demography (population development and migration); and
- Governance, Institutions and Policies (development and harmonisation of policies, institutions and implementation machinery).

The conclusions of the LVBC Vision recommend including the Republics of Burundi and Rwanda because they include significant parts of the Lake Victoria basin, as well as the participation of the NBI and NELSAP[72]. The following recent events have enabled moving forward with these recommendations:

- Burundi and Rwanda joined the East African Community by signing a treaty of accession on 18 June 2007[73]. They thus became members of the LVBC as specified under article 50 of the Protocol[74].
- A Memorandum of Understanding (MoU) was signed between the EAC and NILE-SEC on co-operation for the sustainable development of the Lake Victoria basin. It was signed on 12 July 2006 but is not yet operational as no committee has yet been formed to implement it[75]. The aim of the MoU is to set up a legal framework for cooperation in the basin and its sub-basins in order to:
- Prepare and execute projects, programmes and existing and future actions,
- Export a joint position onto the international scene;
- Exchange information and data; and
- Organise funding.
- Article 3 of the MoU states the obligations of each partner in the implementation of the partnership.

In addition to the above, the LVBC is also in charge of ensuring that the various ongoing projects and programmes are properly applied in its territory, which includes Phase 2 of the Lake Victoria Environmental Programme (LVEMP2). LVEMP1 was initially negotiated and implemented under an agreement between only Kenya, Tanzania and Uganda, signed in 1994. Since only three of the five Lake Victoria basin countries were involved, this limited the effectiveness in dealing with environmental management issues originating in the Kagera River basin - such as nutrient and sediment loading resulting in water hyacinth growth in Lake Victoria. LVEMP2 has been designed so as to rectify this deficiency as its implementation involves all five countries of the Lake Victoria basin, including Burundi and Rwanda.

72 "in a view of the relationship between the Lake Victoria Basin and the Nile River Basin, the Partner States shall cooperate with other interested parties, regional or international bodies and programmes and in so doing, the Partner States shall negotiate as a block"

73 Lake Victoria Fisheries Organisation is a regional organisation established in 1994 by a convention by the three parties; the governments of Kenya, Tanzania and Uganda

73 Treaty of accession of the Republic of Rwanda into the East African Community, signed 18 June 2007 in Kampala, Uganda; Treaty of accession of the Republic of Burundi into the East African Community signed 18 June 2007 in Kampala, Uganda.

74 A State, which becomes a party to the Treaty, may become a party to this Protocol by depositing an instrument of accession to the Protocol with the Depositary.

75 The LVBC is proposed to implement the MoU.

A Nile Basin Cooperation framework?

Under the framework of the NBI, the ten Nile River countries have initiated and made good progress in drafting a substantive framework for cooperation through an agreement that is still under negotiation and will facilitate the formation of a *Nile River Basin Commission*.[76] The stated objective of the draft agreement is *"…the use, development, protection, conservation and management of the Nile River Basin and its resources and establishes an institutional mechanism for cooperation among the Nile Basin States*". The draft agreement introduces integrated water resources management for the basin as a whole, recalling the principles of international water law in article 3[77].

In part IV – *Subsidiary Institutions*, the draft agreement gives priority to the future international cooperative framework above the sub-regional organisations: "…*the parties to the Framework that are also members of sub-basin organizations or arrangements undertake to ensure that the purposes, functions and activities of such organizations and arrangements are consistent with those of the Nile River Basin Commission and with the principles and rules set out in, or adopted under, the Framework. The parties to the Framework that are also members of sub-basin organizations or arrangements further undertake to ensure that such organizations or arrangements work in close cooperation with the Nile River Basin Commission. The Nile River Basin Commission shall maintain regular contact, and shall cooperate closely, with any sub-basin organization or arrangement".*

Ratification of the agreement would mean that establishment of a duly mandated international organisation (the Nile River Basin Commission) for the whole basin that would be capable of coordinating and implementing projects, programmes and actions necessary to achieve the goals shared by everyone, namely prosperity and well-being for the basin's populations in a sustainable environment. It presently appears that likely for mainly historical reasons, the downstream riparians are reluctant to sign this agreement because of their previously "acquired rights". On the other hand, the position of the upstream riparians tends towards signing the agreement, referring any "objector-countries" to the accession procedure provision for ratification in future. However, the provisions of the draft agreement (articles 35, 36 and 37) seem to require the unanimous agreement by all the countries before being ratified.[78]

[76] Draft Agreement on the Nile River Basin Cooperative Framework for consideration by the Nile-COM at its Annual Meeting, Entebbe, June 24-25, 2007.

[77] *Cf* 2.1.1, part V.2.

[78] Article 35 "The present Framework is open for signature by all States in whose territory part of the Nile River Basin is situated, from [date] to [date] at [place] »; article 36 "The present Framework is subject to ratification or accession by all States in whose territory part of the Nile River Basin is situated. The instruments of ratification or accession shall be deposited with the African Union"; article 37 "The present Framework shall enter into force on the sixtieth day following the date of the deposit of the sixth instrument of ratification or accession with the African Union".

5.3 National water policies, institutions and legal frameworks

5.3.1 National institutional frameworks

The countries who share the same river basin do not all have the same level of socio-economic development, the same institutional and legal framework or the same capacities. Setting up cooperation for the sustainable development of a river basin means capacity-building and formulating national and regional policy to introduce the principles and mechanisms of IWRM.

Policy establishes principles to be used as a basis for making decisions to further certain objectives. A country requires policies to guide its operations and provide a frame of reference for its peoples. Ideally, a public policy is to be codified in the form of a written policy statement which has been formally endorsed by a body with the requisite authority. Particularly in the water sector, it is desirable that non-state actors be involved in the formulation of policy. This ensures that the policy is adapted to the circumstances prevailing in the country and that people will be more aware and more committed to ensuring that the intentions enunciated in the policy statements are in fact implemented.

The usual purpose of water policy is to maximise the economic and social benefits of water while ensuring that these are shared in an equitable manner and that environmental sustainability is preserved. A statement of water policy needs to present a vision of water's role in national development and lay out specific goals or objectives for the water sector (NBI, 2006). The objective therefore of each of the riparian countries is to formulate and implement policies that fully incorporate the transboundary aspects of water and further the commitments that they have made to cooperative development of shared water resources on the basis of IWRM principles. The national water policy statement needs to provide a clear definition of the roles and responsibilities of organisations involved in the sector, including responsibility for co-ordination. Following, we summarize the institutional frameworks for the Kagera River basin countries.

Burundi

There is a multitude of ministerial departments relating to water matters[79]. Since 1979, a distinction has been made at institutional level between rural and urban areas in the water and sewerage sector:

- The *Ministry of Energy and Mines through its General Directorate for Water and Energy (GDWE)* is in charge of planning, managing and coordinating programmes and activities in the water and energy sectors. It supervises REGIDESO and the Minister is the chairman of the National Water Commission, an advisory, coordination structure. Decree n°100/049 of 14 March 1997[80] assigns tasks to the Hydraulic Resources Directorate (HRD), a structure that is part of the GDWE, for the design of sustainable development strategy for national hydraulic resources, the preparation and permanent updating of the National Master Plan for Water (NMPW), the planning of the various water demand in each hydraulic basin with a dynamic, long-term vision, the supervision of new State investments in hydraulics and the establishment of drinking water pricing policy for rural and urban areas;
- The *Ministry of Land-use Management, Tourism and the Environment* and its General Directorate for the Environment is in charge of implementing water policy by application of the Republic of Burundi's Environment Code;

[79] Report on water legislation and administration in Burundi, TCP-BDI, FAO, Oct.1991.

[80] Decree for the reorganisation of the central MEM administrative departments

- The 18 December 2001 session of the Council of Ministers adopted a draft decree on the organisation of the *Ministry of Public Health* with the creation of a new Directorate for the Promotion of Health, Hygiene, Sanitation and Liquid and Solid Waste Management;
- Since the cabinet shuffle of 30 August 2005, the *Ministry of Good Governance, General State Inspection and Local Administration (MGGIA)* is the supervisory authority of the DGHER, in charge of coordinating and managing community hydraulic services for drinking water and sanitation in rural areas. This structure was initially part of the Ministry of Community Development (MCD);
- The *Ministry of Transport, Post and Telecommunications* is in charge of navigable waterways (Lakes Tanganyika and Rweru);
- The *Ministry of Agriculture and Livestock*, whose General Directorate for Agricultural and Livestock Planning plans irrigation and drainage;
- The Ministry of Commerce and Industry;
- The Ministry of Community Development and Craft trades; and
- The Ministry of External Relations and Cooperation.

Public institutions:

Decree/Law Nº 1/196 of 2 October 1968 gave *REGIDESO* exclusive control of water supply and distribution all over the country. Decree Nº 100/072 of 21 April 1997 later delimited the scope of the DGHER and REGIDESO while Law n°1/014 revoked the 1968 decree-law. REGIDESO was from then on a public services manager, like the DGHER, operating under the control of the supervisory authority yet to be created.

RCE was in charge of supplying drinking water to rural populations and more particularly of operating and maintaining drinking water supply infrastructure;

SETEMU, a public establishment for the city of Bujumbura, is in charge of stormwater drainage and sewers to collect domestic and industrial waste water. It is also responsible for the treatment of waste water and river improvement in places where they pass through the town.

The national institute for the environment and nature conservation (I.N.E.C.N.) is, among others, in charge of making sure that "environmental standards are met to control pollution, whatever the kind".

Decentralised and community levels:

In the frame of the application of decree-law n°1/011 of 8 April 1989 on the reorganisation of the community authorities, the Government transferred competency for a number of subjects related to the management and maintenance of water and sewerage infrastructure to the community authorities. They are in charge of taking all necessary steps to use the hydraulic resources available in the best possible manner and maintaining all the new and old drinking water supply facilities in their area of influence. The new law n° 1/016 of 20 April 2005 on the organisation of the community authorities strengthens these arrangements.

At the international level:

The Geographical Institute of Burundi (IGEBU) is the national focal point for the Nile Basin Initiative processes.

In the frame of international cooperation, Burundi is a member of and has adopted the following organisations and rules: NEPAD, AMCOW, NBI, EAC and the LVBC.

Rwanda

In a context of extensive decentralisation and regionalization which has virtually emptied the central authorities of their personnel, water management in Rwanda is still the concern of a large number of ministry departments. The main ones are:

- Within the *Ministry of Land, the Environment, Forest, Water and Mines (MINITERE),* the state ministry of water and mines is in charge of the water and sewerage sector with its Rural Water and Sewerage Unit (PGNRE, 2005);
- The *Ministry of Public Works, Transport and Communications (MININFRA)* is in charge of drinking water, sewerage and electricity in urban areas through Electrogaz;
- The *Ministry of Health (MINISANTE)* is in charge of drinking water quality and generally for public health and hygiene;
- The Ministry of Local Government, Good Governance, Community development and Social affairs (MINALOC) is in charge of implementing decentralisation policy;
- The draft law on water currently being promulgated plans the creation of the *National Water Commission* composed, in equal proportions, of State representatives, national councillors and representatives from different public and private water user categories and other competent people;

National Authorities:

- *Rwanda Environment Management Authority (REMA),* 2006 is a public organisation in charge of implementing government policy for the environment, carrying out environmental monitoring on all development programmes and taking part in establish procedure and safeguards to prevent damage to the environment;
- Rwanda Utilities Regulation Authority (RURA), 2001 whose job it is to supervise the operators, especially those in charge of drinking water distribution.
- RADA: Rwandan Agricultural Development Agency

At the regional level – Kagera River basin:

The four provinces in Rwanda are in charge of the execution of ministry activities and more particularly in the water sector, the authorities responsible for water and sewerage in the provinces (REAP). These entities are gradually disappearing.

The draft law on water proposes to create two basin committees for the territories of the hydrographic basins in Rwanda (related to the Congo and Nile Rivers), and one sub-basin committee or aquifer committee in each of the hydrographic sub-basins or for each aquifer. They would depend directly on the administrative authority of the district concerned.

Decentralised levels – district level:

The District is a legal entity that is considered to be the local government. The District owns the water and sewerage infrastructure and the Director of Infrastructure is in charge of water. The District is split into sectors and units run by coordinators. These are subdivided into villages. The city of Kigali is the only urban area.

International level:

In the frame of international cooperation, Rwanda is a member of and has adopted the following organisations and rules: NEPAD, RASMAR, AMCOW, NBI, EAC and the LVBC.

Tanzania

The main ministry departments concerned are:

- The Ministry of Water and Livestock Development: responsible for policy formulation and regulations concerning all aspects of water resources. It has several departments: rural affairs, urban affairs and river basins;
- Issues regarding surface water fall on the Principal Water Officer, in the Department of Water Resources, which deals with hydrology and hydrogeology.
- Issues of water supply rest on the Manager of Rural Water Supply.

National level – National level director:

At basin level, water resources management in the Lake Victoria Basin is under the auspices of the *Lake Victoria Basin Water Officer* (LVBWO) in accordance with the Amendment of the Water Act of 1981. The LVBWO is in charge of sensitisation of the population, enforcement of water laws, collection of user fees, conflict resolution, expansion and operation of the hydro-meteorological network. The LVBWO was inaugurated on 23 March 2000 and became operational in the same year. In most transboundary issues the Basin Water Officer refers to the Director of Water Resources in the Ministry of Water and Livestock Development. Currently, there are two technicians of the LVBWO in the Kagera Region, in the Regional Water Engineer's office (RWE) in Bukoba. The name of the office is designated as the Catchment Water Office, Kagera River Sub-Basin.

In the Regions, the RWE provides technical support to implement policy at district level. Applications for water permits are collected by the regional water engineer and forwarded to LBBWO in Mwanza for evaluation and approval. Bukoba also has its own laboratory, which is under the management of the RWE.

Decentralized level - District level:

The district is the local government. Policy is applied at the district level. The district is divided into villages. On the District Council, run by the District Executive Director (DED), the District Water Engineer (DWE) provides technical support to the district and villages by way of application of the laws. The DWE is a member of the District Management Team along with other Environment and Agriculture experts.

At community level there are the village governments and in many cases water user groups established to manage water supply points.

International level:

Tanzania ratified the East African Community treaty and its agreements, including the protocol establishing the Lake Victoria Basin Commission.

Uganda

The main ministry departments concerned (Badaza, 2005) are:

- The *Ministry of Water, Lands and Environment (MWLE)*, is responsible for apply a comprehensive water sector reform with four sub-sector strategy components as urban water supply and sanitation, rural water supply and sanitation, water for production, and water resources management. The *Directorate of Water Development (DWD)* was created under this Ministry to planning, monitoring and supervision of water supply and sanitation services (which are now under the responsibility of the local Governments). With regard to water resources, the role of DWD has been strengthened: it is the Government sector lead agency an is responsible for managing water resources, coordinating and regulating all sector activities and provides support services to the local governments and other service providers.
- The *Water Policy Committee (WPC)*[81] is overall responsible for setting national policies, standards and priorities, including coordinating revisions to legislation and regulations, and coordinate sector ministries' plans and projects which affect water resources. In addition, it mediates disputes between agencies and coordinate the formulation of an international water resources policy. It is made up of the district representatives;
- The *National Environment Management Authority (NEMA)* is established by the national environment act, as a coordinating, monitoring and supervisory body, with regard to water resources. In consultation with DWD, NEMA sets water quality standards, limits on the use of lakes and rivers, establish regulation for environmental impact assessment, manage riverbanks and lakeshores, manage and restrict use of wetlands;
- *The Ministry of Finance, Planning and Economic Development (MFPED)* with the role of allocating funds, general mobilisation of funding and co-ordination of donor inputs;
- *Ministry of Health (MOH)* with the responsibility for hygiene promotion and household sanitation;
- *Ministry of Education and Sports (MOES)* with the responsibility for hygiene promotion and sanitation in schools;
- *The Ministry of Gender, Labour and Social Development (MGSD)* with the responsibility for gender responsive development and community mobilisation*;*
- *Ministry of Agriculture, Animal Industry and Fisheries (MAAIF)* with the responsibility for spearheading agriculture development, including some aspects of Water for production.

Public institutions:

The National Water and Sewerage Corporation (NWSC) is an autonomous parastatal entity established by Decree No.34 of 1972. It is responsible for the delivery of water supply and sewerage services in 15 large urban centres (Kampala, Jinja/Njeru, Entebbe, Tororo, Mbale, Masaka, Mbarara, Gulu, Lira, Fort-Portal, Kasese, Kabale, Bushenyi/Ishaka, Soroti and Arua). This decree was repealed by Statute No.8 of 1995, referred to as the "NWSC Statute", which now governs all operations of NWSC.

81 The Water Statute, enacted in 1995 provides for establishment of WPC.

Decentralised level – district level:

The Constitution of the Republic of Uganda, provides the framework for decentralisation. “Water law enforcement is the joint responsibility of the Department of Water Resources and district administration, with the emphasis gradually shifting from the former to the, latter” (NBI, 2006). The Local Governments (districts, towns and other lower local government units) together with the communities are responsible for implementing, operating, and maintaining water supply and sanitation facilities (except in the large urban centres).

The Local Governments Act provides for the system of local governments, which is based on the district. Under the district there are lower local governments and Article 189 was added by the constitutional amendment (No.2 Act, 2005), sixth schedule added also administrative units. The water sector in Uganda is organised in a six-tier structure operating from village (LCI), Parish (LCII), Sub-county (LCIII) County (LCIV) through the district (LCV) to national level. However, County and Parish level do not have there own budgets.

Summary of local government institutional frameworks

Table 5.1 – Top five levels of local government in the Kagera River basin countries

Level	Burundi	Rwanda	Tanzania	Uganda
1	Central	Central	Central	Central
2	Province	Province	Region	Province
3	Commune	District	District	District
4	Zone	Secteur	Village gov.	County
5	Secteur	Cellule		Parish

5.3.2 National Legislation and Regulations

Burundi

The interim strategic framework for accelerating economic growth and reduction poverty (interim PRSPs) adopted in 2002 and updated in 2003 sets out the main principles for sector policy. The National Water Resources Management Policy (NWRMP) and its action plan, adopted in 2001 by the Ministry of Land-use management and the Environment, proposes the main guidelines for water resources development and management by field of use (agricultural production, drinking water supply, promoting industry, energy, and environmental protection) and formulates the different strategic action for the country.

The five-year plan of the Ministry of Land-use Management, Tourism and the Environment[82] for 2006 to 2010 proposes and action plan for rational management of land, water, forests and air in order to "…*provide the country with the ability to plan its management of water resources and promote coordinated, participative process for marshland management*".

[82] Ministère de l’Aménagement du Territoire, du Tourisme et de l’Environnement, Plan quinquennal pour la période 2006-2010, Republic of Burundi, Bujumbura, January 2006.

Internal law:

- The main legal framework for the water sector is set down by decree- n°1/41 of 26 November 1992, institutionalising and organising hydraulic affairs in Burundi, also known as the Water Code. This law is a guarantee of water conservation and aquatic ecosystem preservation, the supply of drinking water to the population and the protection of water resources against all kinds of pollution, the utilisation of water as a commodity and the satisfaction of the demand for water in the different sectors of the national economy. In Burundi, almost all the watercourses are public property belonging to the State and the use of water over and above a certain level is subject to permission or requires a concession contract[83];
- In the sewerage sub-sector, decree n° 100/241 of 31 December 1992 lays down the rules for waste water disposal in urban areas;
- Law n°1/010 of 30 June 2000, the Environment Code, deals with matters related to water resources management and conservation and the development and protection of catchment areas and soils;
- Decree-law n° 1/16 of 17 May 1982, the Public Health Code, plans that in the communities, any water abstraction project for drinking water supplies shall be subject to prior authorization of the minister in charge of health or of the authorities appointed by the minister;
- Law n° 1/014 of 11 August 2000 on the liberalisation and regulation of public drinking water and electricity services defines the principles, forms and conditions of private sector interventions. It plans the creation of a regulatory and control body for drinking water and energy and a development fund.
- There are also other provisions, scattered between the civil code, the land law code[84], the forest code[85] and the mining code[86].

International law:

- Boundary water, the definition of which is given in the Environment Code,[87] is subject to currently applicable provisions for the water sector and must comply with the international conventions that have been signed. The national water resources management policy document and its action plan, 2001, propose a shared vision and a cooperative framework for water resources management.
- Burundi signed the 1971 RAMSAR Convention and the EAC treaty and its protocols, in particular the one on the creation of the LVBC.

83 "Preparation of national water resources management regulations – Principles et practices" – FAO, legislative study, 1999.

84 Law 1/008 of 1 September 1986.

85 Law n°1/02 of 25 March 1985 concerning the Forest Code of the Republic of Burundi.

86 Decree-law of 17 July 1976 concerning the Mining and Petroleum Code of the Republic of Burundi

87 Law n°1/010 of 30 June 2000 concerning the Environment Code.

Rwanda

The new water and sewerage sector policy defines the guidelines for efficient, effective water resources management and incorporates new aspects such as decentralisation, the participative approach, privatisation, protecting water supplies to meet the demand for water and financing to programme. It seeks to meet the MDGs and 2020 Vision objectives[88], which plan sustainable integrated water resources management, access to drinking water and sewerage for everyone and water storage and conservation for economic development (Munyanganizi, 2004).

Internal law:

- The Constitution of Rwanda, 4 June 2003, by which all citizens are entitled to a healthy environment;
- Law n°39/2001 of 13 September 2001 founding the Agency in charge of regulating certain public utilities (RURA);
- Law n°17/2002 on finance for the Districts and towns and governing its use;
- The National Land policy, 2004.
- The organic law n° 08/2005 of July 14, 2005 on land schemes in Rwanda;
- The Organic Law n°04/2005 of 8 April 2005 on the modalities for protecting, safeguarding and promoting the environment in Rwanda, in article 1 and the following clauses, sets out the main principles for water as public property and for water resources protection.
- Law n°16/2006 of 3 April 2006, for the organisation, operation and attribution of the Rwanda Environment Management Authority, (REMA);
- The draft law on the rules for the utilisation, conservation, protection and management of water resources defines the rules applicable. It acknowledges that water is public property belonging to the State and that everyone has a right to use it. It introduces concept of integrated water resources management by catchment area.

International law:

- The draft law on water introduces a chapter on the regime of the country's shared water resources: "The Rwandan Government is taking the necessary measures to facilitate cooperation to manage and utilise water resources that are shared with neighbouring countries".
- The 22 November 1934 treaty between Belgium and Great Britain on the use of river and stream water resources along the boundary waters between Rwanda, Burundi and the Tanganyika territory sets down the rules for abstractions from rivers and watercourses that are shared by the two colonial territories and for preventing pollution. Rwanda signed the 1971 RAMSAR Convention and the EAC treaty and its protocols, in particular the one on the creation of the LVBC.

[88] National Poverty Alleviation Strategy actions fall under the 2020 Vision.

Tanzania

Tanzania's new National Water Policy, adopted in 2002, falls under the 2025 Development Vision, which “aims at achieving a high quality livelihood for its people, attain good governance through the rule of law and develop a strong and competitive economy”; and also in the Tanzania’s Poverty Reduction Strategy Paper (PRSP) sets out the medium term strategy for poverty reduction and indicators for measuring progress. In a process to reform the Tanzanian water sector, national water policy needs to respond to the challenges of sustainable water development and use[89]

The National Environment Policy (NEP, 1997) is a proposed framework environmental legislation to take account of the numerous agencies of the Government involved in regulating the various sectors. Thus, the policy provides strategic plans on environmental management at all levels. The policy identifies the lack of access to good quality water.

The National Forest Policy, 1998 outlines the value of the forests in watershed management.

The National Land Policy, 1995, revised in 1997, recognizes the need for protecting environmentally sensitive areas. In addition, the policy recognizes the importance of social services such as water, roads, energy and solid waste management for environmental protection.

Internal law:

- Water Utilization Act[90] N° 42, 1974 and its subsequent amendments (Act No. 10 of 1981, revised on 1997, 1999) is the main legislation governing the use of natural resources, including licences, water management plans and water quality standards. governs the present water resources management system. The 1981 Amendment Act established the Central Water Board with powers to research and investigate pollution and to formulate steps to be taken to control pollution of surface water;
- Works Ordinance (Revised by the Water Utilization Act of 1997) specifies that pollution of water supplies is, in certain instances, a criminal offence. The 1997 amendments included increases in the amounts of fines or terms of imprisonment for the offences. The Act also gives powers to urban water authorities to make rules regarding surface and ground water pollution;
- The Environmental Management Act, 2004 sets principles for the protection and management of river beds and shore which provides that construction works in these area cannot be carried out prior obtaining permit or authorisation issued by the Minister responsible for Environment;
- The Land Act, 1999;
- The Village Land Act, 1999 vests all village land in the village Assembly, and that the Village Council administers the land through the authority of the Village Assembly;
- Local Government (District and Urban) Authorities Act of 1982; enable the local authorities to enact by-laws regarding soil protection, agriculture, natural resource exploitation, etc.

International law:

- The National Water Policy includes the country’s obligation towards shared watercourses contracted through the Southern Africa Development Community (SADC) Protocol on Shared Watercourses. Tanzania ratified the East African Community treaty and its agreements, especially the protocol establishing the Lake Victoria Basin Commission.

89 National Water Policy, Ministry of water and Livestock development, The United Republic of Tanzania, July 2002

90 Control and Regulation.

Uganda

The Government put in place a Poverty Eradication Action Plan (PEAP) in 1997, revised in 2000 and 2004, as a national framework for poverty eradication. Recognising the multi-dimensional nature of poverty, PEAP adopted a multi-sectoral approach and the water sector is recognised as a priority sector instrumental in fighting poverty.

Internal law:

The Constitution of Uganda 1995 provides that the State shall promote sustainable development and public awareness of the need to manage land, air and water resources in a balanced and sustainable manner for the present and future generations.

The National Water Policy of 1999[91], is to manage and develop the water resources in an integrated and sustainable manner (Badaza, 2005). The policy emphasises the need for participatory planning at the lowest possible level and specifically mentions the requirement for districts to set priorities, by-laws and annual development plans within policies and guidelines set by national level ministries. It goes further and devolves rights to planning at county and sub-county levels. The policy refers to the question of management by sub-catchment, (eight sub-catchments of the Nile are delineated in the country). The question will be reviewed in a water resources management project due to start in 2003:

- The Water Act, CAP 152, was enacted in 1995. It is the principal law for the management of the water resources of Uganda. It provides for protection and management of water resources, water supply and water use and related matters;
- The Water Statute of 1995 provides the framework for the use, protection and management of water resources and water supply. Since the Water Act was deliberately formulated as an enabling law, its implementation is going on with the Water Regulations 1998 [Water Resource Regulations (1998), Waste Discharge Regulations (1998), the Water Supply Regulations (1999), and Sewerage Regulations (1999)];
- The Uganda Water Action Plan (WAP) for Water Resources Development and Management, 1995, identifies the issues, recommended policy directives and management strategies;
- The Local Government Act 1997;
- The National Environment Act, Cap 153 was enacted in 1995 to provide for sustainable management of the environment;
- The Land Act was enacted in 1998 to recognise so-called “customary tenure”, and is in order to facilitate the privatisation of land, to enable the growth of a land market, and the acquisition of land by “investors” (Lemu, 2003);
- The Forestry Policy, 2000 on watershed management and soil conservation states, “watershed protection forests will be established, rehabilitated and conserved”. The Government will promote the rehabilitation and conservation of forests that protect the soil and water in the Country’s key watersheds and river systems;
- The National Health Policy and Health Sector Strategic Plan (1999);
- The National Gender Policy (1997).
- The Government, decided in 1997 to reform the Water Sector. Four water sector reform studies comprising Rural Water Supply and Sanitation (WSS), Urban Water Supply and Sanitation, Water for Production, and Water Resources Management. The Rural WSS and Urban WSS reform studies were completed in 2000. Water for production reform study is to be completed in September 2003 and the Water Resources Management Reform study started towards the end of July 2003.

[91] Prepared by the Management of Water Development, Ministry of Water, Lands and Environment.

International law:

- The background work to the development of the water policy and legislation was accomplished under the first comprehensive study of water resources management issues in Uganda based on the Copenhagen-Dublin-Rio principles and strategies, especially chapter 18 of Agenda 21, adopted at the United Nations Conference on Environment and Development (UNCED), Rio, 1992.
- Uganda ratified the East African Community treaty and its agreements, especially the protocol instating the Lake Victoria Basin Commission.

5.4 A Cooperative Framework for the Kagera River Basin

The development and implementation of transboundary cooperation in shared river basins is not an easy matter. Time, patience and perseverance are required to fully develop shared water resources in a manner which is environmentally and economically sustainable and which ensures equitable sharing of the benefits (SIWI, 2006).

According to the principle of subsidiarity, the riparian countries in a transboundary basin may accept within a legal cooperative framework to coordinate their policies and operational means, and possibly delegate their competencies regarding the management of the basin's water resources to the cooperation entity. To reach this level of cooperation, however, the countries involved need to be convinced that shared management of their river basin is in the interests of their populations and will not jeopardize their own sovereignty. They also need to be sure that cooperation is the best way to achieve the overall goals.

The following discussion and recommendations regarding a cooperative framework were carried out within the rather limited resources available under this consultancy. Consultations were carried out with various members of the Regional Project Steering and the NELSAP and Kagera Project Management Unit. The recommendations also recognize that there is a parallel consultancy being carried out by the firm COWI Uganda, which is tasked with a more comprehensive review and recommendations of this subject. We met on several occasions with members of the COWI Uganda team to discuss their preliminary observations including their meetings discussions with the LVBC and EAC. Due to lack of time, we unfortunately were unable to meet directly with representatives of the LVBC Secretariat.

We recognize there are important political and legal sensitivies and complexities which we may not have addressed in this preliminary assessment. We present the following recommendations therefore as preliminary and initial *food for thought* in the ongoing consideration an appropriate cooperative framework for development and management of the water and related resources of the Kagera River basin.

5.4.1 Why a Cooperative Institutional Framework for the Kagera River Basin?

Before any form of river basin cooperative institutional framework is considered and a River Basin Organization (RBO) or management unit established, there must be water and natural resource transboundary management and development challenges that are significantly impacting one or more of the countries within the basin, or are likely to do so within the foreseeable future. Otherwise, there is little point in attempting to develop an international treaty or agreement that, by its very nature, will impact to some degree on what a country can do with its natural resources within its own boundaries (World Bank, 2006).

In other words, there must be *drivers for change* and some *mutual benefit* that encourages all the countries to seek to develop some form of formal river basin coordination. For the downstream countries in the RBO, the benefits to be realized are usually obvious, such as deteriorating water quality and reduced water quantity from upstream development may have already become evident. But for upstream countries, the benefits may be less clear, as most impacts of their development are felt downstream. But there may be concerns that a downstream country is attempting to establish a water share through appropriation that is not equitable or fair. Irrespective, the interests of all riparians should be considered when assessing the benefits and losses of basin management.

The declaration that a shared basin is an international one and must be jointly managed by the riparian states as a common resource for their equitable benefit helps create a common vision among the states. It also encourages their cooperation and need to consult to manage the water resources for socioeconomic development and to maintain environmental integrity anywhere in the basin.

International obligations, international customary law, or both are usually the prime motivators that prompt countries to limit water use, change catchment management practices, or strengthen water pollution control.

We suggest that the overall objective for such transboundary cooperation for the Kagera River basin has already been agreed between the members of the EAC countries in the context of the management and development of the Lake Victoria basin summarized as: “a *prosperous population living in a healthy and sustainably managed environment providing equitable opportunities and benefits*” (Vision of Lake Victoria Basin, 2004).

We believe that a strengthened and more formalized cooperative and institutional framework for the management and development of the Kagera River sub-basin is important at the regional transboundary level for various reasons:

It would identify a unique basin management entity, taking its specificities, the different usages and the needs of its peoples into account;

It would facilitate the establishment of a long-term *Vision of the Basin* and their implementation through application of IWRM principles;

It would enable effective linkages with national and local structures involved in the basin's water resources management;

It would provide a venue for sharing and management data and information necessary for effective transboundary river basin management. As in most river basin organizations, procedures for data and information sharing could be negotiated and agreed, and a comprehensive data and information management information established within the context of an appropriate river basin organization;

It would provide a framework for consultation and participation for the local governments and for civil society in the basin;

It would bring a renewed vision for the Kagera River basin in the context of the Lake Victoria and Nile River Basins, linking these countries with their different challenges, but still sharing common concerns and interests. *"If successful, Kagera could become a model for more integrated cooperation throughout the Nile Basin"*[92].

The cooperative framework is also important at the national levels because it would:

Support and strengthen the countries of the basin to implement the reforms necessary to enable them to achieve global, integrated water resources management;

Raise the awareness of the whole basin population, but also specifically that of the decentralised organisations who are in charge of natural resource and water resource management within the basin concerning the implementation of IWRM;

Act as a correspondent for all the populations and entities for better management of the basin.

5.4.2 Recommendations: A permanent transboundary co-operation framework for the Kagera River basin

The countries of the Kagera River basin previously established a transboundary river basin organization (KBO, 1977) relatively early on. Unfortunately, after successfully completing numerous studies and comprehensive basin plans, many of which form the basis for the discussions in this monograph, due to a complex set of circumstances in the region during the period, the organization was finally dissolved in 2004 (Mbaziira, R. et. al., 2005). Any recommendations for an institutional cooperative framework for the Kagera basin should be tempered by the lessons-learned from that experience. (ref. Section 5.1.3).

In the meantime, other regional institutional and legal frameworks were being created encouraging regional integration through entities linked either to the East African Community (EAC) or the Nile Basin Initiative (NBI). The Lake Victoria Basin Commission (LVBC) was created under the initiative of the EAC, and is now responsible for coordination of natural resources and environmental management, water resources management and water and sanitation. Under the NBI, the NELSAP was created to focus on the Lake Victoria sub-basin of the Nile River basin. NELSAP has a water resources management and development mission to facilitate the countries in joint implementation of projects in order to promote social economic development and reverse poverty.

With these initiatives in place, and through consultations carried out in preparing this monograph, we see emerging a clear national and regional interest and consensus expressed by many levels of government, donors and civil society favouring establishment of some stronger forum for institutional cooperation also at the Kagera River basin level. We have examined three possible options for formalizing a stronger and more permanent cooperative institutional framework for water and resources management in the Kagera River basin, namely:

- Establishing a separate legal and institutional cooperative framework to manage the Kagera River basin in either a completely independent manner (such as the former KBO), or in a similar manner to the LVBC, through the Sectoral Council of the EAC;
- Through an organization to be established at some time in future, under a completely new legal entity once the negotiations on the Nile River Basin Commission are finalized. i.e. The legal and institutional arrangements in support of management and development of the Kagera River basin would be integrated into this new framework; and

[92] United Nations Human Development Report. 2006. p. 226.

- Institutional arrangements which build on the existing institutional frameworks already in place under the EAC and the LVBC;

As for Option 1, we do not see today the political will to establish a new river basin organisation specifically to support the management and development of the Kagera River basin and do not recommend this approach.

As for Option 2, it is unclear how soon the negotiation process in establishing a Nile River Basin Commission will be completed, if at all. Therefore, in the short and even medium-term, given the need to move forward with improved transboundary management of the water and resources in the Kagera River basin, this option is not seriously considered now.

Our recommendation is to move forward with Option 3; that is building on the existing mandate and institutional arrangements of the EAC and the LVBC, as it appears to offer the best opportunities for the near future. We make this recommendation for the following reasons:

The LVBC's mandate covers the entire Lake Victoria sub-basin of the Nile River basin, including the Kagera River sub-basin, (as well as other Lake Victoria sub-basins). Therefore the Lake Victoria basin defines a logical ecosystem management unit for the water and related resources in the Lake Victoria basin and the Kagera River sub-basin (ref. Figure 5.1).

The LVBC shares the same goals and objectives as affirmed in the protocol now agreed by all five EAC member countries. The same national ministries of the four Kagera River Basin countries are members of the LVBC Sectoral Council.

Under the present circumstances, it does not seem necessary or appropriate to dilute tasks nor have overlapping responsibilities. On the contrary, decision-making, human resources and finance need to be aligned if at all possible. One short term option therefore is to create a *Management Unit* (or *Agency*[93]) to facilitate and coordinate the management and development of the water resources in the Kagera River basin within the context, and under the legal and institutional authority, of the LVBC[94]. It would be further recommended to physically establish and locate this *Kagera River Basin Management Unit* within the river basin.

Under this option, the Kagera River basin institutional framework would look something like this (ref. also Figure 5.3 and Figure 5.4 for the exiting and proposed institutional frameworks and relationships respectively):

The **LVBC** provide the overarching legal and institutional framework, and would be the umbrella decision-making entity for the projects and programmes in the basin. It would be in charge of developing a planning and scheduling tool for the whole of the Lake Victoria basin. The mechanism (something like a *rolling master plan for the development and management of water resources in the Lake Victoria Basin)* would provide the sub-basins with guidelines and the main trends of the basin's management policy.

93 In the sense of creating a technical unit within an existing legal and institutional framework – i.e. the LVBC.

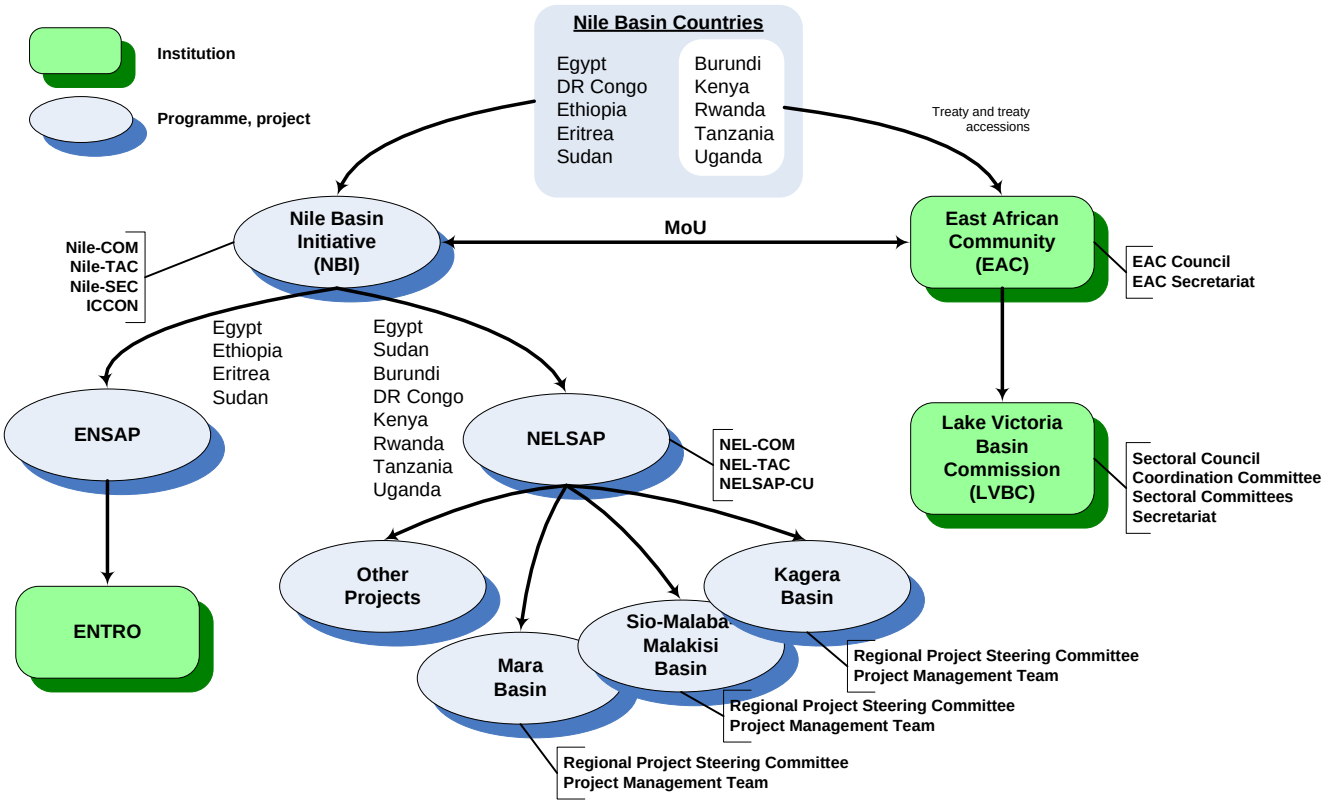
94 The capacity of the LVBC is still growing. However, we believe that a proposed Kagera River Basin Management Unit established within the LVBC legal and institutional framework could further strengthen and improve its effectiveness.

A **Kagera River Basin Management Unit** would be established under the existing LVBC Secretariat[95]. It would be in charge of developing and planning for the Kagera River basin, but in the overall context of the plans and activities of the LVBC. The Unit would be coordinated by a Programme Manager working under the LVBC Secretariat and reporting to its Executive Secretary. A Sectoral Committee for the Kagera River basin representing appropriate government and civil society bodies, user associations, etc. (to be discussed and agreed) would provide overall direction.

The **NELSAP** would continue as a programme under the NBI for the meantime. In any case, the 2007 MoU between the NBI and EAC must be made operational. NELSAP may be expected to continue to provide links with the broader NBI initiatives until such time as a *Nile River Basin Commission* is established. NELSAP projects and programmes could be implemented through the overall guidance or in association with the projects and programmes of the LVBC. The details of the working relationships between the NBI, the NELSAP and the LVBC would need to be studied, discussed and agreed in the context of the evolving institutional relationships in the Nile River basin region.

As a consequence, LVBC and more specifically the *Kagera River Basin Management Unit* would be readily recognized at the regional and international levels as representing the interests of the relevant stakeholders and partners in the ambitious programming and development initiatives. This is also the need to link directly with the NBI and NELSAP programming – a subject requiring further study and agreement. Such an outcome for the cooperative framework enabling appropriate management and development of the Kagera (as well as other L. Victoria sub-basins) could be considered a successful outcome of processes put in place by the NBI and NELSAP.

The existing and proposed cooperative programmes, projects and institutional arrangements are summarized on the following figures:



95 Under this approach, we expect that similar, parallel, Management Units would be established for the two other Lake Victoria sub-basins: 1) Mara, and 2) Sio-Malaba-Malakisi.

Figure 5.3 – Existing institutional framework for cooperative programmes, projects and Institutional arrangements in the Nile River basin

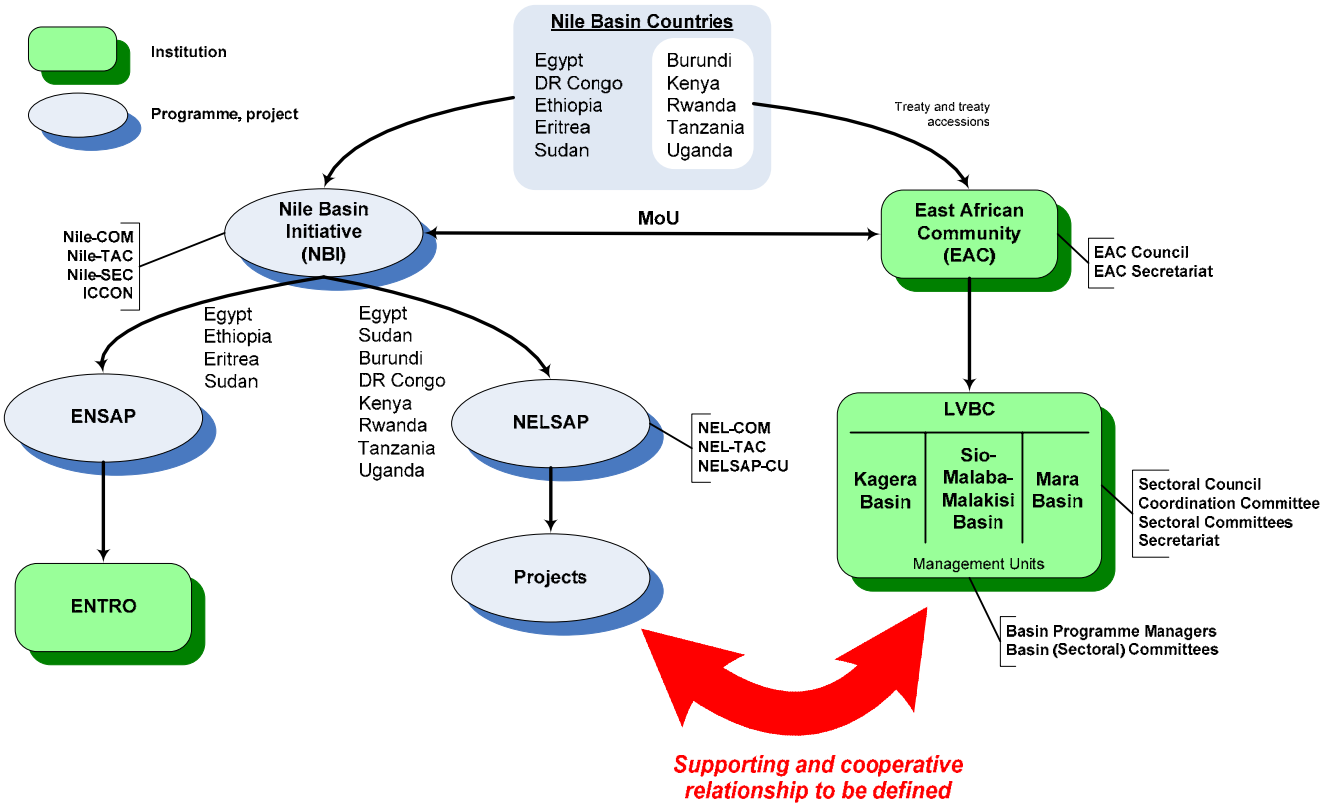


Figure 5.4 – Proposed institutional framework for cooperative programmes, projects and Institutional arrangements in the Nile River basin

5.4.3 Stakeholder Participation

Effective IWRM requires a participatory approach including the appropriate engagement of civil society representatives in the management and development of river basin water and related resources. A key to encouraging an IWRM-oriented civil society involvement lies in the creation of “light” institutions such as watershed fora, municipal consortia, negotiation tables, water boards and land management committees (FAO, 2006). One main challenge is to build a real basin wide set of indicators available on a regular basis, aiming at a better understanding of major issues so as to enable monitoring with time – i.e. a River Basin “Report Card”. Whatever institutional framework is finally put in place for the Kagera River basin, as well as for all levels of water resources management in the Nile River basin, effective linkages with all stakeholders must be considered.

The governments of the four countries which share the Kagera River basin are all in the process of decentralisation; hence the representation of local authorities are certain to appear in the basin's water resource management activities. Appropriate linkages been civil society and river basin governance structures must be built to enable adequate representation and participation of all stakeholders.

At the Nile River basin level, the Nile Basin Discourse has already been established, and appears to be an evolving and increasingly important network of Civil Society Organizations working with and representing communities in the riparian countries of the Nile River basin. The Discourse “…*is cooperating and interacting with the NBI to ensure that there is a voice for the voiceless*”.

At the Lake Victoria Basin level, the Lake Victoria Region Local Authorities Cooperation (LVRLAC) is a regional umbrella organisation for local government bodies in the basin. It seems essential that this organisation is involved in the planning, implementation and evaluation of environment, water resources and sanitation programmes.

At the Kagera River basin level, appropriate linkages must be developed and incorporated into management structures. One such possibility noted above it that the LVBC Kagera River Basin Sectoral Committee guiding implementation of the programmes and projects in the basin should include representation from appropriate levels of civil society.

6. Agriculture, Livestock and Forestry

6.1 Agriculture, development and poverty reduction

It is evident that there are very important links between agriculture, development and poverty reduction – especially in developing countries. Agriculture is by far the main means of livelihood for the rural population, which faces poverty at rates even higher than the urban population. Moreover, agricultural development, in its broadest sense, is one of the main - if not *the* main - means to reduce poverty, especially in the poorest countries whose economies have not yet diversified and where the great majority of people still live in rural areas.

Agricultural growth directly benefits agricultural households by raising incomes and food security. It also indirectly benefits both urban and rural households by: (i) promoting higher wages; (ii) lowering food prices; (iii) increasing the demand for consumer and intermediate goods and services; (iv) encouraging the development of agribusiness; (v) raising the returns to labour and capital, and (vi) improving the overall allocative efficiency of factor markets [Cord Louise, 2002].

On the one hand, sustainable agricultural growth reduces the impacts of the significant well-known challenges facing rural populations everywhere through:

- A strong reliance on the natural resource base to sustain livelihoods, which has led to: (i) a high risk environment for households, given their vulnerability to climatic fluctuations, plant and animal disease, price fluctuations, and macroeconomic policy shifts (for example, devaluation, interest rates, and so forth); (ii) seasonal incomes and food supply; (iii) heterogeneous agricultural production and investment strategies; and (iv) limited growth opportunities, given the low and relatively inelastic demand for food products as national incomes rise.
- A low population density and geographic constraints, relative to urban areas, which lead to high transaction costs and reduced access to physical and social infrastructure.
- An informal economy, which makes it more difficult for policy makers to influence local labour markets and to provide targeted social protection or other support based on income criteria.
- Cultural and linguistic differences, which have often led to limited voice in national and even local decision making processes, especially in remote areas. As we have seen in section 4 of this monograph, this is of less significance in the Kagera River basin in general.
- An important role for women in the economy that is often not recognized in rural income generating programs or in women's access to social services.

And on the other hand, it is not possible to get relief of these constraints without the development of the agricultural sector.

In this section, we will follow the following structure for our discussion of this subject:

- **A general overview of the agriculture in the basin:** What are the main characteristics of the agricultural sector? What is the production? What are the production means and their links with the Kagera basin water resources?
- The agricultural development issues on the basin
- The agricultural development opportunities
- Conclusions and recommendations

Methodological note

It is often not easy to extrapolate national data or regional data to Kagera River basin data. But as the purpose of this monograph is to deal with basin data, some calculations and methodological adjustments must be done. Such “methodological notes” are used in this monograph to explain the adjustments made, to ensure transparency.

Those notes are particularly useful because the Kagera Riparian countries do not have a lot of data concerning their agricultural practices. This lack of data has not always been the same. Prior to the 1994 war, Rwanda had one of the best agricultural data bases on the African continent with a consistent time series on production, area, and yield data spanning the period from 1984 through 1992. This data base, drawn from annual surveys of a nationally representative random sample of approximately 1,240 farm households, was supplemented with a variety of specialized surveys conducted intermittently on topics such as input use, livestock production, natural resource management practices, non-farm income, etc. A key finding of these pre-war studies was that yields of most crops declined from 1984 through1991. [Kelly Valerie, 2001]

In this agricultural part, an area ratio was used to determine any quantitative Rwandan or Burundian value in the Kagera River basin: the part of the Burundian part of the Kagera River basin represents 53% of the Burundi area and the part of the Rwandan part of the Kagera River basin represents 85% of the Rwandan area. For the Tanzanian part of the basin, Kagera Region quantitative values have been used. For the Ugandan part of the basin, quantitative values have been estimated from the Rwanda neighbouring provinces.

6.2 Status of agriculture in the Kagera Basin

6.2.1 Introduction: main characteristics

The agricultural sector employs about 85 % of the basin labour force

The agricultural sector[96] is the economic backbone of the Kagera River basin. The agricultural population[97] represents 90% of the total population [FAO, 2007; AQUASTAT country profiles]. The following table shows that the part of agricultural workers on the Kagera River basin could be estimated to 85% (extracted from national surveys).

[96] Agriculture includes forestry, hunting, and fishing, as well as cultivation of crops and livestock production.

[97] According to FAO, the agricultural population is defined as the people who belong to a household whom chief is a farmer.

Table 6.1 - Main occupation of usually working person in the Kagera River basin (%)

	Burundi	Rwanda	Tanzania	Kagera River basin
Legislators Administrators and Managers	0.1	0.1	0.5	0.1
Professionals	0.2	2.0	0.5	10.3
Technicians and Assoc. Professionals	3.2		2.7	
Clerks		11.4	1.0	
Small business Managers			0.7	
Service and shop sales workers			3.8	
Street Vendors			4.5	
Craftsmen			4.0	
Plant Operator assemblers	0.3		1.3	
Elementary occupation	2.2	6.4	4.0	4.4
Farmers	93.5	79.6	71.7	85
Livestock keepers			0.8	
Fishermen			0.9	
Others	0.5	0.0	0.6	0.3

Sources: Lugomela G. V., Sanga H. S., 2007; National institute of statistics of Rwanda, 2006; ISTEEBU, 2006.[98]

Kagera basin economical development is presently strongly dependent on the primary sector increase and particularly on agriculture for food

The agricultural sector produces more than 40% of the GDP of the riparian countries and generates around 40% of their total export revenues (see tables below).

Table 6.2 - Part of the agricultural sector in the national GDP

	Burundi	Rwanda	Tanzania	Uganda	Kagera River Basin[99]
GDP (2007 billion USD)	0.8	2.2	12.1	8.7	3.1
GDP per capita (2007 USD)	107	244	316	302	
Agriculture, value added (% of GDP)	34.8	42.3	44.5	37	41
Agricultural GDP / agricultural population (USD/hab)[100]	52	117	156	115	

Sources: The World Bank, April 2007; FAO, 2005.

Table 6.3 - Part of the national agricultural exports revenues

	Burundi	Rwanda	Tanzania	Uganda
Total exports (2007 billion USD)	0.07	0.23	2.07	1.14
Agricultural exports / total exports (% value)	48	35	36	41

Sources: The World Bank, April 2007; FAO, 2005.

98 For Tanzania, persons aged 5 years and above, Kagera basin data; for Rwanda, persons aged 16 years and above, country data; for Burundi, persons aged 10 years and above, country data (extracted from the national survey in 1990); for Kagera River basin, data extracted from the first three columns.

99 For the Kagera River basin, data from Rwanda, Burundi and the Tanzanian Kagera Region were compiled. Data for the Tanzanian Kagera come from the Kagera Region Website of the United Republic of Tanzania: http://www.tanzania.go.tz/regions/kagera/gdp.html.

100 According to the Strategic plan for agricultural transformation in Rwanda (SPAT, 2004), this GDP per capita is slightly higher: between 136 and 204 USD per person per year, but nevertheless confirms the given orders of magnitude.

The basin agriculture is largely dependant on very small-scale subsistence farmers for whom production is largely allocated to their own farm consumption

The mean gross value of production per agricultural population ranges only between about USD 50 and 150 per year so that a great majority of the agricultural population produces not even enough food for their own consumption. This low production is due to low yields (see following chapters) and very small scale exploitations (see following table).

Table 6.4 - Cultivable area per agricultural household on the Kagera River basin

	Burundi	Rwanda	Tanzania	Kagera River Basin
Mean cultivable area per household (ha)	0.5	0.7	1.1	0.80

Sources: Ndikumana G., 2007; National institute of statistics of Rwanda, Ministry of finance and economic planning, 2006; BRLi mission to Kagera basin districts in Tanzania, 2007. [101]

The very high population density of the Kagera River basin (average 240 people/km² and around 350 people/km² in Rwanda and Burundi[102]) and the lack of sufficient sustainable agricultural practices (see following chapters) are responsible for the low level of food security, which is partially illustrated by the proportion of malnourishment shown in the following table.

Table 6.5 - Proportion of malnourishment in the riparian countries of the Kagera River basin

	Burundi	Rwanda	Tanzania	Uganda
1990-1992	48	43	37	22
1995-1997	63	51	50	26
2001-2003	67	36	44	19

Source: FAO, 2006.

The most effective way to reduce poverty, and thus achieve the stability goal, is to raise the productivity and expand the employment of resources that the rural poor own or depend on for their livelihood, primarily land and labour.

This assessment recognition is extracted from a World Bank project appraisal document for Rwandan Rural Support Sector Program [The World Bank, 2001]. The Rwanda's Poverty Reduction Strategy Paper (PRSP) identifies the transformation of agriculture and rural economy as the principal source of growth in the medium-term and as an imperative for poverty reduction. On "cross-cutting development issues", the PRSP identifies natural resource (water, land, and biomass) degradation as a key impediment to agricultural transformation, rural development, and poverty reduction. The sustainable development of marshlands, reforestation, and the rehabilitation of degraded land are considered major means to reverse the degradation of the agricultural resource base. [Republic of Rwanda, 2002] This assessment of the Rwandan case illustrates the general basin poverty reduction strategies which will be discussed in this chapter.

[101] For Tanzania, estimation of Kagera Basin data extracted from the Bukoba district figures; for Kagera River basin, data extracted from the first three columns.

[102] This study projections for 2007.

6.2.2 Agricultural production

The total cultivated area in the Kagera River basin is around 2,200,000 ha (see the methodological note below) shared approximately[103] between countries as follows: Burundi (27%), Rwanda (43%), Uganda (8%) and Tanzania (21%). The climatic conditions generally allow, for a large part of this cultivated area, two productive seasons: Season A (end of August to January) and Season B (February to and of June)[104].

Methodological note

For Rwanda, the 2006 agricultural survey gives the yields per crop and the total crop cultivated area in season A : 1 090 000 ha.

The Burundian Monographs in 2006 give the total crop production for Burundi. With using the Rwandan crop yields, the crop cultivated area in Burundi may be estimated as 1 070 000 ha. It is logical to find close crop cultivated areas in Rwanda and Burundi because the total surface area of the two countries are close.

For Tanzania, the Kagera Region website gives 530 000 ha of crop cultivated area.

For Uganda, a comparison has been made with the northern provinces of Rwanda and superficies ratio has been used to estimate the crop cultivated area of the Ugandan part of the basin: 140 000 ha.

For some reasons, the cash crop areas were sometime not included in the sources above, so that the FAOSTAT figures of 2005 may have been used to complete the data.

Then, because 85% of Rwanda and 53% of Burundi are inside the Kagera River basin, 2 180 000 ha are estimated to be crop cultivated areas in the Kagera River basin.

Some other sources confirm some of the estimations made. For the FAO (FAO AQUASTAT 2007) the crop cultivated area in Rwanda is between 900 000 and 1 300 000 ha.

According to the 1976 NORCONSULT study, the crop cultivated area on the Kagera River basin was 1 400 000 ha (without Uganda). That allows to think that the estimation of 2 200 000 ha is not underestimated.

The food crop production, compared to the cash crop production, represents 90 % of cultivated areas in the Kagera River basin according to the FAOSTAT agricultural database[1].

[103] "Approximately" because those figure are extrapolated from national or regional data.

[104] Season C also exists for marshlands irrigation (see further in the report), between May and December.

Food Crop production

Given in the order of importance, food crops are banana (around 40% in value), tubers and roots (sweet potato 11%, cassava 8% and potato 12%), leguminous (bean and peas 10%) and cereals (maize 3%, sorghum 4% and rice 3%). The following two tables give an estimate of the Kagera River basin food crop production (one in cultivated area and one in monetary value).

Kagera River basin food crop production (in tons)

Table 6.6 - Kagera River basin food crop production (in tons)

(* 1000 tons)	Burundian part of the basin	Rwanda	Kagera Region in Tanzania	Ugandan part of the Kagera River basin	Kagera River Basin	%
Bananas + Plantains	827	2375	356	190	3748	37%
Beans and other pulses	139	240	49	102	531	5%
Cassava (fresh and dried)	379	865	215	25	1484	15%
Fruit, nec (inc. persimm.)	45	75			119	1%
Groundnuts	4	10	7	4	26	0%
Maize	66	83	88	24	260	3%
Millet	5	4	2		11	0%
Palm nuts-kernels (nut equiv.)	6				6	0%
Potatoes	14	1082	20	144	1260	13%
Pumpkins, squash and gourds	0	209			209	2%
Rice, paddy	33	31	4	2	69	1%
Sorghum	37	180	17	47	281	3%
Soybeans	0	18		1	19	0%
Starchy roots, nec	41	123		7	171	2%
Sweet potatoes	425	1024	31	114	1593	16%
Vegetables, nec (inc. okra)	132	56			188	2%
Wheat	4	13		3	20	0%
Yams	5	4			9	0%

Sources: FAOSTAT, 2007; Burundian monographs, 2006; Tanzanian ministry of agriculture and food security, 2007; Rwandan national institute of statistics, 2007.

Table 6.7 - Kagera River basin food crop production (in value)

(* 1000 USD 2005)	Burundian part of the basin	Rwanda	Kagera Region in Tanzania	Ugandan part of the Kagera River basin	Kagera River Basin	%	Indicative price (in USD 2007 per ton)
Bananas + Plantains	207	594	89	47	937	40%	250
Beans and other pulses	60	104	21	44	229	10%	432
Cassava (fresh and dried)	48	109	27	3	186	8%	126
Fruit, nec (inc. persimm.)	15	25	0	0	39	2%	329
Groundnuts	4	10	7	4	26	1%	1000
Maize	18	23	24	7	72	3%	278
Millet	1	1	1	0	3	0%	289
Palm nuts-kernels (nut equiv.)	1	0	0	0	1	0%	201
Potatoes	3	234	4	31	272	12%	216
Pumpkins, squash and gourds	0	45	0	0	45	2%	216
Rice, paddy	28	27	3	1	60	3%	870
Sorghum	11	56	5	15	87	4%	309
Soybeans	0	8	0	0	9	0%	458
Starchy roots, nec	12	36	0	2	50	2%	291
Sweet potatoes	69	167	5	19	260	11%	163
Vegetables, nec (inc. okra)	40	17	0	0	56	2%	300
Wheat	2	7	0	2	11	0%	552
Yams	2	1	0	0	3	0%	333

Sources: FAOSTAT, 2007; Burundian monographs, 2006; Tanzanian ministry of agriculture and food security, 2007; Rwandan national institute of statistics, 2007; USAID 2007.

Methodological note

In the tables below, a basin indicative price for each crop has been estimated as the consumer prices in Rwanda given by MINAGRI in 2007. The prices orders of magnitude have been verified with the USAID Food security update documents and with the FAOSTAT prices, which give approximately the same proportions for the crop prices. For each crop, the production of the basin is estimated to be the sum of those from Burundi, from Rwanda, from the Kagera Region in Tanzania and from the Ugandan part of the basin. The production of the Ugandan part of the basin is supposed to be proportionate in area to the productions of the three Rwandan District riparian to Uganda: Umutara, Byumba and Ruhengeri.

The production of the different parts of the basin are estimated from the 2006 Rwanda production, the 1996-2003 Tanzanian Kagera production and the 2005 Burundian production.

As it will be often the case in this “agriculture” discussion, the data used do not give a precise idea of the basin situation (production, cultivated area, prices…). They could give a precise idea of any parameter in a given country or district at a given period, but even the national agricultural data must be used with cautiousness. Indeed, technical constraints, for instance common interplanting practices often complicate the interpretation of yields data. Consequently, most of the figures will only be determinant in this paragraph to give a general overview of the agricultural situation.

The two tables above allow distinguishing some differences in the food crop production of the four countries in the basin. These distinctions are due to the existence of different agro-climatic zones on the Kagera River Basin. Distinctions can be made according to the food crop density[1] or according to the type of crops.

The following map deals with the food crop density, so that we can distinguish at least two major zones:

- The lower Kagera River basin, including the all Tanzanian part, with a low food crop density; and
- The hills and mountains high populated area forming an arc of circle from the North-Western part to the South Western part of the basin.

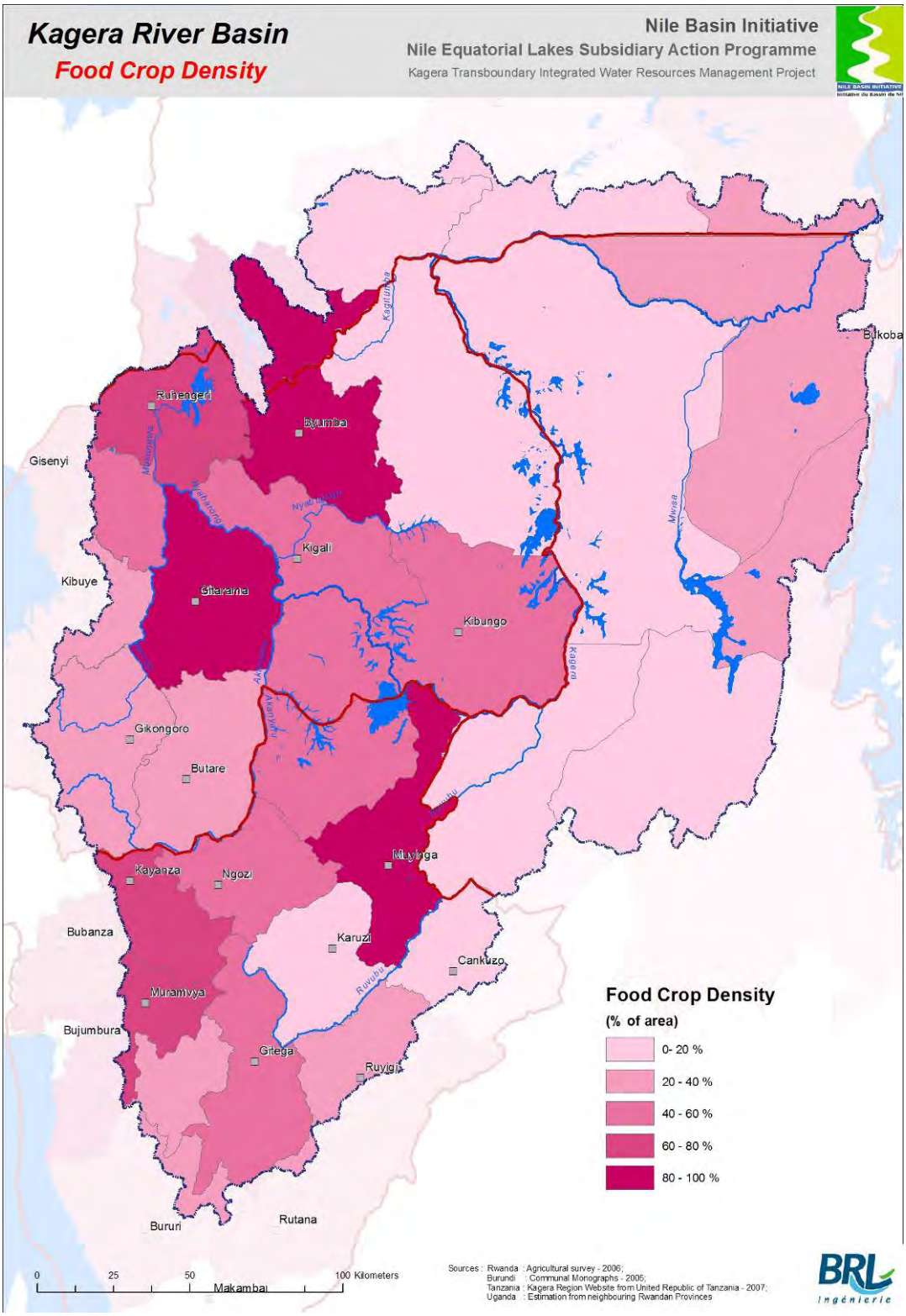


Figure 6.1 – Kagera River Basin - Food Crop Density

Methodological note

For Rwanda, the food crop density per province is estimated from the cultivated area given in the 2006 Rwanda agricultural survey. For the Ugandan part of the basin, the food crop density is supposed to be similar to the neighbouring Rwandan province. For Burundi, the food crop density is extrapolated from the annual food crop productions of 2005 given in the Communal Monographs (Ministère de la planification du développement et de la reconstruction nationale, PNUD, 2006). We have considered here that one hectare of food crop could on average produce 8 tons per year. In Tanzania, the data are extracted from the Kagera Region website from the United Republic of Tanzania. The food crop areas used are means for the years 1996-2001. The Regional figures are confirmed by the Tanzanian Ministry of agriculture and food security website.

This food crop density map coincides with the demography of the basin, that also reflects the fact that 85 % of the labour basin force is employed by the agricultural sector, mainly in a subsistence way. It also generally correlates with the physical attributes of the zones such as the rainfall distribution and the land elevation.

Moreover, some food crop densities are very high in some parts of the Kagera River basin (for instance: more than 80% in the Gitarama, Byumba and Muyinga provinces), and probably close to saturation if the cash crops (see the next part) are included. The following table compares the land use occupancy on a large part of the Kagera River basin in 1973 to the one estimated in this monograph (cash crops included). It shows that the agricultural land occupancy has increased of 25% in 35 years.

Table 6.8 - Evolution of Crop density in the Kagera River basin

Zone	Crop density in 1973	Estimation of Current Crop density
Burundian part	40%	40%
Rwandan part	30%	40%
Tanzanian part	13%	21%
Kagera River basin	26%	33%

Sources: NORCONSULT, ELECTROWATT, 1976; this study, 2007.

Methodological note

In 1973, the study did not consider the Ugandan part of the basin. The current estimation of crop density is based on the previous methodological notes, plus the following cash crop pieces of information. The total area used for the Tanzanian Kagera region does not include its Lake Victoria part.

Figure 6.2 - High agricultural land use density in the Rwandan Karongi district

Bananas, chiefly plantains, are the most important crop in the Kagera Basin forming the staple diet of the vast majority of the people. As a staple food crop, bananas have a number of advantages over annual crops, such as maize and sorghum, in that once established they need relatively small labour inputs, can be eaten directly or with a minimum of preparation, can be conveniently converted into beer, and are less susceptible to the vagaries of the climate. For this last reason, *banana trees are found everywhere on the Kagera River basin*, even if it appears for climatic reasons that some revision of the cropping pattern may be required to supplant bananas as the main food crop in the North-East of the basin. However, banana yields vary greatly. According to FAOSTAT, mean yields are 5.2 t/ha in Rwanda and Burundi, 2.2 t/ha in Tanzania and 4.5 t/ha in Uganda. Several factors contribute to yield variations including rainfall, fertility status of the soil, variety, banana weevil (especially in the Tanzanian part) and the fact that some bananas fields are interplanted with coffee (especially in the Tanzanian part too). Banana is also considered as a cash exportation crop (for the Rwandan, Burundian and Ugandan parts of the basin) as shown in the following table.

Table 6.9 - Banana External Trade for the Kagera River Riparian countries

(1000 tons)		2000	2001	2002	2003	2004	2005
EXPORTS	Burundi	0	0	0	0	0	0
	Rwanda	0.07	0.04	0.04	0.04	0.04	0.05
	Tanzania	0.02	0.13	0.09	0.05	0.29	0.01
	Uganda	0.12	0.11	0.06	0.03	0.10	1.18
IMPORTS	Rwanda		0.01	0	0	0	0
	Tanzania	0	0	0	0	0	0
	Uganda			0.28			0.20

Sources: FAOSTAT, 2007.

Root crops provide a significant part of the diet of the people of the hills zones but are less important in the lower Kagera zone. *Cassava* is grown mainly below 1600 m. Mean cassava yields are between 6.5 and 9 t/ha, which is low compared to the known potential of 30 t/ha on rich soils. This is because cassava is mainly interplanted and/or cultivated on the poorest soils and still cultivated as a famine reserve crop. *Sweet potato* is the major root crop in the basin (in tons). Sweet potatoes are grown even at altitudes above 2000 m but higher yields are for the 1500 m zones. The average yields of sweet potato roots are 6.6 t/ha in Burundi, 6 t/ha in Rwanda, 4.4 t/ha in Uganda and 1.9 t/ha in Tanzania. *Potatoes* (Irish potatoes) are restricted largely to areas above 1500 m and the crop becomes a staple carbohydrate food above 1900 m. Average yields of potatoes are between 2.7 and 8.6 t/ha (2.7 t/ha in Burundi due to interplanting practices and 8.6 t/ha in Rwanda thanks to more favourable zones).

The *bean* crop is of major importance throughout the project area and is the major source of vegetable protein. Haricot beans commonly are interplanted with maize, various root crops, sorghum or banana groves. The reported average yields of dry haricot beans on the basin countries are 0.7 or 0.9 t/ha. The lower yields reflect the higher amount of intercropping. Yields of more than 4 t/ha of dry haricot beans have been obtained at the Rubona Research Station on experimental plots: it shows the considerable scope for increasing farmer yields. The mains areas of *pea* production in the basin are in the *upper catchment areas, mainly above 1900 m*. In these zones, the pea crop replaces haricot beans as the main source of vegetable protein. The average national yields are between 0.7 and 0.5 t/ha: differences are mainly caused again by interplanting practices. Yields of more than 2 t/ha of dried peas may be obtained on the basin. The bean and pea crop have also various yields depending on the year and on the plantation month which show the high climatic dependency.

Maize offers important potential for the expansion of food crop production, particularly in the middle altitude range, 1500 m to 1900 m, where there is adequate rainfall. But the yields are very low: 1.1 t/ha in Burundi, 0.8 t/ha in Rwanda, 1.3 t/ha in Tanzania and 1.7 t/ha in Uganda. A major cause of low maize yields is the generally inadequate plant populations, which may be due to mixed cropping. Low seed rates are commonly used because the farmer has to make a choice between grain to eat and grain to plant. *Sorghum* is usually grown below 1600 m. The yields are low in the Kagera River basin: between 1 and 1.4 t/ha. Sorghum is best suited to hotter and drier climatic conditions of the lower Kagera basin. Average temperatures over most of Burundi and Rwanda are marginal for this crop which should probably be replaced by maize in cooler, higher rainfall areas. Until recently, rice was not grown in the Kagera river basin. This explains why the rice production is still very low. The average productivity per ha is about 4 tons, which is not low but lower than the targeted 7 tons in the Rwanda crop intensification program. Rice is principally cultivated in marshlands in Rwanda and Burundi. Because of its better value-added, the production of rice has become a priority for these two countries and could be an important motor of development for the Tanzanian plains in the basin.

Methodological note

The yields presented in this food crop descriptive part below are mean national yields between 2000 and 2005 from FAOSTAT. These paragraphs are largely inspired by the NORCONSULT 1976 study on the agricultural sector.

Cash Crop production

The cash crops cultivated in the Kagera River basin are principally coffee (73% of the total cash crop areas), tea (14%), sugar (4%), cotton (5%), palm (<1%), tobacco (1%) and pyrethrum (2%). Banana is often considered as cash crop because it is not a subsistence crop and because it is an exportable crop. We have however already dealt with banana in food crops.

These cash crops occupy around 10 % of the cultivated areas in the Kagera River basin (10% in Rwanda and Burundi [Twagirumukiza, 2007] and 11% in the Tanzanian Kagera region[105]). The cultivated areas are given in the following table. It shows that coffee represents, by far, the main cash crop area in the Kagera River basin.

Table 6.10 - Main cash crop areas in the Kagera River basin

(ha)	Burundi	Rwanda	Kagera Region in Tanzania	Ugandan part of the Kagera River basin	Kagera River Basin	%
Coffee	32000	18000	68000	3130	106090	73%
Cottonseed	610		7200	0	7523	5%
Palm nuts-kernels	1120			0	594	0%
Pyrethrum		3156			3156	2%
Sugar	0	330	5000	57	5387	4%
Tea	8900	11920	1300	2073	20010	14%
Tobacco	1146	200	1000	35	1842	1%
TOTAL	**43776**	**33606**	**82500**	**5296**	**144603**	**100%**

Sources: FAOSTAT, 2007; the Kagera Region Tanzanian website, 2007; NORCONSULT, ELECTROWATT, 1976.

Methodological note

The sugar area in the Tanzanian part of the basin is estimated as a little more than the area in 1973 (4000 ha), given in the NORCONSULT sector study on general agriculture. The Kagera Sugar Company, which was established in 1955, stopped production in the 90s but has since started again, with extension plans. The cash crop areas are estimated over the Ugandan part of the basin with a surface ratio applied on the Rwandan areas. The Burundian and Rwandan areas are 2005 data whereas the Tanzanian areas are means of 1996 to 2001 data. No data have been found concerning the tobacco and pyrethrum areas. The figures used are consequently the ones from 1973 found in the NORCONSULT report.

The following table shows the importance of the two main cash crops exportation in the riparian countries economy. Coffee (80% of the cash crop exports value) represents more than 40 % of the Burundian exports and 13% of the Rwandan exports and around 2.5 % of the basin GDP. The proportion of cash crops has decreased in the past 30 years when it was estimated to represent around 90 % (in value) of the exportations of the basin.

[105] Area is given by a calculation with the production [Tanzanian Ministry of Agriculture website] and the different yields [FAOSTAT].

Table 6.11 - Importance of Coffee and Tea in the riparian countries external trade. Export values means between 2000 and 2005.

		Export Value (million USD 2005)	Part of GDP	Part of export revenu
Coffee	Burundi	29.0	3.62%	41.43%
	Rwanda	30.7	1.39%	13.33%
	Tanzania	62.9	0.52%	3.04%
	Uganda	109.7	1.26%	9.63%
Tea	Burundi	4.8	0.60%	6.88%
	Rwanda	4.9	0.22%	2.11%
	Tanzania	15.8	0.13%	0.76%
	Uganda	2.8	0.03%	0.25%

Sources: FAOSTAT, 2007.

Livestock

Livestock represents a limited proportion of the Kagera River basin GDP.[106]

Livestock plays an important role in the social economic well-being of the population:

- Livestock are a source of food providing milk and meat to the population. They can provide this all the year round and this is important in ensuring food security and risk mitigation. Livestock are both an inflation-proof and productive investment. They are one of the few assets which if owned by poor households can be crucial in maintaining household survival in times of crisis. They can be sold to contribute to the income of the farmer.
- Livestock are central to farming systems used by the poor, providing manure – often when the purchase of substitutes is impossible. The use of manure is an efficient and sustainable method for maintaining soil quality and water retention. In addition, livestock integrated with crop farming can stabilize and improve farming if pasture is planted on terraces to stop soil erosion thereby improving crop yields and at the same time providing animal feeds. This would be important for Rwanda because of the problems of soil erosion.
- Livestock provide a range of other benefits including hides and skins, fuel for cooking and appropriate transport for carrying water, goods and people and play a significant role in the social traditions of the Rwandan population and contribute to the social prestige. In addition, animals provide traction that is important in agricultural production. In Rwanda cow dung was traditionally used in the process of making bee hives and decorating houses.

[106] Livestock contributes 5.7 % of the GDP in Rwanda (SHER, 2002).

The following table shows the current estimation of the Kagera River basin livestock populations.

Table 6.12 - 2006 estimation of the Kagera River basin livestock population

	Cattle	Sheep	Goats	Pigs	Poultry	LSU	Cattle LSU
Burundi	380384	250720	1286930	152552	901467	469563	61%
Rwanda	1122179	695367	2655798	527531	1714989	1282257	66%
Ouganda part of the basin	183 039	62771	193942	14570	90585	165865	83%
Kagera Region in Tanzania	385316	51918	369115	6568	?	332404	87%
Kagera River basin	1723811	838632	3502558	550392	> 2026103	1837056	70%

Sources: cf. methodological note below.

Methodological note

In the table above,

- data for Burundi are extracted from the provinces monographs (data from 2005);
- data for Rwanda are extracted from national MINAGRI statistics concerning 2006;
- data for Tanzania are extracted from the Tanzanian Kagera Region website (data from 2002);
- data for Uganda are estimated to be proportionate to the data from the neighbouring provinces in Tanzania or Rwanda (surface ratio);
- for the Kagera River basin, the Rwandan part of livestock is estimated to be 85% of the national total and the Burundian part of livestock is estimated to be 53% of the national one (surface ratios).

LSU is the Livestock Standard Unit which may be defined as an animal with an average weight of 250 kg. In this study are used the following proportions: 1 cattle = 0.75 LSU; 1 sheep = 1 goat = 0.1 LSU; 1 pig = 0.2 LSU [from “mémento de l’agronome”, 1993]. The poultry population is not taken into account in the LSU calculation because no estimations were found for the Tanzanian Kagera Region and because it only represents a small part of the total LSU (1 poultry = 0.01 LSU).

The distribution of livestock within the Kagera basin is irregular. In general, the livestock populations are related to human population and in areas of high human population density livestock populations also are high. There also is some relationship between human population density and the relative proportions of the types of livestock that are kept. In densely populated areas the numbers of cattle are much lower in relation to the number of sheep and goats than in sparsely populated areas (Figure 6.3). The exception of the correlation population density / livestock is the Umutara province in Rwanda, which has a low population density, a low crop density and a high livestock density.

A major reason for the low livestock populations of the lower Kagera River basin is the presence of cattle diseases such as the East Cost Fever (ECF), *trypanosomiasis* and *cysticercosis* and malnutrition. Tsetse flies and ticks are present in much of the zone and have limited the movement of man into these areas. However, these diseases have been greatly reduced during the last decades. This is not the case for malnutrition, which is not a disease but in many part of Burundi and Rwanda it is a forerunner for much animal illness. Dry season food shortages (caused by lack of natural pastures and fodder crop productions for densely stocked areas) inhibit growth, result in much reduced resistance to disease and are largely responsible for the low fertility rate in the cattle of Kagera River basin. [NORCONSULT, 1976]

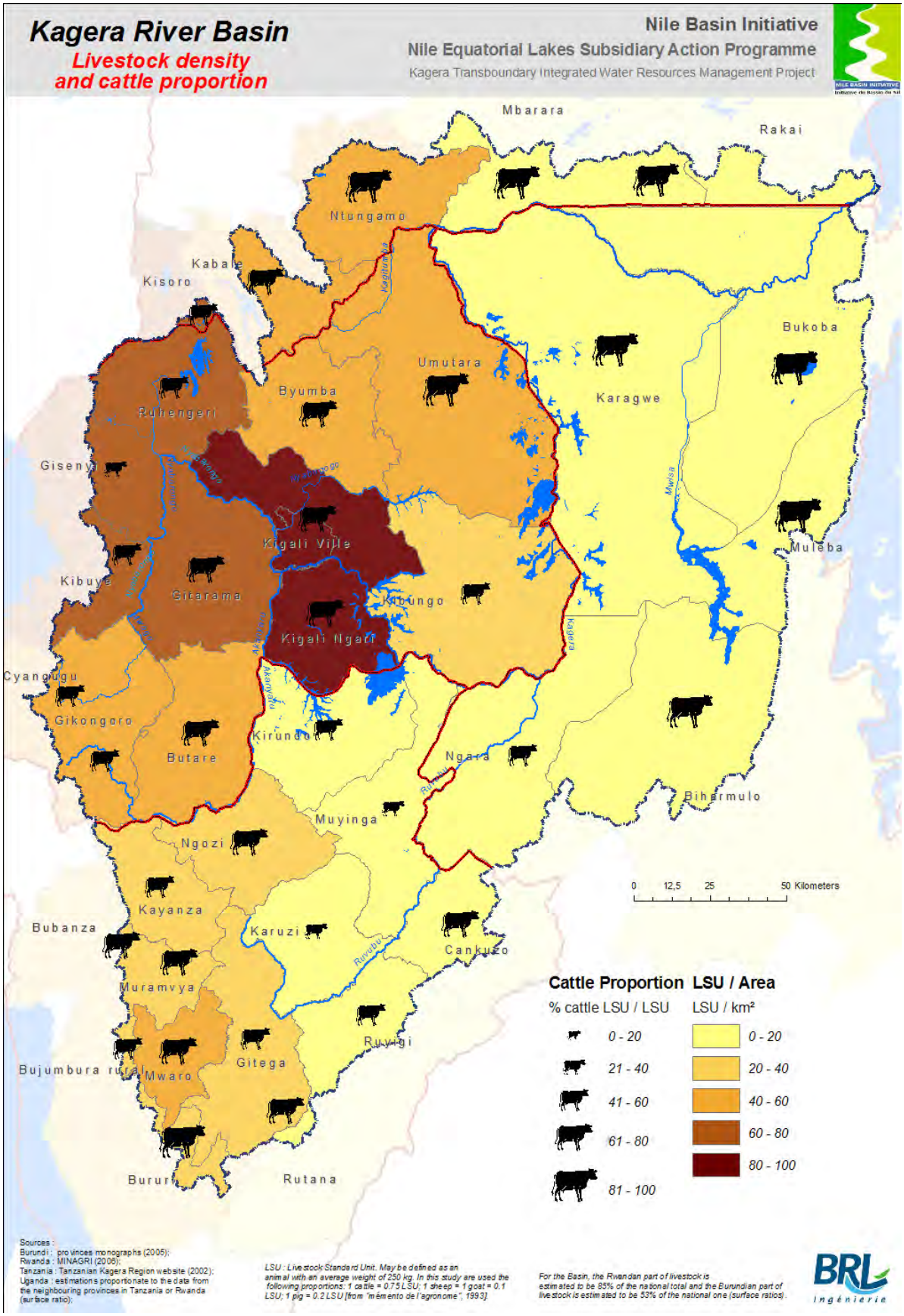


Figure 6.3 – LSU density distribution and cattle proportion distribution (% LSU) in the Kagera River basin

Cattle represent 70 % (in LSU) of the Kagera River basin livestock population. The dominant cattle are of the race *Ankole*, with very large horns. A short horn zebu can be distinguished in Rwanda and Burundi. The proportion of farmers owning cattle varies from as little as 25% in the more densely populated areas of the upper Kagera River basin to more than 70% in the dry open areas of the lower basin. Herd sizes also vary with density of population. In highly populated areas the typical farmer keeps two to four cattle, but in the more sparsely populated areas, the typical herd contains 20 to 50 heads. These lower zones are thus the only ones which get commercial livestock production enterprises. It is common, particularly in Burundi and Rwanda, for farmers to keep a mixed herd of cattle, goats and/or sheep. Pig production is a more confined and specialized business.

The livestock population in Rwanda and Burundi in 1973 is given in the 1976 NORCONSULT study (Kagera River basin development Phase II, Sectoral studies, General agriculture). The livestock population of the Tanzanian Kagera region in 1984 is given in its website. It is consequently possible to determine the evolution of the livestock population in the Kagera River basin. *The following table shows that the livestock population (in LSU) has largely increased in Rwanda and largely decreased in Burundi*[107] *during the past 30 years and slightly increased in the Tanzanian part of the basin during the past 20 years.* This is mainly described by the evolution of cattle numbers, while the pig and goat populations have more than doubled in Rwanda and Burundi.

Table 6.13 - Evolution of livestock populations in Rwanda, Burundi and Tanzania (in LSU)

	1973	1984	2006	Comparison
Rwanda	652730		1282257	196%
Burundi	669550		469563	70%
Tanzanian Kagera region		313813	332404	106%

Sources: NORCONSULT, 1973; Tanzanian Kagera Region website, 2007; this study, 2007.

Forestry

In Burundi and in Rwanda, the forest plantations represented in 2000 respectively 78% and 85% of the total forest area whereas in all the other riparian countries this proportion is marginal (Rwanda owns around 40% of the Central Africa forests plantations) [FAO, 2003]. The estimated area of forest plantation in the Kagera River basin is around 450,000 ha.[108]

Those plantations are crucial in the Kagera River basin where the natural forest areas are low and the population density is high. Consequently, the forestry sub-sector plays an important role in the maintenance of climatic stability, protection of water sources, soil fertility, controlling land degradation and as a source of wood fuel and industrial raw materials. Involvement of the community in this sub-sector is crucial in order to attain sustainability in the use of the country's natural resources.

[107] This evolution in Burundi is a perfect illustration of (i) the agricultural evolution which has progressively pushed cattle out of the farming system as a result of the shrinking of grazing areas and (ii) the dramatic decline during the 12 years of civil war.

[108] Extracted from: 306 663 ha in the Rwandan part of the Kagera River basin [FAO TAMP, 2007] and less than 150 000 ha in the entire Burundi [Burundian monographs, 2006].

From West to East, one can remark an unequal distribution, and even an absence of forestry in the new inhabited zones.

The Upper basin is considered as a forest region, with a favourable climate under sufficient rainfall. This is in this part of the basin that are the big public forest plantations that can be qualified as “industrial” ones, which present a real interest, ecological and economical.

The Centre of the basin is characterized by lower rainfalls and there are some small forestry plantations, public and private. In this region, the large public forests are often localized in mountainous parts, their vocation being more ecological than economical. Those plantations play a major role in the wood supply of the populations.

The Lower basin is penalized by the climate: low rainfalls. Plantations are low in this region. In many communes of the Umutara province, there is no forestry. If nothing is done, the newly settled population will face serious problems of wood supply, after the shortage of the weak natural forest resources of the zone. The Kagera Region in Tanzania is living on its forestry resources capital so that every year sees a dwindling in the area under forest cover.

The forest cultivated area is difficult to estimate, because it is not well inventoried in the Kagera River basin and the same figures could be used during one or two decades. However, the forestry areas are currently increasing in the basin because of the increase of forest products demands. This forestry growth has however to be compared with the decrease of natural forest areas in the basin, caused by overexploitation[109].

Large forest plantations have begun in the 1970s, with numerous goals: wood for fire and constructions, wooden poles, charcoal, water resources regulation and erosion prevention. The forest plantations in Rwanda have for instance increased from 25,000 ha in 1975 to 247,500 ha in 1989. In the first half of the 1990s, a lot of forest plantations were destroyed or mismanaged and overexploited by displaced populations. From the end of the 1990s to the present time overall forest production is increasing slowly in Rwanda (FAO estimation of 1000 ha per year[110]) and in Burundi, but these increases do not compensate for the overall losses of global forest (natural + artificial).

The decrease of natural forests[111] and the increase of forest exploitations is the consequence of the high and growing population density. The need of forest products is thus increasing, natural forest areas are replaced by houses or fields (forests are often burnt to improve temporarily the soil fertility) or even forest plantations with any more productive species such as eucalyptus. But even if the mean annual loss rate of forest cover in Burundi and Rwanda is the highest in Central Africa, the loss of forest cover in absolute value is relatively low, especially because most of the forest areas which could be used easily as agricultural or construction areas have already been used. This is not the case in the lower Kagera River basin, where the region’s forests are at great risk from total destruction as demands for fuel wood soar with the increasing population. [Tanzanian Kagera Region website, 2007].

The Kagera River basin forestry is characterized by a great proportion of private forest plantations (more than 70%) which are often very small plantations (less than 2 ha). The growing demand for forests products is indeed an incitation for the farmers to use their lands with forest plantations instead of crop. Such a community based implication in the forest management is a positive factor for future development of large scale forestry and soil protection measures, whereas some external factors (such as conflicts or possible wood importation) could be negative factors for the Kagera River basin forestry.

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109 The mean annual loss of forest cover in Burundi and Rwanda has respectively been 9 % and 3.9 % from 1990 to 2000. [FAO, 2003]

110 FAO, 2000.

111 During the period 1960-2000, Rwanda lost 63% of its natural forests [FAO, TAMP, 2007].

6.2.3 Water and agriculture

There are an estimated 2,200,000 ha of cultivated land for agricultural production in the Kagera River basin. Water for production on these lands is provided as follows[112]:

- rainfed-only agriculture (more than 94% of the agricultural area);
- marshlands agriculture without any infrastructure (around 5%);
- marshlands irrigation with at least drainage infrastructure (1%);
- plains irrigation schemes, with reservoir or river water intakes (less than 1%).

The difference between the said “plains” and “marshlands” irrigation is not clearly defined[113]. The marshlands irrigation possible areas mainly consist in narrow valleys, with peat (upper basin) or organic soils (lower basin), whereas the plains irrigation possible areas are mainly plains or plateaus, with alluvial soils. In the marshlands areas, the main irrigation infrastructure required consists of drainage systems for flood waters. In the plains irrigation areas, irrigation infrastructure is primarily conveyance works for the dry season. It is however the water intake characteristics which will be used to differentiate the two irrigation types in this monograph:

- plains irrigation systems are usually characterized by large diversion works; water is usually taken from adjacent streams/rivers where dams have been constructed;
- marshlands irrigation systems are characterized by water control structures in the valleys, with rudimentary systems made up of one or more distribution and drainage channels.

Plains irrigation is not a common practice in the Kagera River basin, probably because of the followings:

- there are only very few suitable plains areas in the major part of the basin (these are mainly in Tanzania);
- if one considers the meteorological and hydrological status and the population needs, the water requirements are largely met by rainfall and irrigation requirements have therefore been limited until recent times;
- a shortage of qualified water resources management technical staff in some regions and particularly of financial resources;
- insufficient management knowledge of the irrigation development projects planning at the national level;
- insufficient operation and maintenance practices;
- the traditional agriculture (without sufficient inputs and intensification practices and without sufficient soil fertility and conservation measures), which characterize the Kagera River basin, cannot alone produce enough income to justify irrigation infrastructure installation, operation and maintenance investments;
- land tenure issues (land conflicts, no clear land ownership, very small scale agricultural production) do not enhance the farmers to invest in land and water management.

[112] Extrapolated from the Rwanda agricultural survey 2006 and the PAD for the Rwandan rural sector support project in support of the first phase of the rural sector support program. Orders of magnitudes are confirmed by the DSS baseline national reports.

[113] According to SHER, 2002, in the Rwandan context, the word “marshland” has a larger meaning than an undrained valley. It can be indeed used to mean more or less *wet lowlands*.

However, some very small-scale plains irrigation schemes exist in the Kagera River basin, especially in the lower Tanzanian part of the basin where 288 ha are thus irrigated. The plateau and lowlands areas in Tanzania are indeed more adapted to plains irrigation than the Rwandan or Burundian hills and mountains. Figure 6.4 shows the major existing plains irrigation schemes in the Tanzanian part of the Lake Victoria basin: this map does not show if these irrigation schemes are still functioning but it notably shows the relative underdevelopment of the irrigation in the Kagera Region in Tanzania.

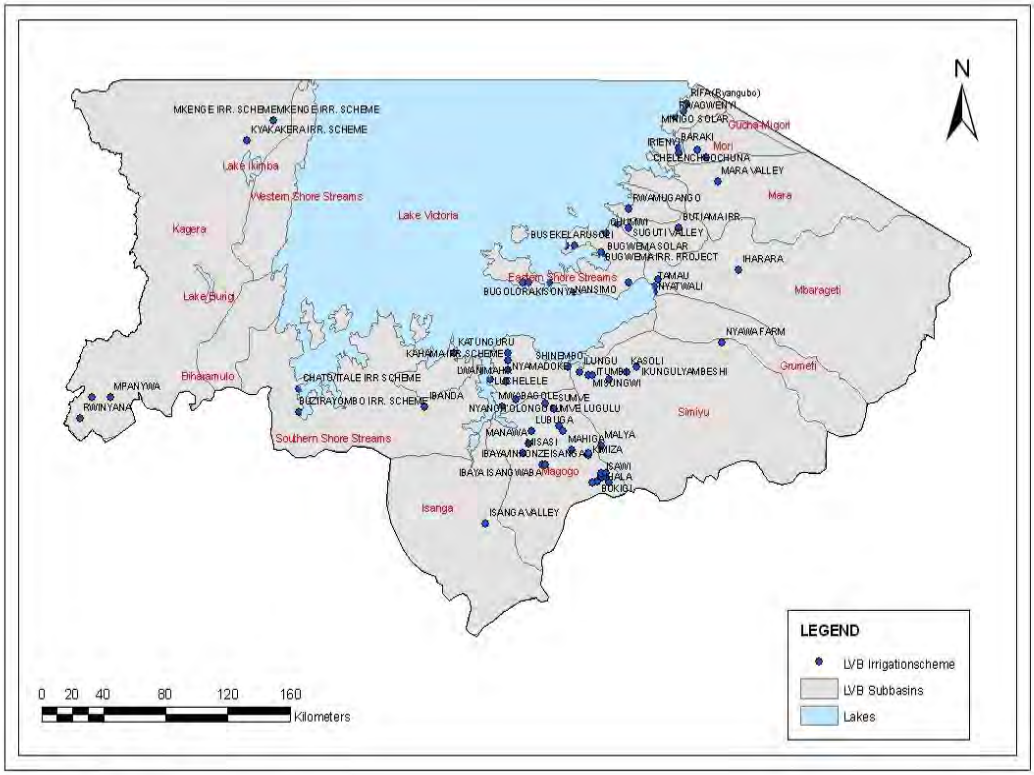

Figure 6.4 - Distribution of plains irrigation schemes in the Tanzanian part of the Lake Victoria basin[114]

The following table details these existing plains irrigation schemes. It shows that the plateau areas of the Ngara district are the only existing functioning plains irrigation schemes in the Kagera River basin Tanzanian part. The chapter on “development opportunities” will however deal with the huge potential of plains irrigation in this zone.

114 Source: Lugomela, Sanga, 2007.

Table 6.14 - Current functioning irrigation plains schemes in the Kagera River basin

District	Division	Name of area	Areas under irrigation (ha)
KARAGWE	Bugomora	Rwabi - Kagati	3
NGARA	Rulenge	Bigombo	56
		Rwinyara	4
		Mpangara	11
		Nyabihanga	8
		Bukiriro	14
	Bugufi	Ruvubu	12
	Kanazi	Mubuhenge	12
		Mzaza	150
		Ngundusi	10
		Murutabo	5
		Mukafigiri	3
Total			**288**

Sources: The Regional Commissioner's Office, Bukoba, 2003

Marshlands account for 165,000 ha and 120,000 ha respectively in the all Rwanda and the all Burundi, so that it is estimated that they account for around 250,000 ha in the Kagera River basin[115], of which only 50 % (125,000 ha) are cultivated [DSS Baseline assessment Burundi, 2007; PAD RSSP, 2001; Plan Directeur National de l'Eau du Burundi, 1997].

Consequently, *farmed marshlands* account for only around 6 percent of cultivated areas in the Kagera River basin. They are part of a production and ecological system that includes neighbouring hill-sides. Less than 20 % of these farmed marshlands have even been developed adequately to allow for improved farming practices, with decent infrastructure. The proportion of farmed marshlands irrigation with at least drainage infrastructure is however actually increasing with the support of the Rural Sector Support Project (RSSP) in Rwanda and a lot of other recent micro-irrigation projects as those financed, for instance, in the Burundian Gitega province by the ICRC (80 ha), the FAO (23 ha) or the PAPV/STABEX (30 ha)[116]. Rice is the main targeted crop of these irrigation development projects.

The land and water development in marshlands (improved farming practices with decent infrastructure) starts with the digging of narrow and sinuous drains. The cut grass and the cleared soil are put on the vegetation of remaining islands. These created land elevations form the basis for future cultivated land plots. The exploitation takes place during the dry season when the marshland is accessible and the land drainage works can start. But this land drainage can be blocked up if necessary, to meet crop water requirements during the dry season. Commonly the following general arrangement is put in place:

- A diversion dam with a water intake in the main stream axis is built upstream of the irrigated area;
- Head reaches start from the water intake and run alongside the slope intersection between the marshlands and the foothills (piedmont). They will eventually be used for additional irrigation in the dry season and as a protection ditch against runoff water;

[115] The Tanzanian contribution to the marshlands of the Kagera River basin is supposed to be very low (less than 500 ha) according to the LVEMP (Vol. 1, 2001).

[116] See development opportunities further for more information.

- According to the longitudinal slopes, water falls are constructed in the main stream to reduce the water velocity. When floods flow problems occur in the downstream direction, storage reservoirs are created to delay and spread the floods crossing over the time.

Figure 6.5 - Rwandan marshlands irrigation infrastructure in Kanyonyomba

Finally, apart from these (still very minor) previous agricultural activities, which try to concentrate irrigation waters, around 94% of the area of the Kagera River basin agriculture is rainfed-only. This represents about 2,070,000 ha situated on the entire Kagera River basin: hillsides, plateau or lowland areas. This agricultural system is characterized by traditional production techniques in utilisation of the resources of soil, water, labour and capital and the low level of use of modern inputs. This rainfed agriculture integrates polyculture (animal production systems) as a necessary food and revenue complement. Cultivation techniques are purely manual which requires a high labour force. Those characteristics lead to very poor performances [SPAT, 2004[117]]. The result is the very low value productivities estimated at less than USD 150 per person and per year.

Low agricultural productivity is the result of many of inter-related factors. Soil erosion is both one of the causes and one of the consequences of fertility loss, which has the effect to encourage farmers to over-exploit the available natural resources. However, there is evidence of some more progressive soil and water management techniques being used on the Kagera River basin: for instance, anti-erosion measures such as *terracing*[118] and *water harvesting*.

Implementation of *radical terraces* has mostly been financed by the World Food Program (WFP) and are used for steep slopes and are particularly efficient in the Kagera River basin where slopes as much as 100% are cultivated. Radical terraces are however appropriate for slopes between 20 and 50% and are formed by quite vertical talus reinforced by rocks or herbs and quite flat cultivable lands with irrigation and drainage facilities.

Gradual terracing consists in materializing contour lines on the hills. Herbs and shrubs are planted on these lines in order to constitute a quickset hedge which prevent from surface run off and associated soil erosion. [PGERB, 2002; Hategikimana, 2005]

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117 Republic of Rwanda, Ministry of Agriculture and Animal Resources. October 2004. Strategic plan for agricultural transformation in Rwanda. Main document. Draft version.

118 Figure 6.2, in the Karongi district, shows the use of terracing. The sentence describes this technique as a non-traditional one only because it is still not the main practice according to the Rwandan MINAGRI. Indeed, in many ways, terracing could be considered as a traditional practice.

It is however very difficult to estimate the actual proportion of radical and gradual terraces on the Kagera River Basin. If one consider the Rwandan case:

- according to interviews with MINAGRI authorities, 5 000 ha are radical terracing made (0.5% of the rainfed cultivated area) and 36 000 ha (4%) gradual terracing made;
- according to the National institute of statistics (Rwanda agricultural survey 2007), 35% of the rainfed cultivated area are radical terracing made and 12% are gradual terracing made.

The main conclusion of these differences is that the actual total areas and proportions of terracing are not known. The quantified areas are highly dependent on the criteria considered to distinguish with and without terraces. For example, one may consider that even a well constructed hedge contributes to the formation of gradual terraces. This monograph will not try to further determine precisely the proportion of terraces in the basin, but will focus more on the opportunities of soil conservation and protection. The statistic to highlight from the Rwanda agricultural survey in 2006 is that 100% of cultivated areas have received soil conservation actions in one form or other (terraces, anti-erosion ditch, hedges and fences, etc.).

Rainwater harvesting, in order to manage droughts during the dry season, especially on the hillsides, is a very rare practice on the Kagera River basin. It is however a key environmental intervention component of the NELSAP program in the Lake Victoria basin and one of the numerous agricultural development opportunities on the basin.

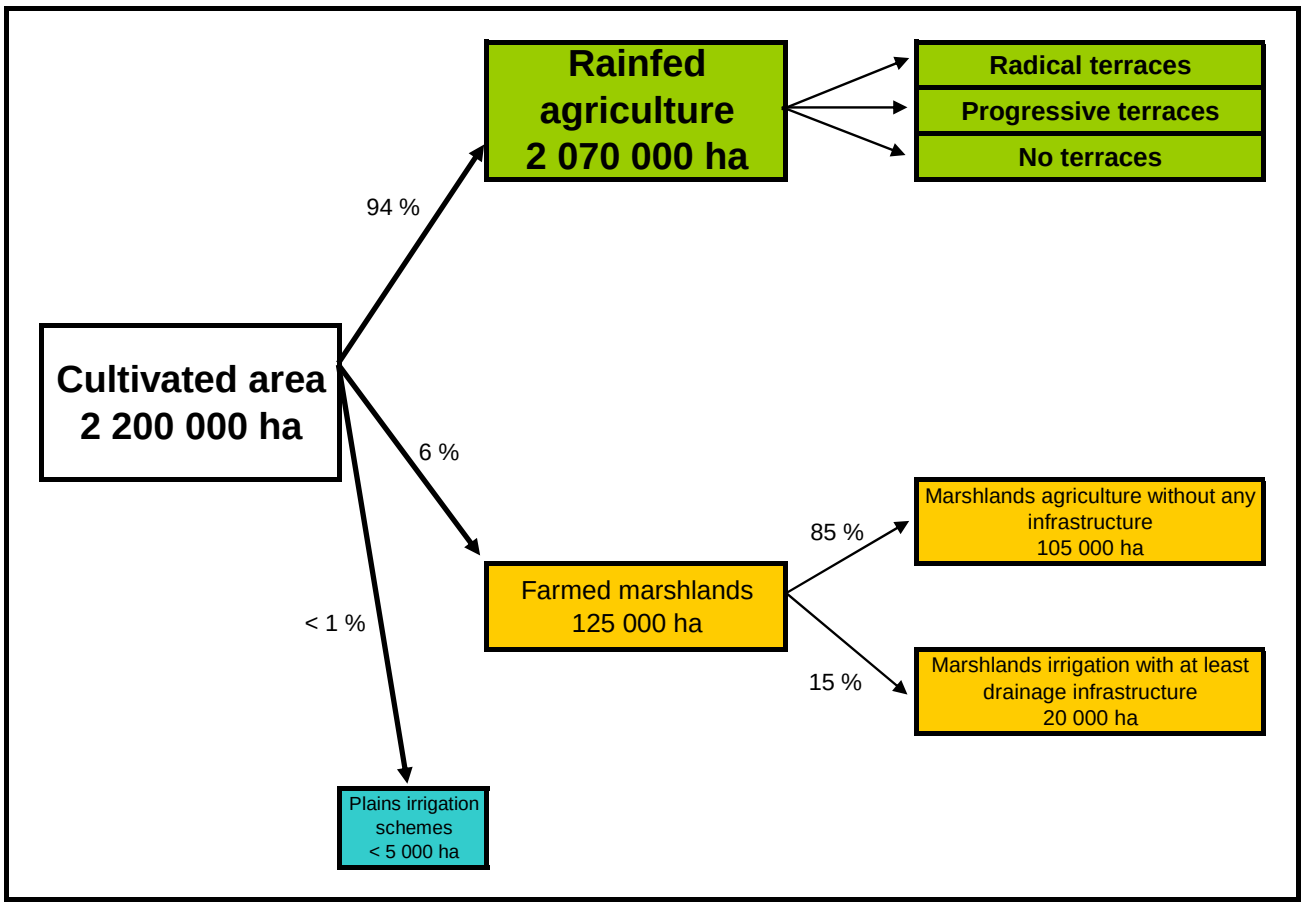


Figure 6.6 - Main agricultural practices on the Kagera River basin: a traditional use of water

6.3 Kagera basin agricultural development opportunities

6.3.1 Introduction: from a *subsistence* to a *market-oriented* agriculture

The Kagera River basin agriculture is primarily subsistence agriculture

As seen above, present cultivation practices are in most of the case directed to a subsistence-level food production. This situation is particularly the case in the upper parts of the basin[119] where:

- the population density can reach 600 people/km² in some provinces;
- the food crop density is higher than 80%;
- a large majority of the agricultural households have less than 0.5 ha;
- more than 99 % of the households practice traditional agriculture (in opposition with animal traction or mechanized agriculture).

The following table shows the size distribution of cultivable area per household in Rwanda, which is without any doubt close to the most representative of the upper Kagera River basin.

Table 6.15 - Distribution of exploitations in Rwanda, according to their size

Cultivated area	% of households
0,00-0,50 ha	54
0,50-0,75 ha	14
0,75-1,00 ha	11
1,00-2,00 ha	16
2,00-3,00 ha	3
> 3 ha	2

Sources: HYDROPLAN, 2005.

The self-consumption of the crop production is even not enough to satisfy basic nutritional needs of the population of the basin, and in most cases, no monetary surplus is possible for the agricultural household. This situation is illustrated by the coverage of nutritional needs in Rwanda, presented in the table below. Moreover, the infant malnutrition rate is 24% (2002). In some provinces such as Gikongoro, Kibuye and Butare, the malnutrition rate reaches 40% to 50% [SPAT, 2004, figures for Rwanda only].

Table 6.16 - Coverage rate of nutritional needs in Rwanda (% of basic nutritional requirements)

	1984	**1986**	**1987**	**1988**	**1989**	**1990**	**2000**	**2001**	**2002**	**2003**
Energy	92	90	79	81	74	71	78	80	96	93
Proteins	83	82.5	65	68	61	59	61	71	74	76
Lipids	14.5	15	12	13	11	10.5	12	17	25	27

Sources: BUSOKEYE, 2004

[119] case of the Ruhengeri province in Rwanda for instance.

For whom could "integrated" development lead to a competitive market-oriented agriculture

In light of the present high population densities continued reliance on subsistence agriculture does not create an appropriate basis for the evolution of future agricultural production in the basin. Producers' strategies rarely consider the internal and external market context[120]. However, the evolution of present sub-regional and international economic context (e.g. the broadening of membership within the Eastern African Community to include Rwanda and Burundi) will likely mean more and more open regional markets. Traditional subsistence agricultural production cannot be expected to compete efficiently in this regional open-market context. It will be still less able to position itself within the international marketplace, which is one of the EAC basin countries' objectives. It is therefore appropriate for the respective government authorities to adopt a proactive approach to agricultural development in order to avoid the risk that the basin's already low production deteriorates further. It is therefore necessary to act on all factors likely to generate quality transformations at the level of the production apparatus, regarding the behaviour of all actors and regarding the socio-economic at the economic environment.

According to the *Rwandan agricultural policy* document (IFAD, 2004), increasing the competitiveness of the agriculture cannot be a success without structuring measures such as institutional arrangements for sub-sectors coordination, development of quality norms, transport and logistical investments and reinforcement of private sector capacities.

The following paragraphs of this "opportunities" chapter are dealing with specific possible intervention themes, such as "intensification", "land tenure", "anti-erosion measures"… but the goal of this sub-section was to insist on the fact that only an integrated and community-based approach will enable a transition from subsistence agriculture to a competitive market-oriented agriculture.

6.3.2 A "Green Revolution" for the Kagera River basin - towards intensification

Agricultural intensification is a critical starting point in designing effective poverty reduction strategies

The *Green Revolution* is a term used to describe the transformation of agriculture that led to remarkable sustained increases in yields between the 1940s and 1960s. This transformation occurred as the result of programmes of agricultural research, extension and infrastructural development. However, it is considered that the Green Revolution, for many reasons, has not effectively reached Africa, whereas it was particularly efficient in Asia. In fact the tremendous productivity gains in Asian countries caused grain prices worldwide to fall 40 percent since 1950; consequently the situation was made worse for African farmers who had to accept lower prices even though their production costs remained high as they are still producing with the "old" techniques and technology. [FASID, 2003]

[120] except in the marginal cases of exportable crop production or food production surplus such as potato, rice, maize and passion fruit for example and to a small extent milk and meat.

Investments in agricultural extension in African developing countries, trying to reproduce the Asian Green Revolution, will not necessary lead to the same way of development, especially concerning the other economical sectors. But enhancing agricultural productivity is however a critical starting point in designing effective poverty reduction strategies, especially in low-income countries. [Christiaensen, Demery, 2007][121]

East Africa, including the Kagera River basin, is not an exception in the fail of the African Green Revolution. The following table compares the yields of some major crops between the Kagera River basin and China (see the crop descriptive above), which gives an order of magnitude for yield increase opportunities[122] in the Kagera River basin. It also shows that the cash crops yields are close to the Asian standards. According to Daniel C. Clay and al., the food crop yields have declined from the 1980s, especially the yield of tubers, the main source of calories for the poor.

Table 6.17 - Comparison of yields between the Kagera River basin and Asia.

	Kagera River basin (t/ha)	China (t/ha)
Bananas	2.2 to 4.5	24.3
Cassava	6.5 to 9	19.7
Sweet potato	1.9 to 6.6	21.7
Potatoes	2.7 to 8.6	15.0
Bean	0.7 to 0.9	1.3
Pea	0.5 to 0.7	1.2
Maize	0.8 to 1.7	5.3
Sorghum	1.0 to 1.4	4.5
Paddy Rice	4.0	6.3
Coffee green	0.2 to 1.0	1.6
Tea	0.8 to 1.8	0.9
Sugar cane and crop	29 to 90	64

Sources: FAOSTAT, 2007.

As demonstrated in the agricultural practices description part above, a large majority of the current cultivated area is rainfed on hillsides. Consequently, the adoption of modern inputs, including improved seeds adapted to climatic droughts should be the first vector of agricultural intensification on the Kagera River.

[121] This study concludes that the participation effect of agricultural growth on poverty is on average about 1.6 to 3 times larger than that of growth in other sectors.

[122] This is just a proof that yields are very low in the Kagera River basin and not a precise evaluation of yield growth expectancy because natural factors of production in China and East Africa are far from being equal.

Limited adoption of modern inputs such as fertilizer, improved seeds, and integrated pest management leads to inefficient crop production

Fertilizer

Great disparities exist between the different provinces of the basin and even within the districts of the same province as far as the fertilizer supply is concerned. These differences can be observed in the aspects of transportation, supply, training, farming, awareness, and motivation of the farmers. The explanation for these variations lies in:

- uneven fertilizer promotion throughout the countries, especially in the more remote areas (e.g. Tanzanian part of the basin),
- regional variation in the agricultural extension advice and training provided on fertilizer use,
- uneven farmer motivation regarding fertilizer use, and
- unequal current and past access to fertilizer supplies.

Compared with other countries, the fertilizer market supply is very limited in the Kagera riparian countries. Not only is its marketing secondary and occasional, it is also poorly organized. On the one hand, the total cultivable land area is shrinking with time in the Kagera River basin and on the other hand, these lands are becoming more and more infertile because of insufficient organic fertilizer use (see the chapter “one cow for one family”) and mostly because of the lack of chemical fertilizer. Most farmers do not own enough manure-generating cattle to cover their fertilizing needs. [ABT, 2002]

According to Dr. Balu Bumb, IFDC[123], economist and program leader for policy, trade and targets, “Fertilizer use in the Great Lakes Region is 3 to 4 kg/ha. In comparison, the world use is 93 kg/ha, and farmers in the "Green Revolution" countries of Asia use 100 to 150 kg/ha”.

A survey in Rwanda analysed the behaviour of the farmers regarding their fertilizer consumption between 1995-1999. [Kelly Valerie, 2001]. Only 12% of farmers have used inorganic fertilizers during this period. This leaves 88% of farmers who did not use the input from 1995 through 1999[124]. These farmers were asked to explain their reasons for not using the input. The results are summarized in the table below which shows the breakdown of responses by Prefecture.

Table 6.18 - Why farmers did not use inorganic fertilizers in Rwanda from 1995 through 1999 (% of non-users)125

	Butare	Byumba	Cyangugu	Gikongoro	Gisenyi	Gitarama	Kibungo	Kibuye	Kigali rural	Ruhengeri	Umutara	Rwanda
Don't know	41	22	78	50	56	84	76	39	27	60	41	53
High price	44	38	13	24	24	9	10	52	70	24	2	30
No credit	1	3	7	0	4	0	0	1	1	12	1	3
Not available	10	40	11	21	19	10	4	0	3	3	45	13
Other	5	31	2	6	2	1	10	8	0	1	18	7

Source: MINAGRI (FSRP/DSA) survey data, 2000.

123 International Center for Soil Fertility and Agricultural Development, 2006.

124 Interestingly this fact is contrary to the popular view that the rivers and lakes are polluted with nutrients through extensive use of fertilizers.

125 Some columns total to more than 100% because multiple responses were permitted.

The most common explanation for non-use (53% of the 88% who were non-users, which represents 47% of all farm households) was that they did not "know" fertilizer. We interpret this response to mean that although they have heard about inorganic fertilizers, their knowledge of the benefits and of how to use the fertilizers was not strong enough to stimulate use.

Improved seeds

The NORCONSULT 1976 study attributes firstly the low productivity of most of the crops to the lack of attention given to the seeds improvement. 30 years later, it is still a recommendation of agricultural programs within the basin, such as the Rural Sector Support Project in Rwanda: “Government efforts should focus on putting in place the conditions for making high yielding seed varieties to farmers. These seeds should be adapted to the local physical environment and resistant to diseases and pests. In this vein, the Institut des Sciences Agronomiques du Rwanda (ISAR) should focus its attention on producing the foundation seeds and transfer them to seed farmers for multiplication. Following this multiplication, MINAGRI should certify the seeds to ensure high quality before they are sold to paddy farmers.”

The box below shows that (e.g. maize in Tanzania) farmers are not reluctant to using improved seeds, but that the “improved seed market” is not well adapted.

Case of Maize crop in Eastern Africa [De Groote, 2002]

As seen in the descriptive crop part, maize is one of the 3 main crop productions in the Tanzanian part of the Kagera River basin. It is also, by far, the main cereal crop.

Farmers are, in most areas of East Africa, not reluctant to using improved varieties of maize. There do not seem to be strong cultural views against using these improved varieties. Likewise, farmers appear to be willing to use fertilizer. We do observe, however, that the adoption process has basically stalled in Tanzania. Much of the improved seed that is used, especially in Tanzania is recycled and come from old varieties. Thus, not all of the benefits of hybrid seeds are being realized. A recent survey of literature on recycled maize seed use concludes that “while advanced-generation hybrids may not perform as well as crops grown from F1 seed, in many cases they significantly outperform the variety that the farmer was growing previously” (Morris et al. 1999). This suggests that farmers obtain some, but not all agronomic benefits from improved varieties. Using newly purchased seed would presumably increase output, but would also increase costs…

Moreover, any seed improvement should be linked to seed market oriented selection. This is one of the objectives of the “sector approach” recommended by IFAD in 2004, which aims to:

- enforce the agricultural professionalism and specialization;
- promote exportation crops and high yielding ad hoc crops and their regionalization in order to reduce production costs;
- facilitate the private participation to the cash crops sector.

Cash crops development [IFAD, 2004]

If the access to the international market could be developed, the Kagera River basin could have a great interest to develop its cash crop productions, well adapted to the region.

Coffee and tea are the priority cash crops in terms of production and of opportunities because it concerns more than 500 000 households in the basin and highly contributes to the farmers monetary revenues. Moreover, the recent emergence of coffee washing stations allows the production of very high quality coffee. The regeneration of old coffee trees and the seed and

techniques improvements are sector development opportunities. Tea plants and coffee trees have positive impacts against erosion.

Pyrethrum is cultivated in the North West of the Kagera River basin. After a decreasing period, this crop offers new opportunities thanks to the increase of the international market demand.

Exotic fruits such as *maracuya*, Cape gooseberry or bananas and flowers (particularly roses) could be exported if their production were intensified.

Pest management

The Kagera River basin agriculture faces important phytosanitary issues caused by ravagers or diseases difficult to manage in time (generally because of climatic hazards). The soil fertility and the agriculture practices also influence the incidence of crop enemies. For instance, the bean fly and the white worm particularly appreciate low fertility soils. The worst diseases and ravagers encountered on the Kagera River basin crops, by order of importance, are the mycosis (e.g. anthracnose or mildew), insects and mites, bacteriosis, virosis and adventitious plants. [Uwamariya Laurence, 1990]

Agricultural production losses (before and after the harvest) caused by pests are not well known. They are different according to seasons, years and provinces. In Rwanda for instance, FAO estimates them at 30%. Those losses could be reduced through pesticides use but according to the http://earthtrends.wri.org website, pesticide use intensities are the lower known in the world in the Kagera riparian countries with less than 0.2 kg/ha/year between 1990 and 2001.

6.3.3 Irrigation development opportunities

As seen in the description of the agricultural water uses, two kinds of irrigation may be distinguished. They both represent an opportunity of agricultural development and intensification, but globally in two different zones:

- plains irrigation potential in the lower basin, and
- marshlands irrigation potential in the upper basin.

The current trend in developing irrigation (plains and marshlands/wetlands irrigation) is low. It is estimated in Rwanda that around 1,000 ha of marshland/wetlands are developed each year by the Ministry of Agriculture adequately to allow for improved farming practices, with decent infrastructure. In Tanzania no new large-scale irrigation schemes on the plains are currently planned. It is thus possible to estimate that the current trend of progress of irrigation is only between 1,000 and 2,000 ha of marshlands/wetlands irrigation schemes each year, however there are large development opportunities particularly on the Tanzanian plains.

Plains irrigation

In the Tanzanian Kagera Region, the currently functioning irrigated schemes represent only 288 ha. However, this lowlands and plateaus area has a large potential for plains irrigation, estimated at around 24 000 ha.

The potential irrigated area is not easy to determine and the given figures really depends on the regional development plans. Consequently, the 24,000 ha potential given by the Regional Commissioner's Office in Buboka gives probably the more realistic development opportunities in the coming decades. However, it is important to notice that the irrigation potential was described as larger in the NORCONSULT 1976 study[126], especially because of the Ngono project (Bukoba District, 60,000 ha)[127], the Kyaka project (Bukoba District, 20,000 ha)[128] and the Kagera Sugar Company project (Bukoba district, 8,000 irrigated ha). Some of the Bukoba district plains irrigation projects which are plains irrigation projects in the basin using waters directly from the Kagera River, would be positively influenced by any reservoir dam project upstream, such as the Rusumo Falls and Kakono hydroelectric projects. The economic analysis of the prefeasibility study of the Kyaka project (1976) indicates that with a dam at Kakono the rate of return from irrigated agriculture would be about 15%, and that without a dam the return would be around 10%.

Such reservoirs could also have "direct" impacts on the basin irrigation development: 2,500 ha[129] of plains irrigation are planned to be directly linked to the Rusumo Falls reservoir for instance.

The existing and currently planned plains irrigation schemes in the Tanzanian Kagera region are presented in the following table, which shows the high potential of the Ngara Region and Bukoba districts. The Biharamulo district is not presented because its plains irrigation potential is situated outside the Kagera River basin.

126 NORCONSULT A.S. ELECTROWATT. 1976. Kagera River basin development phase II. Sectoral studies. General Agriculture.

127 H.P. Gauff. K.G. Consulting Engineers, 1974. Ngono Multipurpose Project Feasibility Study.

128 Prefeasibility study for irrigation development of the lands bordering the Kagera River between Kakono and Kyaka. 1976.

129 It may be anticipated that improved understanding of the value and locaion will be provided in the feasibility study for the Rusumo Falls multipurpose project presently underway.

Table 6.19 - Estimation of the plains irrigation potential in the Kagera River basin

District of the Kagera Region	Division	Name of area	Estimated potential area (ha)	Areas under irrigation (ha)
BUKOBA RURAL AND URBAN	Kagera Sugar Company		8000	?
	Kiziba	Nkenge	1 300	-
		Kajunguti	3 800	-
		Kyakakera	3 000	-
		Kanyigo	1 500	-
		Ruzinga	1 500	-
	Izinmbya	Kabirizi	1 000	-
	Misenyi	Kakindo	1 000	-
	Katerero	Bonde la Ziwa Ikimba	100	-
	Bukoba Districts total		21 200	-
MULEBA	Mshamba	Ngenge (Rukoma)	100	-
	Kimwani	Kyota	25	-
		Intunzi	200	-
	Kamachumu	Ruhanga	200	-
		Buyaya	100	-
	Muleba District total		625	-
KARAGWE	Mkwenda	Kagenyi	50	-
		Mwisa	240	-
		Kitototo- Site	140	-
		Kibwera – Site	60	-
		Rwabi - Kagati	30	3
	Karagwe District total		520	3
NGARA	Rulenge	Bigombo	80	56
		Rwinyara	40	4
		Mpangara	110	11
		Nyabihanga	150	8
		Bukiriro	35	14
	Bugufi	Ruvubu	120	12
		Kagera	550	-
	Kanazi	Mubuhenge	86	12
		Mzaza	150	150
		Ngundusi	100	10
		Murutabo	100	5
		Mukafigiri	30	3
	Ngara District total		1 051	285
TOTAL			23 896	288

Source: Regional Commissioner's Office, Bukoba, 2003 in the Kagera Region website; DSS Tanzania, 2007[130].

[130] The Mwiruzi scheme is only mentioned in the Tanzanian DSS Baseline report, not in the Kagera Region website. It is however just outside the Kagera River basin. The Kagera Sugar company has been added to the Kagera Region website data, and its potential irrigated area has been estimated as 8000 ha in the NORCONSULT 1976 study.

Marshlands irrigation

Given that the availability of suitable land for cultivation decreases and the population increases, the extension of agricultural exploitation of marshlands has become an obligation in the upper Kagera River basin.

The total marshlands area in the Kagera basin is estimated at 250,000 ha from which 50% (125,000 ha) are already cultivated, but only 20 000 ha have irrigation and drainage infrastructure. The agricultural development opportunities of marshlands are therefore double the present areas through:

- possibility of cultivation of new marshlands areas (potential: around 125 000 ha, but among them will be protected natural areas);
- possibility of intensification of the cultivated marshlands through irrigation infrastructure development (estimation of 20 000 more ha already planned by Rwanda and Burundi on the Kagera River basin [PGNRE, 2005]).

Current agricultural marshlands management faces the following issues on the Kagera River basin [SHER, 2002]:

- limited studies, with empirical formulas not necessarily adapted to the field, with not appropriately adapted crops and over sized drainage infrastructure;
- infrastructure designed for drainage but not for irrigation or integrated land and water management so that some former marshlands are not wetlands anymore, leading to environmental and biodiversity losses;
- lack of complementary upland soil conservation measures;
- lack of appropriate operation and maintenance caused by the above noted points and the limited management understanding and capacity of the users; and
- low productivity which does not encourage O&M: i.e. low inputs, traditional agricultural techniques and low agricultural extension services.

Rice marshland irrigation

Rice production is a priority crop for the Rwandan and Burundian governments. The rice production is considered as a high value-added crop, which is still an importation crop today in the Kagera River basin. According to the Government of Rwanda, August 2007, rice production is still very low. Of the targeted 66,000 ha identified for cultivation, only 13,000 ha are cultivated. The average productivity per hectare presently is about 4 tons compared to the targeted 7 tons. This low productivity is due to the reasons explained above. Among strategic interventions foreseen in Rwanda are the reclamation of 7,000 ha of marshlands in 2008 and the rehabilitation of water management infrastructure in existing marshlands.

Water availability

There are no relevant national statistics dealing with the water consumption of the irrigated areas in the Kagera River basin [SGI, 2005]. As a hypothesis, the maximum water withdrawal may be considered as 3 L/s/ha. It is however possible to consider a mean water consumption of 1 L/s/ha during 250 days if one considers restitution from drainage and water losses. The following table describes the main current and potential irrigation schemes and their estimated consumption.

Table 6.20 - Current and potential water uses for irrigation

	Source of water	Current cultivated area	Current cultivated area under irrigation infrastructure	Potential planned irrigated area	Potential irrigated area
Marshland irrigation	Diffuse in the upper Kagera River basin	125 000 ha	20 000 ha 432 Mm3	40 000 864 Mm3	?
Plains irrigation	Kagera River between Kakono and the mouth	> 5000 ha	0 ha 0 Mm3	10 000 ha 216 Mm3	> 50 000 ha 1 080 Mm3
	Diffuse in the lower Kagera River basin	?	288 ha 6 Mm3	23 000 ha 497 Mm3	?

Sources: this study, 2007; SGI, 2005 (PGNRE).

In comparison with the natural flow of the main watersheds of the Kagera River basin (around 5,000 Mm^3 for the Nyabarongo and 1 000 Mm^3 for the Mwogo-Nyabarongo), all those volumes are relatively low and will not be a limiting factor for the global basin irrigation development: especially for the total potential plains irrigation schemes close to the Kagera River between Kakono and the mouth.

However, on smaller watersheds inside the entire basin and for secondary rivers (e.g. in Kanyonyomba in the Umutara province), water shortages in the dry season or all along the year may appear as marshlands irrigation is developed: that is why water reservoirs are often necessary in conjunction with any irrigation infrastructure development. These reservoirs may also provide an important source of livestock watering in the dry season.

To conclude, whereas the Kagera River basin receives significant water resources, there is not always correlations between water availability and water needs or water access at reasonable cost; one of the current limitations for irrigation development in the basin. Moreover, even if the water is accessible (e.g. in the lower Kagera River basin), a basin-wide analysis at the Lake Victoria basin or at the Nile River basin scales should be undertaken to fully understand the larger impacts of potential water withdrawals.

6.3.4 Livestock: One cow for one family

The three most important dimensions of food security in a given region are:

- ensuring a safe and nutritionally adequate food supply at the household and regional level,
- a reasonable degree of stability in the supply of food from year to year, and
- ensuring that each household has physical, social and economic access to enough food to meet its needs.

Livestock play an important role in all these dimensions of food security. They make a contribution to food production through the provision of high value protein rich animal products. They indirectly support crop production through draught power and provision of manure. They stabilize food supply as they supply food all the year round in addition to being the most significant source of income and store of wealth for small holders thereby providing access to food all the time. This is crucial for the Kagera River basin which usually experiences food insecurity periods.

The presence of domestic animals and availability of animal products therefore contributes to food security to the population and livestock keeping is very important as it serves as a precautionary savings to farmers [Kessy, 2004]. Standard economic risk theory postulates that households with more savings will engage in higher-risk, more profitable activities since those households can deplete their savings or asset base when things go wrong. Using data from the 1998 household priority survey in Burundi, a study [Bundervoet, 2006] estimates the relationship between livestock holdings (accumulated savings) and crop choices (risky vs non-risky crops) for the whole of rural Burundi and finds the empirical results to be consistent with theory. i.e. Households with a higher value of livestock significantly reduce allocation to low-risk activities and increase investment in higher-risk, higher value activities (fertilizer use, maize, rice, etc.).

Consequently, facilitating the availability of dairy cattle is a policy option. This goes in line with strengthening veterinary investigation centres to carry out effective disease surveillance and early warning system, analyze, and process animal disease data as chicken and goat diseases were reported widely.

Under the title "*One cow for one family*", the Rwandan MINAGRI has proposed in 2005 a programme based on having a cow for every poor household in Rwanda. The number of families in Rwanda that do not own livestock is known and the entry point into the programme will be to sensitize beneficiaries into the concept of animal husbandry. The promotion of animal feeding based on cultivated pasture will form a major component of the program. This will also involve utilization of agricultural by-products, promotion of techniques of pasture conservation, utilisation of agricultural by products and management of water, its conservation and utilisation. Animal husbandry under zero-grazing is strongly recommended for Rwanda within the framework of integration of livestock production with agriculture. It is also recommended because of the low carrying capacity of the land that does not permit free range grazing.

The program of giving one cow per household is aimed at scaling up the success recorded by other initiatives like the one of Heifer Project International (see box below) which is currently operating in former Byumba, Ruhengeri and Kigali Ngari provinces.

Methodological note

Heifer Project International is a Non Governmental Organization that started in 2001 by giving cows in Byumba. Records show that to date 1102 families in the three provinces of Byumba, Ruhengeri and Ngari have received in calf heifers. The families that received the cows have sold 268 bulls bringing incomes to the population in the three provinces. This means that 1102 families are now keeping livestock in the three provinces. In addition 438 in calf heifers are waiting to be passed on to other beneficiaries. This initiative has led to an increase in the incomes of farmers, they have received more milk and their food security has improved. Four milk collecting plants with a capacity of 2000 litres each have been installed in Byumba, Ruhengeri, Buliza and Gasabo showing that farmers have entered into marketing economy. There is also a local cheese cottage in Rushaki Byumba. In one farmers' cooperative in Byumba known as Giramata which started in 2003, collected 321,000. litres in 2004. Apart from the cash income, they have been able to open up a veterinary drug shop for members where they obtain drugs for the animals. They have planted pastures along terraces which stop soil erosion and increase the crop yields in addition to the contribution made by manure in increasing soil fertility. Records show that of the 85 animals that have calved down, average milk production is 15 litres per day (range 6 – 34). This indicates a potential for increased milk production in the country.

Sources: MINAGRI, 2006. A proposal to distribute a cow to every poor family in Rwanda

Upscaling the Heifer Project International initiative in Rwanda?

This initiative only focuses on cattle but other initiatives have targeted other species more adapted to the development potentials. For instance, the very high population density in the upper Kagera River basin encourages small ruminant production in integrated crop-livestock production systems; e.g. Burundi has already experienced research activities on integrating sheep production with reforestation and palm-tree plantation systems. [Nsabiyumva I., ?]

To conclude, this monograph emphasizes the development opportunities of integrating livestock in other agricultural production systems. Of course, any such development should be linked with capacity building measures, oriented towards [IFAD, 2004]

- improving fodder quality and small stock breeds, as well as providing training and participative learning in improved production and marketing practices;
- improving community-based animal health and disease control by ensuring that vulnerable households have access to para-veterinary services and by reporting contagious animal diseases to higher-level animal health services;
- improving private sector delivery of inputs and processing facilities;
- empowering community committees to manage local development and contribute to policy decisions on animal health and management.

6.3.5 Land degradation control: an integrated issue

Soil erosion

Studies conducted in the mid-1980s (as detailed in sections 2 and 7 of this monograph), found that the average loss of surface soil due to erosion is 10.1 t/ha/year. Soil losses range from 21.5 t/ha/year in the Congo-Nile divide to 2.6 t/ha/year in the Bugesera area [The World Bank, 2005]. According to SHER (2002), the soil erosion in Rwanda has been estimated between 50 and 400 t/ha/year. In fact, data on erosion rates in the Kagera River basin are scarce, and from one source to another, the erosion is said to be low (10 t/ha/year represents less than 1 mm/year) or high (400 t/ha/year represents around 3 cm/year)[131].

Two main issues may be developed concerning erosion on the Kagera River basin:

- important river sediment load, from which a part finally enters into Lake Victoria,
- soil degradation.

Soil degradation is one of the causes of the low soil productivity in the Kagera River basin, which is itself one of the causes of soil degradation. Whereas the debate on the erosion rate is still open, by lack of measurement, all the observers agree that erosion in the Kagera River basin should not be tolerated[132], as it leads to any appreciable reduction in soil productivity not to mention significant negative downstream impacts.

“While there is an increased risk of soil degradation when land is put under cultivation, rural societies do their best to gradually build up techniques that will allow the long-term preservation of soil productivity (organic or lime dressing, drainage, multicropping). However, when new needs emerge too fast, a crisis will arise to which rural society cannot respond in time. And here the State must step in to help overcome the crisis by technical assistance (technical guidelines) and financial support (subsidies).” [Roose, 1996]. In the case of the Kagera River basin, the high population growth and densities (ref. Section 4) have created a rapid development of agricultural lands. Anti-erosion measures have been adopted at a large scale on the basin, but they have not been sufficient to inverse the trends of soil degradation, which inevitably leads to the vicious circle “more needs, more soil degradation”.

Except for the two planting periods, the countryside is green, as annual rainfall is usually good even if it is irregularly distributed. Erosion risk would therefore be moderate if the cultivated slopes were not so steep [Berding, 1992]. Two country-wide surveys indicated that 50% of the cultivated land is on slopes exceeding 18%, 20% on slopes exceeding 40%, 5 to 6% on slopes exceeding 65% (the limit for terracing), and 1% on slopes exceeding 84%.

131 The following table confirms these figures disparities according to the place of measurements.

132 In terms of erosion, tolerance was first defined as soil loss balanced by soil formation through weathering of rocks. This can vary from 1 to 12 ton/ha/yr, according to climate, type of rock and soil depth. However, it was very quickly realized that the productivity of the *humiferous* horizons, rich in biogenic elements, is far greater than that of *alterites*; weathered rocks which are more or less sterile. Moreover, this approach ignores the importance of the selective erosion of the nutrients and colloids that make soils fertile. Tolerance was then defined as erosion that does not lead to any appreciable reduction in soil productivity. [Roose, 1996]

Erosion risks are aggravated locally by two phenomena:

Land tenure problems (also see the following part on land tenure). The concern for equality in inheritance means that each heir receives an equal share of each section of land, which means in turn splitting the original plot into as many vertical strips as there are heirs. The result is that on densely populated hills (those farmed for a long time) very long, narrow plots are put under crops at the same time, which seriously increases the risk that sheet erosion will scour the soil right to the bottom of the slope. Once such scouring starts, it happens again each year in the same spots, because it is difficult to prevent runoff from flowing toward the lowest points in a field. The land is quickly ruined. Land tenure laws should be changed to encourage more sustainable forms of land transfer.

Landslides. If erosion control on a hill calls for digging total absorption ditches on slopes of over 40% or on shallow soils on a sliding alterite (schist, gneiss, micaceous rock or volcanic ash on granite domes), the slope is thrown out of balance. If a long series of storms waterlogs the soil cover (and especially if this is compounded by earthquakes), it can start sliding from one of these ditches, and continue down to the river, which can then be temporarily blocked by this mass of earth.

Experiments show how urgent it is to combine all available erosion control techniques in order to stabilize sloping land while also substantially increasing its productivity (see table below).

Table 6.21 - Erosion (t/ha/yr) and runoff (% of annual rainfall) on small plots (5 × 20 m) on steeply sloping (25-60%) ferralitic soils in Rwanda and Burundi

Plant cover	Treatment	Erosion (t/ha/year)	Runoff (K_{aar} %[133])
Bare soil	tilled parallel with the slope	300 to 550	10 to 40%
Manioc or potato, maize/bean or pea-sorghum, as companion crops	traditional hoe tillage	50 to 150 (300)	10 to 37%
Crops + idem + 200 trees/ha	litter 50 kg/tree/year	30 to 50 (111)	5 to 7 %
Idem + trees + hedges every 5 to 10 m	biomass	year 1: 7 to 16	10 to 15%
	3 to 6 kg/m²/year	year 4: 1 to 3	1 to 3%
Idem + trees + hedges	± covered ridges every 5 m	1 to 4	0.1 to 2%
Banana plantation	open, mulch removed (10 t/ha/year)	20 to 60	5 to 10% (45)
	complete, mulch spread out or in lines	1 to 5	0 to 2%
Coffee plantation or manioc	thick mulch (20 t/ha/year)	0 to 1	0.1 to 10%
Pinus forest, pasture, old fallow	(5-15 t/year of litter)	0 to 1	1 to 10%

Sources: Roose, 1996. Analysis of 250 reliable measurements of annual erosion on plots of 100 m² (20 m in length) fairly similar to farmers' fields.

[133] K_{aar} is the Average Annual Runoff, in % of rainfall.

This table indicates that:

- the risks of sheet and then rill erosion are very high on bare soil, varying from 300 to 550 t/ha/yr, depending much more on rainstorms than on slope; it would take only 5 to 10 years to remove the whole topsoil horizon (20 cm) at this rate;
- the risks of runoff (K_{aar} = 10 to 40%) can be serious on such steep slopes when they are poorly covered (as with degraded soil);
- traditional farming methods and intercropping do considerably lessen risks (C = 0.2 to 0.5), but not enough, since the tolerance threshold is no more than 1 to 12 t/ha/yr depending on soil depth;
- trees dotted among the crops do little to improve soil conservation;
- hedges of grass or bushes every 10 metres, plus large ridges covered with pulses or sweet potatoes every 5 metres, do constitute a valid preliminary solution;
- mulching (tested under banana, coffee or cassava) is a second solution which is immediately effective even on steep slopes;
- reforestation with pines (needle litter being very effective) or other species allowing an under-storey quickly reduces runoff and erosion to acceptable levels [Roose, Ndayizigiyé, Sekayange, 1992];
- farming methods - not just erosion control structures - play the major role in stabilizing slopes.

“In conclusion, the verdant landscapes can give an impression of stability to busy experts who are used to the gullied, bare land of semi-arid regions. In reality, however, the soil is very poor, very steep slopes of 60 to 100% are cultivated out of necessity as land is short, rain is excessive at some periods and scant at others, and the cover provided by crops on the most degraded land is too light to protect the soil from the various erosive processes in the Rwandan hills (see figure below).” [Roose, 1996].

The following figure 6.7 represents the main different erosion types, i.e.

(i) Soil degradation: decrease of organic matter, fertility and infiltration

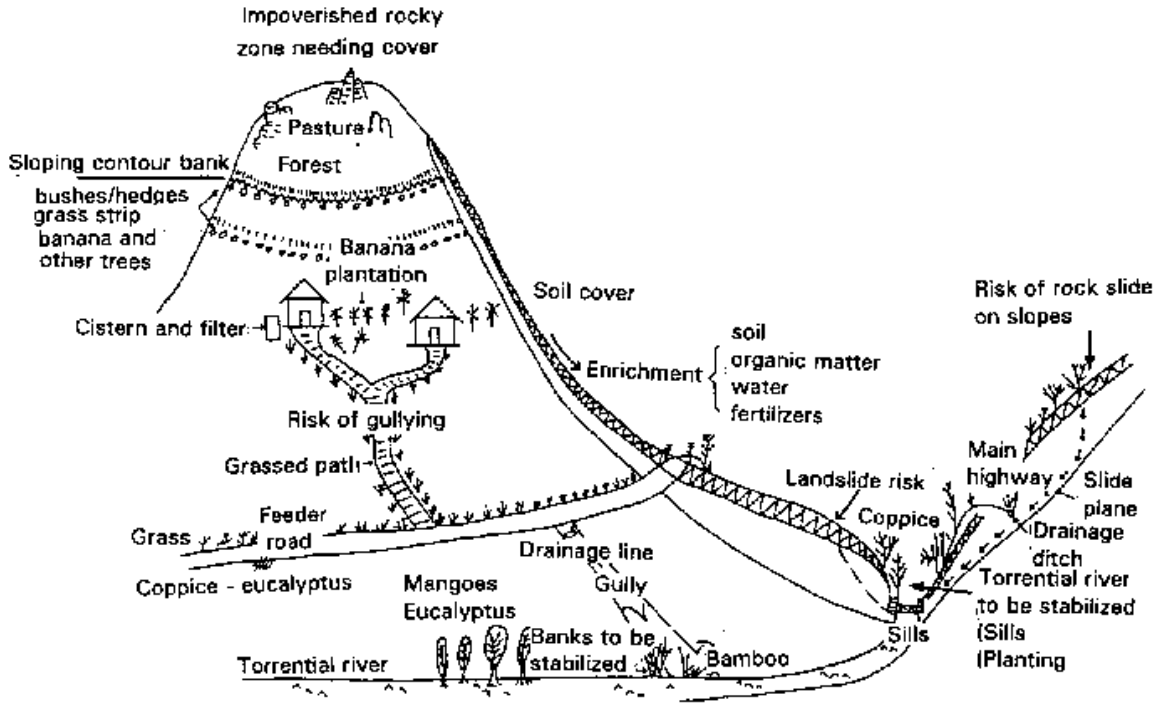
(ii) Sheet and rill erosion

(iii) Dry mechanical erosion: creep erosion

(iv) Gullying (tracks) serious accidents downstream

(v) Landslides (mud flows, flooding)

(vi) Shifting of torrent channels



Sources: Roose, 1992.

Figure 6.7 - Six processes leading to rural environmental degradation of a quartzite/schist hill

But if the verdant landscapes give an impression of stability, it is also because of global adoptions of some anti-erosion measure by the population[134]. The cases of Rwanda and Burundi are particularly striking: despite very acid soils and slopes of over 30-80%, families manage better on a single hectare than in the Sahel for instance [Roose, 1992], so long as they intensify their production systems, practice intercropping, plant trees, stable stock, quickly recycle all wastes, and stop the bleeding of nutrients through erosion and drainage. At present the hills hold many gradual terraces for instance. There is also an erosion control technique traditionally used on steep slopes, especially for growing peas on schist and in the highlands in the very upper Kagera River basin [Nyamulinda, 1989]. It consists of micro-step terraces 1 metre wide, cut into the slope, preserving the root systems of clumps of grass. And there are even more and more radical terraces, which are not traditional but efficient on steep slopes and part of the Rwandan, Burundian and Ugandan agricultural development plans.

Some production systems can keep erosion at an acceptable level: mulching under coffee, banana or cassava, large contour ridges with permanent plant cover, green manure covering the soil surface, reforestation with species that provide good litter. Radical or gradual terracing (1000 and 100 days' labour respectively) and other erosion control structures are less effective than biological systems (grassed banks, hedges, etc.) and require more upkeep and space. Moreover, some of these methods are not well adapted and gradual terraces for instance can increase risks of gullying and landslides where the soil cover is thin or the slope too steep (> 40%). At present the hills hold many gradual terraces which are too wide between banks which are too steep or even undermined at their base. After 5 to 7 years, the lower part of the terrace has filled out with fine soil, while the upper part is scoured and tends to become sterile: intervention is required.

[134] According to the Rwandan agricultural survey 2006, 100% of agricultural households have adopted anti-erosion measures (from radical terraces to anti-erosion ditch).

Agroforestry

This method can considerably boost biomass production on cultivated fields. Two hundred trees (*Grevillea robusta, Cedrella serrata, Polyscias fulva*, etc.) planted in or around fields can produce enough firewood for the whole family, plus 1 to 4 t/ha/yr of leaves and twigs very useful for mulching.

If the soil is neither too acid nor too deficient in phosphorus, the shrubs chosen for hedges can fix nitrogen from the air. Depending on author and site [Balasubramanian (1992) in the eastern savannah, König (1992) and Ndayizigiyé (1992) around Butaré on the central plateau], cutting the hedges three times can bring up to the soil surface: 75 to 130 kg/ha/yr of nitrogen, 2 to 20 kg of phosphorus, 20 to 60 kg of potassium, and similar amounts of calcium and magnesium, depending on the richness of the soil in these elements an input of minerals close to that from 10 tonnes of farm manure. Apart from the litter provided by 200 trees per hectare, it is clear that agroforestry can make a considerable contribution to the organic and mineral balance of the soil in two ways: by significantly reducing nutrient loss through erosion and drainage, but also by extracting nitrogen from the air and through the uptake of nutrients carried by drainage beyond the reach of the roots of annual crops.

According to Roose (1996), agroforestry (e.g. 200 trees per hectare plus hedges every 5 to 10 m) can control erosion (1 to 3 t/ha/yr), produce fodder and mulch (4 to 10 t/ha/yr) and take up nutrients from deep in the soil, with a reasonable amount of work (10 to 30 days per year). Animal husbandry can enhance the benefit of this biomass, since dung is one of the keys to fertilizing ferralitic soil, which is like a sieve. Moreover, the agroforestry development, as seen in the Forestry section above, is perfectly well adapted to the rural community.

Water harvesting

Water harvesting can be defined as the collection of water for (i) its productive use – crop, livestock, forest and (ii) reducing the run-off and the associated soil erosion. Water harvesting includes a sample of methods used to improve the use of rainwater at a specific site before it leaves a geographical region/space.

Methods used include: (i) those that improve the infiltration of water into the soil, (ii) technical implementations that prolong the duration of occurrence of the water on the spot of infiltration and (iii) means of storage of water which can be tapped over time (like gutters + cisterns, etc.). Water harvesting is however not a widespread technique in the Kagera region, but it represents a real development opportunity.

Conclusion

The following figure shows some adapted agricultural techniques to different erosion threats: (1) rainsplash and rills scouring of topsoil; (2) rainsplash, rills gullies, compaction of tracks; (3) undermining of banks by river, gullies and mass sliding; (4) deposits with very irregular texture: gravel-sand, clay-peat - drainage necessary and (5) torrential river with very varied flows and solid loads.

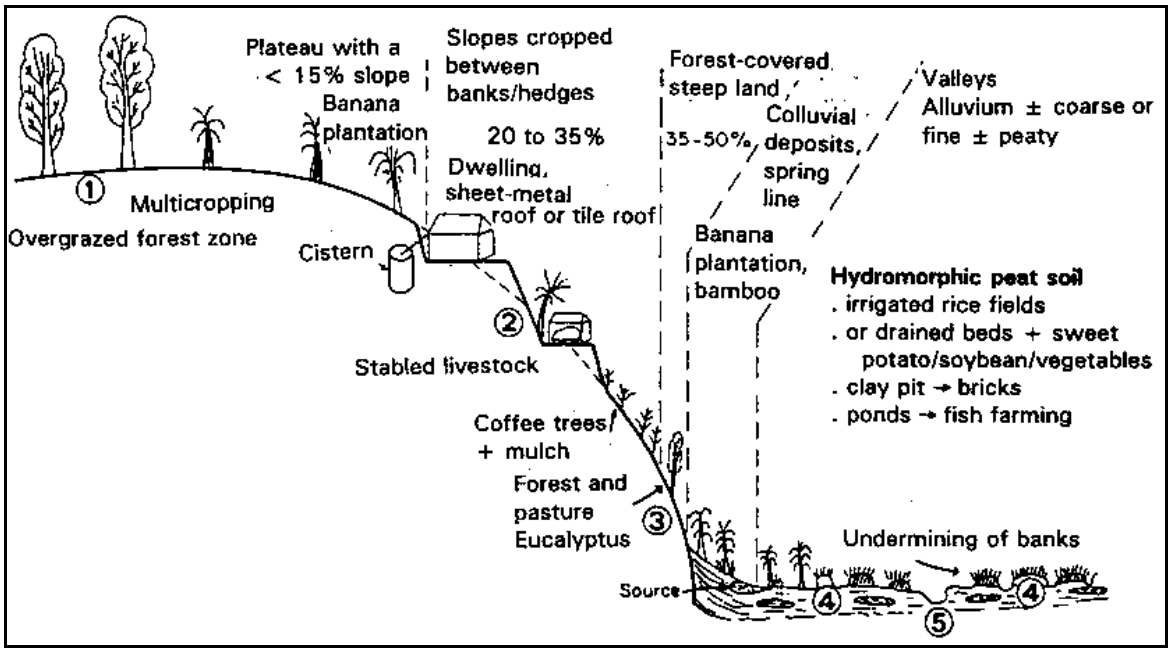


Figure 6.8 - Erosion risk and suggested improvements for the granito-gneissic hills of the Kagera River basin[135]

However, if the challenge of increasing agricultural production at a higher rate than the population growth in the erosive soils of the Kagera River basin is to be met, anti-erosion measures are not in themselves enough. Rather they must be proposed and implemented as part of a technological package comprising management of both water and soil: cisterns, hedges, organic fertilization (mulching, green manure and improved farm manure) with the necessary inputs.

6.3.6 Land tenure

It is well known that clarification and improvement of land tenure laws, and the provision of greater land security, are essential in order to protect this asset base for the poor, and to promote productive and sustainable farming. The approach to land tenure varies from country to country and includes freehold tenure, state leasehold and community-based tenure (legally recognized indigenous tenure and community-based). A combination of freehold, state leasehold and community-based tenure prevails in Uganda, Tanzania and Rwanda. In Burundi, freehold and community-based tenure, including pastoral systems, occur extensively.

Table 6.22 - The following table shows the land ownership categories in the Kagera River basin

	Customary laws	Government's certificates
Burundi	100%	
Rwanda	>90%	<10%
Tanzania	84%	5%
Uganda	80%	<20%

Sources: Republic of Rwanda, 2004; DSS Tanzania, 2007; Burundian monographs, 2006; Land and Equity Movement in Uganda, 2004.

In this context, “land access” is the operative expression, since there is no concept of private property in Burundian law, and only very few governments’ certificate of ownership delivered in

[135] Source: Roose, 2002.

the other countries. Land tenure was, and remains, a complicated matter, largely defined by the length of time an individual has occupied the area, and is certainly influenced by political disposition. The all-powerful patronage endowed to politically connected individuals has even legitimated ownership of more than one piece of land. The legal and regulatory vacuum for registering formal land use has allowed the abuse of political power to continue unchallenged. For example, governors on the commune level often allocate land to individuals without communicating this to the central competent administration, who would in turn allocate that very same tract to someone else. If we consider that land 'ownership' in the sense of access is passed on from father to son, it is unsurprising that the struggle to secure tenure is also passed down the generations.

Add to this already volatile mix of factors is the steady return of thousands of Burundian and Rwandan refugees, soldiers, released detainees of the *gacaca*[136] process and IDPs (internally displaced people) with equal, if not more tenacious, claims to their 'piece of earth', creating what the ICG (International Crisis Group) described as a land 'time-bomb'. Complicating the matter further is the fact that some of these refugees fled Burundi or Rwanda as far back as 1972, and now face an arduous process of claiming rights to their lands. The problem is compounded by the existing *Imidugudu*[137] policies of the Rwandan government and future uncertainty about the land tenure law and associated policies [Clingendael Institute, 2002].

Moreover, gender inequality is particularly manifest on the issue of land. According to customary land tenure, subdivision can only be done between male heirs and women have no inheritance rights. This is because a woman was traditionally expected to leave her parent's home upon marriage, after which she would work on her husband's land. But the practical reality of post-conflict is not amenable to this neat categorisation. Widows make up a significant percentage of the upper Kagera River basin population (two-thirds of IDP households are headed by women and children). Yet, despite their strong involvement in the economy, women have been relegated to the margins of society through their socio-legal status.

The prevailing land scarcity and demographic pressure make land into a highly sensitive issue along ethnic, intra-ethnic and class-lines. Improper land use and management systems lead to erosion and deteriorating land quality (see paragraph on erosion above), while rural productivity remains at low subsistence levels. Any agricultural transformation program would have to deal with land reforms, with both redistributive reforms and land tenure reforms to make sure that all the population (both men and women) enjoy the same rights on land, to improve the value of the land and promote investment and to contribute to sustainable land use and management. Any land reform will be an engine of the development and will play an important role in enhancing peace and equity. It will definitely have a role to play in the process of poverty reduction in the Kagera River basin. [Rurangwa, 2002].

[136] *Gacaca* is a community-based justice system especially established to try alleged *genocidaires*.

[137] *Imidugudu* is the term for the Rwandan 'villagisation' process.

6.4 Conclusions and recommendations

We reiterate that “The most effective way to reduce poverty, and thus achieve the stability goal, is to raise the productivity and expand the employment of resources that rural poor own or depend on for their livelihood, primarily land and labour” (World Bank, Rwanda RSSP, 2001).

6.4.1 Strengths and weaknesses of the agricultural sector

Strengths and weaknesses of the agricultural sector in the Kagera basin are summarized below. Some weaknesses are repeated to indicate that hey are part of a vicious circle:

Strengths	Weaknesses
Governance: national governments are all putting in place sound policies and financial frameworks to enable agricultural transformation in the region. This is encouraging foreign (IFIs, donors, etc.) and private investment. **Climate:** notwithstanding concerns about climate change and frequent occurrences of droughts, etc. climate and rainfall is generally favourable for agricultural production in the region. **Knowledge:** the use of traditional techniques may also be a weakness, but it also can facilitate improvements where traditional anti-erosion techniques, traditional irrigation techniques, high cash crop productivity. **Land and water:** although limited, and mismanaged in the past, the agricultural potential of land and water in the Kagera basin is a significant asset to the population. **Human resources:** the high population density is obviously a weakness, but also a strength as there is plenty of labour force (especially young people) that could be harnessed with good management to enable more intensive and high-value agricultural production in the region.	**Low productivity.** Traditional techniques. Low use of inputs. Low access to the market, to agricultural extension services. Continued land degradation and loss of soil fertility. Weak agricultural research, extension and other services. Limited major irrigation development where feasible – e.g. Tanzania. Shocks like droughts, wars or diseases. Environmental degradation. **Environmental degradation.** Deforestation and the absence of reforestation activities. Wetlands exploited and degraded. Water hyacinth growth. Unclear agricultural economic policy and regulatory environment. Low productivity. **Human pressure.** Continued reliance on subsistence livelihoods – too small plots for food security. Land tenure issues. Environmental degradation.

6.4.2 An integrated and community-based watershed management programme

We believe the most effective approach to supporting improved agricultural development for the Kagera River basin is through an integrated and community-based watershed management programme summarized below. The key elements of such a programme include (ref. Mekong River Commission, 2007):

- governance and policy making,
- institutions and institutional development/capacity-building,
- planning,
- implementation, and
- monitoring and evaluation.

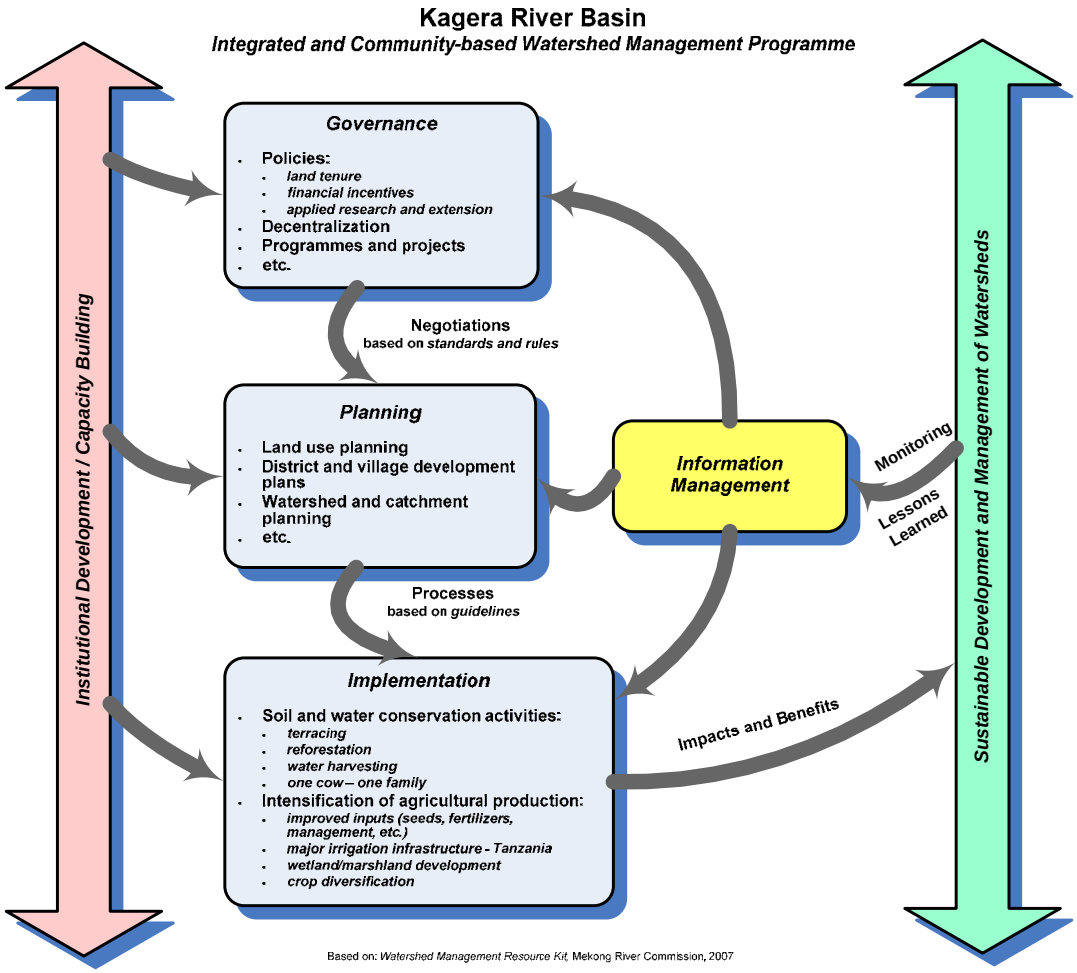


Figure 6.9 – Kagera River Basin – Integrated and Community-based Watershed Management Programme

The types of interventions proposed in such an integrated and community-based programme are extracted from the strengths and opportunities identified in the previous section. These are summarized under the following sections as follows:

6.4.3 Policies for improved agricultural productivity

Policies, established through governmental organizations are essential to support agricultural-based development. These include:

- Resolving land tenure issues through putting in place appropriate land tenure legislation and policies - in the respective countries – a complex subject - through appropriate policies and regulations, thus enabling landowners to take a long-term and thus more sustainable view to land and water management;
- Providing appropriate financial incentives through appropriate taxation, credit schemes and/or insurances services for the implementation of activities and adoption of techniques and technologies; and
- Political and financial support by national governments, and perhaps regional institutions (e.g. FAO, IFAD, river basin organizations, EAC, etc.) to applied agricultural research and agricultural extension services provided by relevant government ministries.
- Agricultural market development - facilitating access to services for producers.

6.4.4 Soil and water conservation activities

Programmes for community-based integrated watershed management at the catchment level – i.e. linked to villages and farmer organizations. Such activities would need to be supported by sound knowledge (supported by local research activities) and qualified and knowledgeable agricultural extension personnel based in the communities. A programme of soil and water conservation activities in the Kagera River basin could be implemented under the overall guidance of technical staff situated in a transboundary river basin organization. This technical group would have a mandate to plan and coordinate such activities ensuring consistent policies and implementation approaches based on sound integrated water management techniques.

A programme to consider is soil conservation works including terracing, reforestation and water harvesting. It is estimated that about 2 million ha of land are susceptible to soil erosion. A programme directed at improving around 9,000 ha/yr (2,000 ha of radical terraces, 2,000 ha of gradual terraces and 5,000 ha of reforestation/agroforestry) appears seems feasible. This programme is linked to the development of irrigation schemes in the lowlands downstream (see the intensification of agricultural production).

In addition to providing benefits to the people directly affected, such a programme will provide significant downstream environmental benefits through reducing sedimentation and nutrient loading, an argument can be made to international financing institutions and/or downstream riparians to encourage cost-sharing (i.e. subsidizing) such activities.

6.4.5 Intensification of agricultural production

A variety of opportunities exist for improving existing agricultural production through the following programmes of intensification:

- **Improved agricultural inputs**: Intensification of agricultural production will be through implementation of a wide variety of programmes, also supported by qualified advisors from governments or NGOs. Efforts would be directed at providing the necessary higher-productivity inputs already available (e.g. seeds, fertilizers, pesticides) and associated incentives for their adoption (education, financial, etc.).
- **Major irrigation development activities**: The Kagera basin has some locations with soils and available water supplies (some of them to be developed under major hydropower schemes on the Kagera River mainstream) that would enable implementation of relatively large-scale (as much as 20,000 ha) irrigation infrastructure – mainly in the Tanzanian portion of the basin. The feasibility of these projects must be assessed in relation to these hydropower projects, including, for example, an additional 2,500 ha linked to the Rusumo Falls project, and the soil types and interests of the relevant land-owners and farmers to take up this opportunity – if feasible.
- **Wetland/marshland development**: Of the approximate 250,000 ha of wetland/marshlands in the Kagera River basin, some 125,000 ha are presently being farmed. Improvements have been made to some 20,000 ha, leaving an opportunity to improve an additional 100,000 ha with irrigation and drainage improvements. However, during the following 20 years, a rate of 2,000 ha of marshland irrigation development per year seems the more feasible. Such activities would need to be carried out with due care provided to the management of these organic soils, minimizing negative impacts and seeking to maintain the existing environmental services (e.g. water quality improvement, and even waste water treatment) that these wetlands offer.
- **Rural incomes diversification:** There are 2 proposed aspects to this programme:
  - *Crop diversification:* There are opportunities to move from subsistence agricultural production to more market-oriented activities. Some of these (e.g. coffee and tea) would also offer improvements to soil and water management at a basin level. Transitions to market-oriented cropping would need to be guided by sound government policies, a stable economic environment, and financial incentives through appropriate credit, or micro-credit schemes.
  - *Livestock ownership development:* Implementation of the “one cow – one family” – or similar multiple-benefits programmes. This programme would require provision of appropriate financial incentives through limited subsidies, or implementation of a micro-credit scheme directed at enabling farm families to take advantage of this approach.

6.4.6 Financial incentives

We believe that improved agricultural productivity is possible with the provision of appropriate governance and financial incentives. Financial incentives could be provided through the following approaches:

- **Grants and loans**: When it comes to major infrastructure projects such as hydroelectric schemes and large-scale irrigation systems, international financing institutions (IFIs) can be attracted to participate with national governments in direct grant and/or loan support directed towards their implementation. IFIs are more easily convinced to participate in such investments if they are implemented under the umbrella of sound technical approaches and with broad stakeholder support. This is where transboundary river basin institutions can facilitate.
- **Subsidies**: It may be appropriate to subsidize certain types of development activities due to either regional or even global benefits. For example, upstream soil conservations activities (as noted above) may provide important downstream benefits, which are worthwhile to subsidies either at the national (governmental) or international (through IFIs, donors, etc.) levels.
- **Credit and micro-credit**: Ideally farmers and agricultural producers should be willing to directly finance improved agricultural productivity; however, often such financing is not available to poor, and often land-less individuals. Establishment of appropriate credit/micro-credit schemes implemented through governments or qualified NGOs. According to SHER (2002), there is good potential building on existing capacity and experience to expand local credit schemes due to the presence of societies of saving or credit with collective guaranty, and various rural multiplicities of rural group investment schemes at the district level, etc.
- **Insurance mechanisms**: The Kagera River basin faces pervasive risks and shocks, including drought, health, economic and political shocks. The poorest households are typically those least able to cope with such shocks because of their inability to accumulate assets and because they often have no access to market insurance. However, the proposed intensification of agricultural production will necessarily require more investment (with the financial incentives described above) and consequently more risks. Any insurance mechanism would facilitate the adoption of intensification measures and also reduce the impacts of inevitable shocks.

6.4.7 Recommended programmes and financial requirements

Over the next 20 years, international and regional investments totalling some USD1,790 million are possible. Detailed assessments and studies of each of the proposed programmes is required.

Table 6.23 – Agriculture, Livestock and Forestry in the Kagera River Basin - Summary of Potential Investments

Agriculture, Livestock and Forestry	**1789.8**
Soil and water conservation	**329.6**
Terracing	
Radical terraces (40 000 ha)	*142.4*
Gradual terraces (40 000 ha)	*67.2*
Water harvesting	70.0
Reforestation / agroforestry (100 000 ha)	50.0
Intensification of agricultural production	**1109.8**
Improved / modern inputs	20.0
Plains irrigation schemes (20 000 ha)	100.0
Plains irrigation schemes linked to Rusumo falls dam (2500 ha)	*20.0*
Marshlands irrigation schemes (40 000 ha)	400.0
Livestock development and rural incomes diversification	
Buy animal	*518.0*
Accompanying measures	*51.8*
Policy support - training / capacity building	**350.4**
Agricultural research	40.0
Agricultural extension	
On the new agricultural areas	*70.4*
On the other agricultural areas	*160.0*
Agricultural market development, proximity services to producers	40.0
Rural financial systems and agriculture credit development	40.0

Methodological Note

This note provides the assumptions underlying Table 6.23.

Soil and water conservation

Terracing

Radical terraces (40 000 ha)

According to interviews with Rwandan MINAGRI authorities, 5 000 ha are radical terracing made and 1 000 ha of radical terraces can be built each year. We have consequently supposed that 2 000 ha of radical terraces could be built each year on the Kagera River basin. The cost of one hectare of radical terraces is estimated to be 3 000 USD the first year and 160 $ / year of fertilizer the four following years.

Gradual terraces (40 000 ha)

The same rate of 2 000 ha/year has been used. The cost of one hectare of radical terraces is estimated to be 1 000 USD the first year and 160 USD / year of fertilizer the four following years.

Water harvesting

The cost estimation is based on the need for water for the livestock development program. It is estimated that a 100 m3 reservoir costs 2 000 USD and can be sufficient for the needs of 20 cows. So that 50 000 cows per year (see the diversification programme) would represent around 5 000 000 USD / year, or 2 500 * 100m3 reservoirs per year, of water harvesting investment, during 14 years (see the diversification programme).

Reforestation / agroforestry (100 000 ha)

We have estimated that when 700 ha of irrigation schemes are built in the lowlands, around 2 000 ha of upstream hillsides must be protected. According to the following irrigation plans (see below), around 180 000 ha of hillside must consequently be protected, including 80 000 ha of terraces (see above). Consequently, around 5 000 ha will be reforested (with agroforestry development) each year, at an estimated cost of 500 USD / year.

Intensification of agricultural production

Improved / modern inputs

Based on the consultant experience on similar programme, the cost of an improved/modern inputs programme (fertilizers, seeds, pesticides) has been estimated at 2 000 000 USD per year during 10 years.

Plains irrigation schemes (20 000 ha)

According to the Tanzanian Ministry of Agriculture, 20 000 ha are planned to be irrigated in the Kagera River basin. We have thus estimated that 1 000 ha of plains will be irrigated each year during 20 years, with a mean cost of 5 000 USD / ha.

Plains irrigation schemes linked to Rusumo falls dam (2500 ha)

In 1986 [Commission Economique Pour l'Afrique, 1986], 2 500 ha were forseen to be linked to the Rusumo falls dam project. The estimated cost was 8 000 USD / ha, which represents thus a hard investment of 2 500 * 8 000 = 20 000 000 USD spread on 3 years.

Marshlands irrigation schemes (40 000 ha)

Currently, Rwanda is converting 1 000 ha of marshlands into marshlands irrigation schemes each year. We have consequently estimated that 2 000 ha of marshlands could be converted into marshlands irrigation schemes. The unit cost is higher than for plains irrigation schemes and is estimated at 10 000 USD / ha. Consequently, during 20 years, the marshlands irrigation schemes invesments are 20 000 000 USD / year.

Livestock development and rural incomes diversification

Livestock development is only a part of a possible integrated rural incomes diversification project. However, we have used the costs for a possible "one cow for one family" project at the basin scale in order to estimate the possible costs of any global rural incomes diversification project.

Buy animal

700 000 cows should be bought by the project "one cow for one family" at the basin scale, during 14 years. That represent a hard investment of 37 000 000 USD per year.

Accompagning measures

The soft costs for such a project can be estimated at around 10 % of the hard ones, i.e. 3 700 000 USD per year.

Policy support - training / capacity building

Agricultural research

Based on the consultant experience on similar programme, the cost of an agricultural research programme has been estimated at 2 000 000 USD per year during 20 years.

Agricultural extension

On the new agricultural areas

The cost of the agricultural extension on the new agricultural areas (terraces, agroforestry, irrigation schemes) is estimated at 10 % of the hard cost, spread on the 5 following years. This represents thus a total of 70.4 millions USD shared on 20 years.

On the other agricultural areas

The cost of the agricultural extension on the "old" agricultural areas (existing terraces, existing agroforestry, existing irrigation schemes and all the other existing cultivated areas) is estimated at 8 000 000 USD per year during 20 years.

Agricultural market development, proximity services to producers

Based on the consultant experience on similar programme, the cost of an agriculture market development programme has been estimated at 2 000 000 USD per year during 20 years.

Rural financial systems and agriculture credit development

Based on the consultant experience on similar programme, the cost of a rural financial systems programme has been estimated at 2 000 000 USD per year during 20 years.