Nile Basin Initiative

Potential areas for irrigation development

Rwanda

Potential for Irrigation Development
Akagera NP Area
Rwanda

The Nile Basin Initiative (NBI), under the Nile Equatorial Lakes Subsidiary Action Program (NELSAP) and the project Regional Agricultural Trade and Productivity Project (RATP) has undertaken a study entitled "Assessment of the Irrigation Potential in Burundi, Eastern DRC, Kenya, Rwanda, Southern Sudan, Tanzania and Uganda". The study was categorized as "preparation for a development program" and has a strategic perspective.

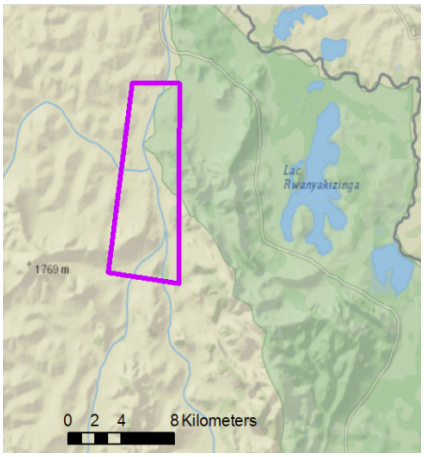
During 2011-2012 an overall assessment on the potential to develop irrigation has been undertaken by a consortium headed by FutureWater and WaterWatch (Netherlands). Based on these analyses 35 high potential areas have been selected. This note provides the highlights of one of these areas.

Overview

The Akagera NP focal area is situated in the Eastern province, in between the town of Nyarugumba and the Tanzanian border. The elevation in the valley is around 1250 m above sea level and from there it's going up to 1450 meters on the hills. The focal area is covering mainly the valley bottom and the foothills on the sides. On the western side another stream is joining half way. Slopes range from 0% in the valley to about 7% on the foothills. Slopes over 20% can be found on the hill in the south west of the focal area.

Land and Water Resources

TThe soils in the valley are formed by alluvial and colluvial processes. Soils on the foothills in the north of the area are formed by metamorphic processes, and towards the South-West the soils are derived from magmatic acid rocks. The soils in the valley are for 80% very poorly to poorly drained, and consist of heavy clay. The other 20% is drained slightly better. The soils on the foothills in the north are a mixture, but mainly consist of sandy to loamy clay, and are yellow to red, predominantly laterite. The soils in the South-West are mainly yellow soils, well drained and sandy clay alternate with red sandy clay soils, which are derived from granite, and are limited by 50 cm depth by gravelly layer. At the moment no fertilizer is used in the area, and only 3% is used for agriculture. Therefor erosion is hardly noticed, despite of the steep slopes. Due to the poor drainage capacity of the soils in the valley salinization is a real risk. On the slopes the percentage of organic matter is low, and the slopes are quite stony. The average land productivity within this focal area is lowest from the five Rwandan focal areas. With an average NDVI of 0.59 it is just slightly above the Rwandan average. NDVI values are higher in the valley, as water supply is most reliable. The climate of the area can be characterized as warm with constant temperatures during the year ranging from about 15oC to 28oC. Annual average precipitation is 899 mm and reference evapotranspiration 1424 mm per year.

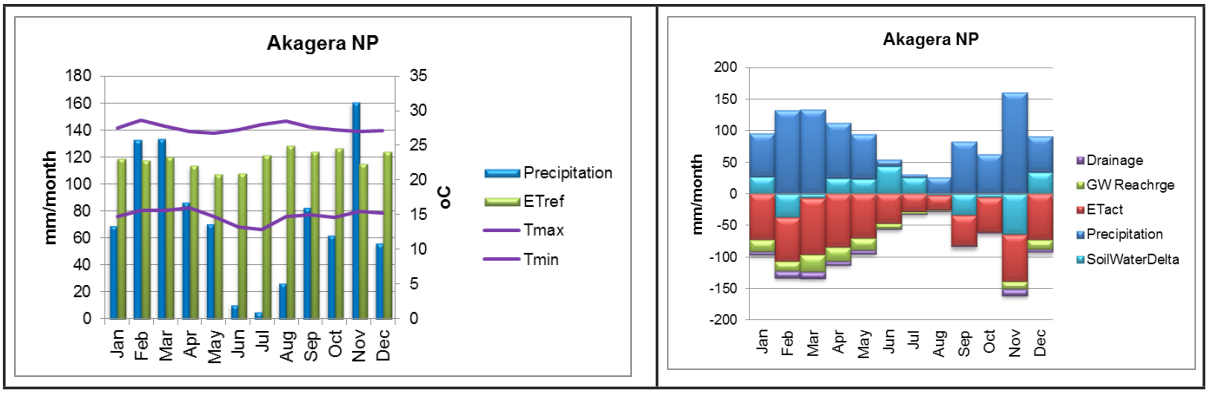


Rwanda at a Glance
(World Development Indicators 2010)

Population	10.6 million
Population below the poverty line (1.25 USD)	63 %
GDP	5.6 billion USD
GDP Per Capita	528.3 USD
Agriculture as a % of GDP	34%

Socio-economic Factors

The area is hardly inhabited as the population density is only 10 people/km2. There are no villages in the focal area, and just some solemn houses. People's main activity for living is keeping livestock. The area is very newly occupied, so population density is expected to increase within the coming years. This however means that the social structure and the capacity and knowledge for farming are generally very low. Current infrastructure is poorly developed and the area is far (+/- 20 km) from the nearest tarmac road. Consequently, the area is not always well accessible in rainy seasons. Wild animals are wandering around in the area as well; this may be a problem for agriculture. It is however planned to build an electric fence along the national park. This area is located within Akagera national park. Therefore it is really important that a feasibility study will show what will be the effects of an irrigation scheme in this area for the environment.



Average climate conditions and water balances for the area based on various global and local datasets, satellite information and advanced modeling approaches.

Irrigation and Crop Potential

For Akagera Np focal area the potential future crop is mainly maize. According to the land productivity and the Faostat figures, the yield is around 1.960 kg/ha while local expert data describe yields reaching 1.000 kg/ha. In the scope of a detailed feasibility study these numbers should be narrowed down. Calculated with the Faostat yields, the yield gap is 62% toward the world's average yield, and 92.2% towards the maximal obtainable yield. According to local experts, yields can increase under irrigation towards the world's average, reaching 5000kg/ha (19.8% of maximal obtainable yield).

Benefit-Costs Analysis

A first-order benefit-cost analysis is undertaken for the area. Information for this is based on various sources such as FAO publications, IFPRI publications, local expertise and data. A full benefit-costs analysis has to be undertaken in a sub-sequent feasibility study for the area. The following table shows that based on the benefit-costs analysis for the area investments in irrigation are very positive.

Investment Costs	
Irrigation infrastructure (US$/ha)	6,000
Social infrastructure (US$/farmer)	750
Accessibility infrastructure (million US$)	3.0
Operational Costs	
O&M irrigation (US$/ha/yr)	60
Extension service (US$/farmer)	15
O&M roads (US$/yr)	60,000
Summary	
Initial investments (million US$)	36.8
O&M costs (million US$/yr)	0.435
Net benefits per year (million US$/yr)	3.364
IRR (Internal Rate of Return)	6.9%

The initiative of this study was taken by Regional Agricultural Trade and Productivity Project (RATP) of the Nile Basin Initiative (NBI). Financial support was provided by the Canadian International Development Agency (CIDA). The study was undertaken by a large consortium headed by FutureWater and WaterWatch (Netherlands). More details is available from a series of reports and databases.

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Potential for Irrigation Development
Kigali Area
Rwanda

The Nile Basin Initiative (NBI), under the Nile Equatorial Lakes Subsidiary Action Program (NELSAP) and the project Regional Agricultural Trade and Productivity Project (RATP) has undertaken a study entitled "Assessment of the Irrigation Potential in Burundi, Eastern DRC, Kenya, Rwanda, Southern Sudan, Tanzania and Uganda". The study was categorized as "preparation for a development program" and has a strategic perspective.

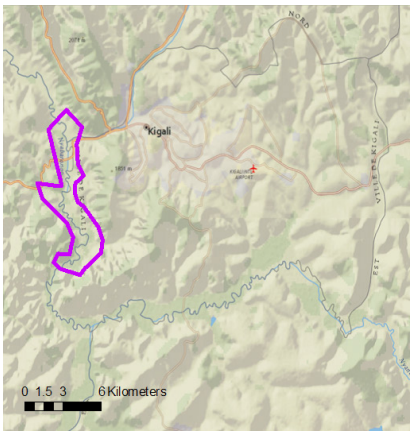
During 2011-2012 an overall assessment on the potential to develop irrigation has been undertaken by a consortium headed by FutureWater and WaterWatch (Netherlands). Based on these analyses 35 high potential areas have been selected. This note provides the highlights of one of these areas.

Overview

This Focal area, located just a few kilometers west of Kigali, spreads around Nyabarongo River for about 10 km, covering the plains around the river and the foothills on both sides. The valley bottom descends from North to South from 1362 m to 1350 m. The foothills within the focal area mostly remain under the 1400 m. Although the elevation difference in not too large, the slopes can easily reach up to 10%, or even over 30% in some small areas

Land and Water Resources

Soils in the area are formed under different processes. The soils in the valley are formed with alluvial processes, due to long term erosion and sedimentation. Soils on the slopes are sedimentary or weakly metamorphic. Within the valley soils are clayey, poorly drained and contain a relative high percentage of organic matter, reaching over 10% in the Nyabarongo valley. Since the soils are nearly flat, erosion in the valley is not a major issue. Currently no fertilizer is used. On the slopes, the soil changes slightly into loamy clay and drainage capacity increases. Water holding capacity in the whole area is high with numbers above 150 mm/m. The average land productivity in the Kigali focal area is with 0.59 just above the Rwandan average. Some build up and industrial areas in the north have a very low NDVI under the 0.5. The Nyabarongo Valley had the highest average land productivity with values fluctuating between 0.6 and 0.7. The coefficient-of-variation is very small in the valley, and fairly small on the slopes on the sides. This means that the land has nearly the same productivity around the year. The climate of the area can be characterized as relatively warm with constant temperatures during the year ranging from about 15oC to 26oC. Annual average precipitation is 1068 mm and reference evapotranspiration 1413 mm per year.

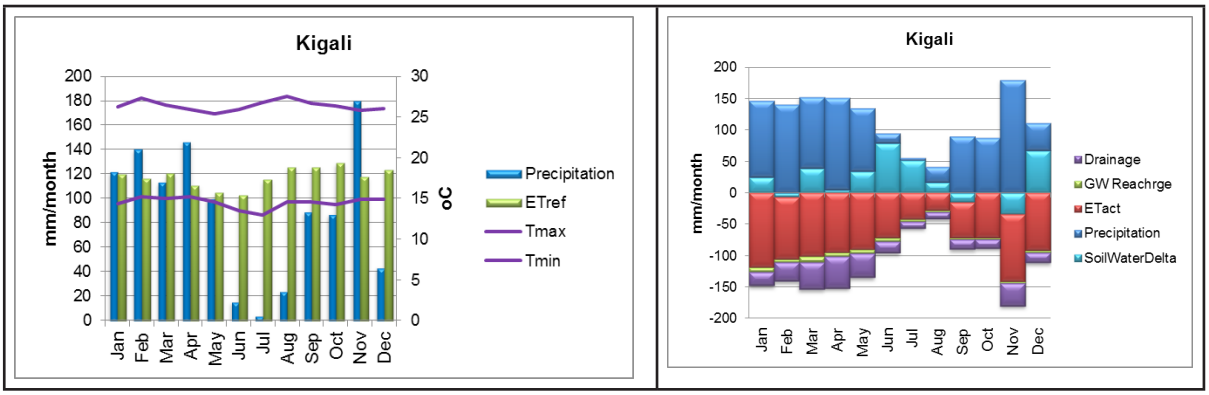


Rwanda at a Glance
(World Development Indicators 2010)

Population	10.6 million
Population below the poverty line (1.25 USD)	63 %
GDP	5.6 billion USD
GDP Per Capita	528.3 USD
Agriculture as a % of GDP	34%

Socio-economic Factors

As the sugar cane will mainly grow within the Nyabarongo valley, there will hardly be any displacements needed. People live on the dry slopes on the sides of the river. Currently, the risk of flooding in the valley is too high to live there. Limiting the flooding risk is one of the main challenges for irrigation development within the river valley. Population density in the area is above Rwanda´s average, with approximately 500 people per square kilometer. Within the focal area, however, the population density is much lower as not many people live within Nyabarongo valley. The valley is surrounded by mud roads which are poorly maintained. Since the area is so near to Kigali town, it is easy for the people to get off farm employment in town. Farmer's expertise in agriculture and irrigation is moderate, but private sugarcane farmers are poorly organized and they depend on the goodwill of the Kabuye sugar works factory, which has a monopoly in Rwanda. The preparation of this area for irrigation will have a very positive impact on the whole Nyabarongo river valley, as flood risks will be reduced and agricultural performance in the valley will increase. Regulating the river flow upstream of the focal area is one of the main challenges.



Average climate conditions and water balances for the area based on various global and local datasets, satellite information and advanced modeling approaches.

Irrigation and Crop Potential

Concerning the majority of crops, Rwanda's yield is above Africa's average. For sugar cane, however, this is not the case. With an average sugar cane yield of about 18.000 kg/ha, Rwanda is at 30% of Africa's average of 60.000 kg/ha. Rwanda has (had) a serious sugar crisis, and therefore the current yields should be increased and new areas should be developed. The Kigali focal area is very suitable for growing sugar cane, as groundwater levels are shallow and water is available abundantly. Yields when irrigated are expected to surpass the worlds and Africa's average towards 100.000 kg/ha.

Benefit-Costs Analysis

A first-order benefit-cost analysis is undertaken for the area. Information for this is based on various sources such as FAO publications, IFPRI publications, local expertise and data. A full benefit-costs analysis has to be undertaken in a sub-sequent feasibility study for the area. The following table shows that based on the benefit-costs analysis for the area investments in irrigation are very positive.

Investment Costs	
Irrigation infrastructure (US$/ha)	20,000
Social infrastructure (US$/farmer)	500
Accessibility infrastructure (million US$)	2.0
Operational Costs	
O&M irrigation (US$/ha/yr)	100
Extension service (US$/farmer)	10
O&M roads (US$/yr)	40,000
Summary	
Initial investments (million US$)	42.3
O&M costs (million US$/yr)	0.245
Net benefits per year (million US$/yr)	6.000
IRR (Internal Rate of Return)	15.2%

The initiative of this study was taken by Regional Agricultural Trade and Productivity Project (RATP) of the Nile Basin Initiative (NBI). Financial support was provided by the Canadian International Development Agency (CIDA). The study was undertaken by a large consortium headed by FutureWater and WaterWatch (Netherlands). More details is available from a series of reports and databases.

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Potential for Irrigation Development

Muyira / Butare Area Rwanda

The Nile Basin Initiative (NBI), under the Nile Equatorial Lakes Subsidiary Action Program (NELSAP) and the project Regional Agricultural Trade and Productivity Project (RATP) has undertaken a study entitled "Assessment of the Irrigation Potential in Burundi, Eastern DRC, Kenya, Rwanda, Southern Sudan, Tanzania and Uganda". The study was categorized as "preparation for a development program" and has a strategic perspective.

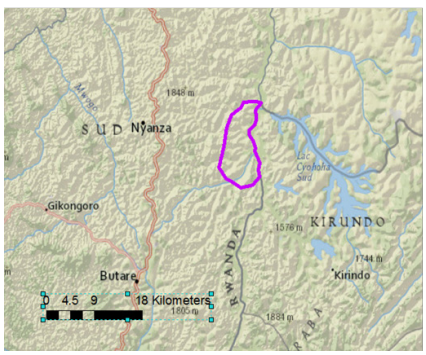
During 2011-2012 an overall assessment on the potential to develop irrigation has been undertaken by a consortium headed by FutureWater and WaterWatch (Netherlands). Based on these analyses 35 high potential areas have been selected. This note provides the highlights of one of these areas.

Overview

The Muyira / Butare Area is situated on the border with Burundi and is expanding from the Akanyaru River towards the west. The river is located at an average height of 1350 m above sea level and the focal area is rising from the valley bottom and expends over several foothills reaching up to 1500 m. The valley bottom is flat, and towards the west the slope increases rapidly reaching as much as over a ten percent slope. The transmission slopes from the foothills towards Akanyaru swamp are steep, but the slopes on the hilltop decrease to 1-5%. The diversity in slope percentage suggests that a range of irrigation methods should be assessed for their suitability within this focal area.

Land and Water Resources

Geomorphological, the focal area is split into two parts; the alluvial plain in the east, formed by the Akanyaru-river, and the rounded hills towards the west. The soil on the foothills consists alternately of granite, granitic gneiss, meta-sediment, quartzitic micaceous schist and amphibolites. In practice this means that soils are mainly well drained deep soils (>60%). Soils are dark brown and sandy loam to clay with a relative high percentage of organic matter in the top soil (>2%). Due to erosion and the high pressure on agricultural land, the land is degraded in some places. Fertilizer is used on small scale. On the steep slopes, the stones restrict the agricultural practice slightly. There are no signs of salinization. The focal area has average high land productivity, which is comparable to the Rwandan average. The yearly average NDVI in the Akanyaru valley is 0.7, and decreases to 0.55 on the foothill in the west. The climate of the area can be characterized as warm with constant temperatures during the year ranging from about 15oC to 26oC. Annual average precipitation is 1180 mm and reference evapotranspiration 1470 mm per year.

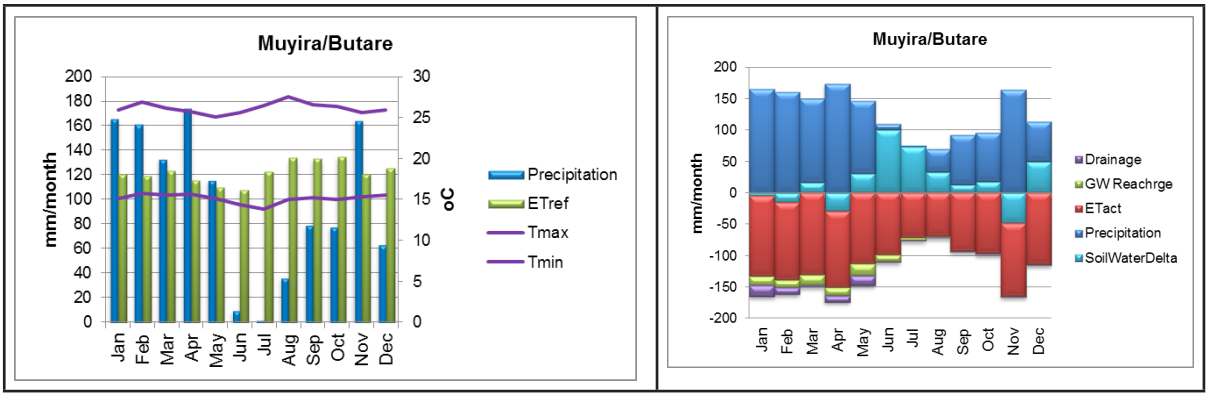


Rwanda at a Glance
(World Development Indicators 2010)

Population	10.6 million
Population below the poverty line (1.25 USD)	63 %
GDP	5.6 billion USD
GDP Per Capita	528.3 USD
Agriculture as a % of GDP	34%

Socio-economic Factors

The population density in the Muyira focal area is relatively low, with only 300 people/km2. In the valley, where the most intensive irrigation takes place, there are currently no people living because of the high flood risk. Therefore displacements are not necessary. On the foothills people live mainly along streets following the contour lines. There are no villages or large clusters of houses. With the layout design of the irrigation system, the current houses can be taken into account, and the irrigation system can be planes around. Most people know about irrigation through the nearby located rice irrigation scheme in the Nyarubogo perimeter. Historically, coffee was grown a lot as compulsory cash crop, which still leaves its signs today. Nearby markets include Nyanza, and the Bujumbura-Kigali highway. In order to develop irrigation in a sustainable manner, good arrangements should be made between Rwanda and Burundi about the water use. Within the focal area there are no protected areas.



Average climate conditions and water balances for the area based on various global and local datasets, satellite information and advanced modeling approaches.

Irrigation and Crop Potential

Rwanda has relatively high yields compared to surrounding countries. Population pressure and the increasing food demand have been triggers for the intensification of agriculture. It becomes clear that the Muyira focal area has high yields compared to the African standards. Compared to the world's average, however, quite some improvements can be done to reach realistic maximum yield. Maize reaches towards 8.2% of the theoretical maximum yield in the world, and to 40% of the world's average. Pineapple yields are at 11.6% of the maximum yield, and 45% of the world's average yields. Soybeans, however, reach to 75% of world's average, but to only 4.9% of the maximum obtainable yield. In order to focus on realistic yield increases, it is recommended to focus on the growth of maize and pineapple, as yields can be expected to double or increase even more.

Benefit-Costs Analysis

A first-order benefit-cost analysis is undertaken for the area. Information for this is based on various sources such as FAO publications, IFPRI publications, local expertise and data. A full benefit-costs analysis has to be undertaken in a sub-sequent feasibility study for the area. The following table shows that based on the benefit-costs analysis for the area investments in irrigation are very positive.

Investment Costs	
Irrigation infrastructure (US$/ha)	6,000
Social infrastructure (US$/farmer)	500
Accessibility infrastructure (million US$)	1.0
Operational Costs	
O&M irrigation (US$/ha/yr)	60
Extension service (US$/farmer)	10
O&M roads (US$/yr)	20,000
Summary	
Initial investments (million US$)	39.5
O&M costs (million US$/yr)	0.460
Net benefits per year (million US$/yr)	12.763
IRR (Internal Rate of Return)	45.2%

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Potential for Irrigation Development

Nyabitekeri Area Rwanda

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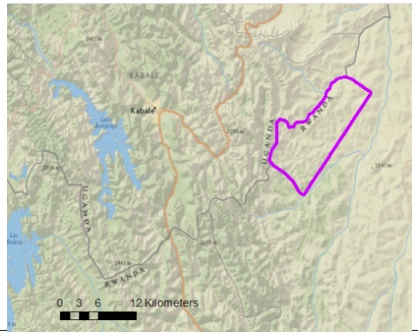
Overview

This focal area in Rwanda's eastern province is situated at the border to Uganda. It covers the transmission zone between the hills in Uganda and the lower land in Rwanda. Therefore the elevation difference within this zone is large with an elevation of 1800 m in the west, and an elevation of just above 1300 m towards the valley. Slopes vary accordingly, from over 20% in a small area towards the western border, and show a homogeneous variation of slopes between 3-8% over the whole area.

Land and Water Resources

The soil shows a very fragmented picture; the West towards the Ugandan highlands the soils show a small part of shallow well drained clay or loamy clay soil with a rocky sub soil within 50 cm. A bit further down the slope the rocky sub soil descends to over 100 cm from surface. The largest part of the area, which is located under the 1450 m are formed by magmatic processes. These yellow soils are deep, well drained, loamy clay to clay, and have a limiting gravel layer between 50-100 cm. This gravel consists of granitic sand mixed with laterite. These soils are interspersed with pieces of well drained clayey soils, which are very shallow and have saprolite or bedrock at around 50 cm. In the stream valleys deep alluvial soils can be found, they are very clayey, and drain imperfectly to moderately. These soils are combined with soils which are heavy clay, and drain poor to very poorly. Soils are very poorly fertilized, as agriculture is not the main business in this area. No fertilizer is used in this area. The percentage of organic matter in the soil is very low, and slight erosion was observed. The land productivity is with 0.61 above the Rwandan average of 0.58. Especially in the steep South-West and in the stream valleys the NDVI is high with values around 0.65. The higher areas have less productive parts. The climate of the area can be characterized as relatively warm with constant temperatures during the year ranging from about 14oC to 27oC. Annual average precipitation is 965 mm and reference evapotranspiration 1351 mm per year.

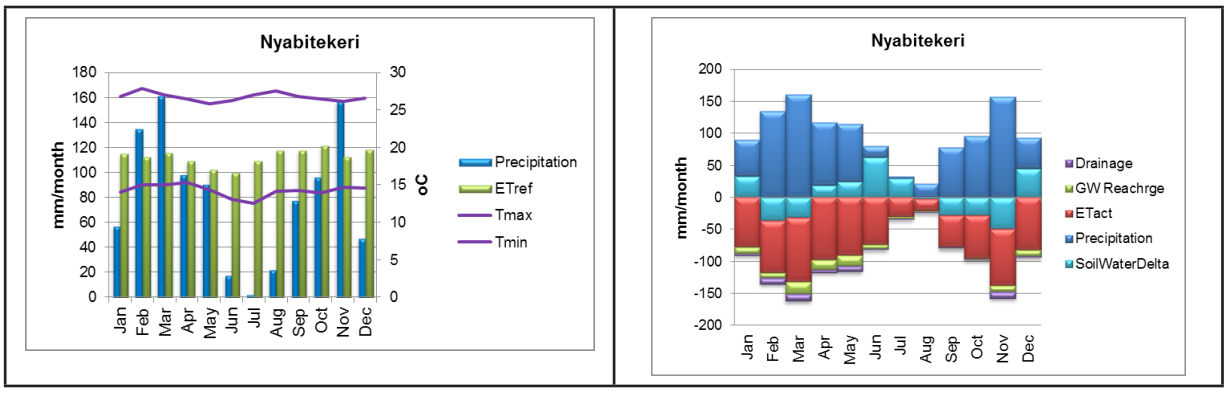


Rwanda at a Glance
(World Development Indicators 2010)

Population	10.6 million
Population below the poverty line (1.25 USD)	63 %
GDP	5.6 billion USD
GDP Per Capita	528.3 USD
Agriculture as a % of GDP	34%

Socio-economic Factors

Compared to Rwanda's average, the population density is low with only 50 people/km2. Most people live in small villages and some houses that are scattered around the focal area, mainly along the roads. With any irrigation system design it should be possible to work around most of the villages and strips of houses. People mainly live from cattle keeping and livestock. The area is well accessible, as roads are crossing through the area, which are accessible year round. Markets are nearby and well accessible. Concerning irrigation development, the people's mindset is said to be conservative and not eager for a quick change. The knowledge for agriculture and irrigation is low and the people have hardly any experience with agricultural cooperatives. Maybe a nearby planned irrigation system within Nyagatare district can enhance and increase the farmers irrigation capacity. The area suffers under slight erosion, as upstream slopes are very steep. Depending on the irrigation water source different problems may occur, as most of the water in the streams passing by/through the area is coming from Uganda. Within the focal area there are no protected areas.



Average climate conditions and water balances for the area based on various global and local datasets, satellite information and advanced modeling approaches.

Irrigation and Crop Potential

Yields in this focal area are slightly higher than Rwanda's average. For maize and pineapples yields are at 40% and 45% respectively of the world's average yield, and at 8.1% and 11.5% respectively of the maximum obtainable yield. Rice, however, is performing really well with yields almost doubling the world's average and reaching 81.2% of the maximum obtainable yield. The comparison is not completely fair as rice is usually grown under irrigation, which decreases the yield gap. The figure however shows that Rwanda is successful in growing rice, and that an increase of rice production will enhance agricultural productivity. Maize and Pineapples are expected to increase the yields by 2.5-3 times under irrigation.

Benefit-Costs Analysis

A first-order benefit-cost analysis is undertaken for the area. Information for this is based on various sources such as FAO publications, IFPRI publications, local expertise and data. A full benefit-costs analysis has to be undertaken in a sub-sequent feasibility study for the area. The following table shows that based on the benefit-costs analysis for the area investments in irrigation are very positive.

Investment Costs	
Irrigation infrastructure (US$/ha)	6,000
Social infrastructure (US$/farmer)	750
Accessibility infrastructure (million US$)	1.0
Operational Costs	
O&M irrigation (US$/ha/yr)	60
Extension service (US$/farmer)	15
O&M roads (US$/yr)	20,000
Summary	
Initial investments (million US$)	42.6
O&M costs (million US$/yr)	0.493
Net benefits per year (million US$/yr)	18.360
IRR (Internal Rate of Return)	72.2%

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Potential for Irrigation Development
Sake Area
Rwanda

The Nile Basin Initiative (NBI), under the Nile Equatorial Lakes Subsidiary Action Program (NELSAP) and the project Regional Agricultural Trade and Productivity Project (RATP) has undertaken a study entitled "Assessment of the Irrigation Potential in Burundi, Eastern DRC, Kenya, Rwanda, Southern Sudan, Tanzania and Uganda". The study was categorized as "preparation for a development program" and has a strategic perspective.

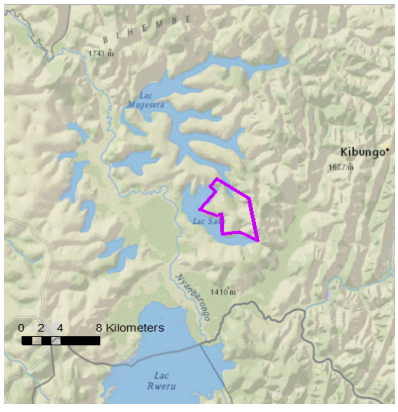
During 2011-2012 an overall assessment on the potential to develop irrigation has been undertaken by a consortium headed by FutureWater and WaterWatch (Netherlands). Based on these analyses 35 high potential areas have been selected. This note provides the highlights of one of these areas.

Overview

Sake Focal area is situated in the South-East of Rwanda, at the eastern shores of lake Sake. In the north it is bordered by one arm of Lake Mugesera. This focal area with a total surface of 2073 ha has a height of 1300 m at the lake shores, and is going up to 1450 m at the eastern side. The focal area is covering one foothill, and on the nearly flat top Sake village is situated. Slopes vary from 1-2% near the lake and on the top of the hill around Sake to 10% in parts going up from the lake. Towards the East the slopes increase even more reaching as much as over 15%.

Land and Water Resources

The soils in this area are quite homogeneous. Along the shores the soils are yellow and well drained. This soil is derived from acid magmatic rocks. The soil consists of sandy clay or clay loam and is moderately deep, limited between 50 and 100 cm, and sandy underneath. Apart from this, the slopes rising from the lake are somewhat stoniness. The soil on the foothill, covering the plateau on which the village of Sake is situated, is yellow or red, and well drained. The deep soil varies from clay to sandy clay and holds more than 2% organic matter. On the steeper parts towards the lake, erosion is a serious problem. Fertilizer is used in the area on a moderate scale, to improve the yields and soil qualities. The fertility of the soils has suffered from the high population density, which puts a large pressure on the agricultural land. The average NDVI is 0.61, which is just above the Rwandan average of 0.58. On the slopes from the lake to the Sake plateau and the steep slopes in the east, the land productivity is highest with average values between 0.65-0.70. On the plateau the average NDVI is in the range of 0.55-0.60.



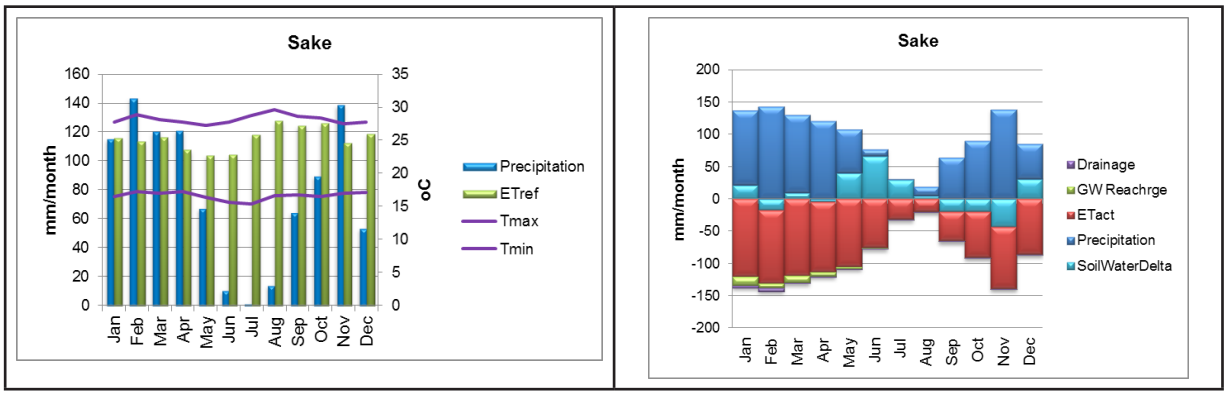
Rwanda at a Glance
(World Development Indicators 2010)

Population	10.6 million
Population below the poverty line (1.25 USD)	63 %
GDP	5.6 billion USD
GDP Per Capita	528.3 USD
Agriculture as a % of GDP	34%

The climate of the area can be characterized as warm with constant temperatures during the year ranging from about 17oC to 28oC. Annual average precipitation is 940 mm and reference evapotranspiration 1390 mm per year.

Socio-economic Factors

The population density in Sake focal area is around Rwanda's average with 400 people/km2. Much of the area can be irrigated without any population displacements. People in the area are eager on irrigation development, but it is recommended to leave the current infrastructure as much as possible as it is. Infrastructure is in place and planned to increase. The road network is well developed, as Sake is within 20 km of the Bujumbura/Kigali highway, and also within 20 km to the road connecting to Tanzania. There are plans to develop a Bugesera international airport, and a railway line passing by. Sake village is built on the flattest area on top of the hill. This flat area would be most suitable concerning irrigation, but the village does restrict the area and irrigation possibilities. Houses are built wide apart, which makes the areas in between barely useful. Whenever designing the irrigation system, either a drastic approach including many displacements should be chosen, or an approach that focuses on irrigation of the slopes that rise from the lake towards Sake village. People have good knowledge regarding agriculture and irrigation.



Average climate conditions and water balances for the area based on various global and local datasets, satellite information and advanced modeling approaches.

Irrigation and Crop Potential

Yields in Sake focal area are slightly higher than the average yields in Rwanda. For maize and pineapples, the Rwandan yields exceed the (East) African average, reaching towards 8.1 and 11.6 percent of the maximum obtainable yield respectively. Compared to the world's average, which can be seen as a realistic yield gap, maize yields reaches 40% and pineapple 45%. For green beans no data is available in Faostat, but the yields worldwide are relatively close to each other. Tomatoes are grown at 1.5% of the maximum obtainable yield, and 23% of the world's average. With an average yield of 0.8 kg/m2, the yield gap can be decreased easily with irrigation to yields reaching 4-6 kg/m2. Yields of maize can be increased considerably to reach 5000 kg/ha, which is just under the world's average. Pineapple yields are expected to grow to 80.000 kg/ha, nearly reaching the maximum obtainable.

Benefit-Costs Analysis

A first-order benefit-cost analysis is undertaken for the area. Information for this is based on various sources such as FAO publications, IFPRI publications, local expertise and data. A full benefit-costs analysis has to be undertaken in a sub-sequent feasibility study for the area. The following table shows that based on the benefit-costs analysis for the area investments in irrigation are very positive.

Investment Costs	
Irrigation infrastructure (US$/ha)	6,000
Social infrastructure (US$/farmer)	500
Accessibility infrastructure (million US$)	1.0
Operational Costs	
O&M irrigation (US$/ha/yr)	60
Extension service (US$/farmer)	10
O&M roads (US$/yr)	20,000
Summary	
Initial investments (million US$)	11.5
O&M costs (million US$/yr)	0.140
Net benefits per year (million US$/yr)	14.655
IRR (Internal Rate of Return)	>100%

The initiative of this study was taken by Regional Agricultural Trade and Productivity Project (RATP) of the Nile Basin Initiative (NBI). Financial support was provided by the Canadian International Development Agency (CIDA). The study was undertaken by a large consortium headed by FutureWater and WaterWatch (Netherlands). More details is available from a series of reports and databases.

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