

Socio Economic Effects of Water Management on household livelihoods at Busiga commune of Ngozi Province in Burundi

KWIZERA Chantal¹ and NDIKUMWENAYO Astère²

¹Faculty of Agriculture and Bio Engineering, Department of Environment Sciences and Technologies,
University of Burundi, B.P. 2940 Bujumbura, Burundi

²Faculty of Sciences, Department of Biology, University of Burundi, B.P. 2700 Bujumbura, Burundi

ABSTRACT

Water is essential for all life on Earth. It provides many environmental goods and services that are of economic benefit to society. Water is a variable parameter for different applications in the fields of climate system, hydrology, and most critically in agriculture. Despite these benefits, water resources seem to face severe quantitative and qualitative threats worldwide especially in Burundi at Gatika and Rugori, hills where water was lost in several ways especially during the rainy season where floods coupled with erosion washed away crops. To cope with this trend, a study has been carried out with water management through different methods such as suspended barrels, micro-irrigation and cemented well to stabilize water resources in the region. The results of this study highlighted the effectiveness of water management on these two hills. It has played a major role in enabling farmer to cultivate many abandoned plots through irrigation with water stocked in barrels and well. Furthermore, environment protection from flood and erosion was observed. Moreover, the outcomes showed improved crop production and yield, resulting in improved food security ascribed to diversified crops production. Likewise, enhancement of monthly income has been pointed out. The study encourages the population to undertake water management methods to boost the agro economy systems and benefit its advantages.

Keywords: Busiga commune, Household livelihood, Water management methods.

1. INTRODUCTION

Water is at the core of sustainable development and is critical for socio-economic development, food production, healthy ecosystems and for human. Water is essential for all life on Earth. It provides many environmental goods and services that are of economic benefit to society. Every living organism on Earth contains a substantial proportion of water. This last is the most critical resource for development. Its effects can be felt not only in the environment framework, but in many areas such as industrial, economic development and most critically in agriculture where it is considered as the most major resource for sustainable agricultural development worldwide. Water use in Agriculture has, arguably, been very successful around the world. It is the key input for agricultural production and plays an important role in food security. It has been reported that water for irrigation contributes to 40 percent of the total food produced worldwide ^[1]. Other researchers highlighted effectiveness of water irrigation in improving significantly the leaves number, stem diameter, plant height and leaf area ^[2]. They add that water availability in agricultural system could enhance the fresh and dry weight of leaves, stem and roots. Furthermore, Water is essential for growth, development and tissue expansion. Literature confirms that water in agriculture plays a vital role in contributing towards domestic food security and poverty alleviation ^[3]. Water is the primary natural resource for agriculture and vegetation that influences the processes of plant growth and agricultural production. It is a variable parameter for different applications in the fields of climate system, hydrology and stream flow prediction. However Water scarcity still the one of the major limiting factors for improving agricultural production in the world. It still the principal and biotic factor that limits plant growth and development all over the world ^[1], especially in Africa where technology still

at its embryonic state, especially in Burundi where water resources seem to face severe quantitative and qualitative threats worldwide precisely at Gatika and Rugori hills of Busiga commune at ngozi province which is one of the more populated communes as shown in the following table 1. On these hills, water was lost in several ways especially during the rainy season where floods coupled with erosion were observed in the region and washed away crops resulting in a reduced crops production and left households in a very pronounced food insecurity.

Table 1. Répartition de la population par province, 2019 ^[4]

Rang	Provinces	Population
1	Gitega	1084575
2	Ngozi	988106
3	Muyinga	945771
4	Kirundo	939560
5	Kayanza	875487
6	Bujumbura Marie	743514
7	Bujumbura Rural	695138
8	Cibitoke	688583
9	Karuzi	652703
10	Makamba	644412
11	Ruyigi	598995
12	Rumonge	526457
13	Bubanza	505515
14	Rutana	498766
15	Bururi	468246
16	Muramvya	437568
17	Mwaro	408487
18	Cankuzo	342281

Considering that agriculture production is highly dependent on water in Burundi, while more than 90 percent of the population live from agriculture ^[5], the situation can be further worsened easily if no method is used to cope with this situation dominated by higher demographic pressure ^[1]. Whence there is a need of alternative new and more suitable approach to water resources to reverse the trend and improve crop production to meet the nutritional and economic requirement of the population. A study for this purpose has been carried out with water management different methods such as suspended barrels, micro irrigation and cemented well to stabilize water resources in the region to improve crop production and enhance food security as well as the household income.

2. MATERIALS AND METHODS

2.1. Site description

The experiment was carried out at Gatika and Rugori, hills with a very high water disturbance, located in Busiga commune of Ngozi province. The cultivated areas were displayed in the following table 2.

Table 2. Area occupied by each crop

Crops	Area
Maize	3 ,5 ha
Sweet potatoes	0.70 ha
Beans	1 ,5ha
Potatoes	3 ,5 ha
eggplants	0.60 ha
cassava	2 ha

2.2. Experiment design

The used methods to stabilize water resources in the region were the suspended barrels, localized irrigation and cemented well (Figures 1, 2 and 3)



Figure 1. Suspended barrels



Figure 2 Cemented Well

Water was collected from rivers in the region and stored in the barrels and the cemented well to protect the area from flood and erosion. These waters were used during dry season. Micro-irrigation is described as a modern irrigation approach where minimal amounts of water are often applied directly below and above the soil surface, typically as discrete drops, continuous drops or small streams through emitters positioned along water delivery lines, whence household can get crop production during all season.



Figure 3. micro- irrigation

2.3. Sampling and data collection

Water was collected from rivers in the regions and stocked in the suspended barrels and the cemented well. During the dry season, this saved water were used for plant irrigation through micro- irrigation (Figure 3). After harvest, production was weighed and recorded for analysis.

2.4. Statistical analysis

For data analysis, Advanced Excel 2007 and SPSS were used to appraise the effectiveness of the used methods, while figures and table were made using Excel.

3. RESULTS ANALYSIS AND DISCUSSION

3.1. Effects of water management different methods on household livelihoods

Before the study, households was having small plots of land. Large area was not cultivated as can be seen in the following figures 4 and 5.



Figures 4 and 5 some agricultural plot before the study

As well known, harvest is the basis to enhance the population food security, livelihood and strengthen the social relations. As testified by Some of the farmers, disturbance of the crop yield let the population in a dubious situation with sorrows for tommorow and limited livelihoods.

3.2. Effects of different methods on household agricultural yield (Kg/ha)

During the study, some have been exploited as shown in figures 6 and 7 as examples



Figure 6. Plot for potatoes crops



Figure 7. Plot for cassava crops

In general, the emphasis was placed on certain crops most cultivated by farmers in the region including potatoes, cassava, maize, sweet potatoes, beans and Eggplants. The crops production were displayed in the following figure.

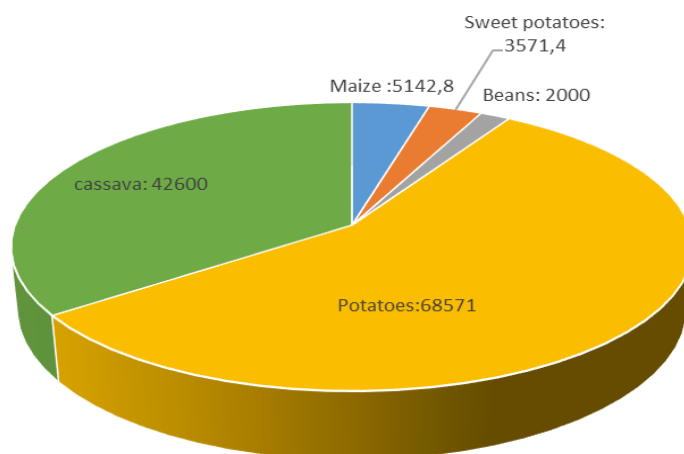


Figure 8. Effects of different methods on crops yield (Kg/ha)

The study highlighted the effectiveness of these Water management methods in improving crop production in the region. It enable farmer to get production even during the dry season by using irrigation with water stored in the barrels and well. Specifically, the figure showed higher crop production for potatoes with 68571Kg/ha, followed by cassava of 42600 Kg/ha. This was due to the importance of these crops in the area. They are the key of the market in the region that they are even sold in the neighboring countries. Others crops recorded lower quantity due to that they were considered as wedding crop. However eggplant was consumed before harvest due to its multiple use as reveled by the household. This crop was used when they want to supplement their diet or for other needs. This confirmed little improvement of food security and a better household livelihood. Likewise, it has positively impacted the neighborhood food environment.

3.3. Influences of different methods on household socio economy

The population in the region was having a low household socioeconomic status. However literature report that this last is associated with unhealthy behaviours including poor diet and adverse health outcomes ^[6-7]. It was reported that Households and individuals of lower socio-economy are more likely to suffer from poorer health because of fewer resources ^[5], whence this study has analyzed this parameter. (Table 3). It sets out some indication regarding this parameters.

Table 3. Influences of different methods on household socio economy

Crops	Unit price (BFI/Kg)	Total price (BFI)
Maize	600	3085680
Sweet potatoes	400	1428560
Beans	1100	2200000
Potatoes	700	47999700
Eggplants		1100000
Cassava	350	14910000

Through this table, the household can get some financial income after harvest, while before the study they were in deplorable situation with no income because some of their agricultural plots were abandoned as shown on figure 4 and 5. This confirmed the effectiveness of water management in improving household income. For their needs, these households employ a variety of other coping strategies such as selling a part of the crop production and practicing bartering. This confirmed the efficiency of water management in the region not only for the beneficiaries, but also for others and the hall country in general.

4. CONCLUSION

The results of this study highlighted the effectiveness of water management on these two hills. It played a major role in enabling farmer to cultivate many abandoned plots through irrigation with water stocked in barrels and well. Furthermore, environment protection from flood and erosion was observed. Moreover, the outcomes showed improved crop production and yield, whence improved food security ascribed to diversified crops production that can provide protein and other nutrients to the population. Likewise, enhancement of monthly income has been pointed out. Household could sell a part of the production and practice bartering to complete their needs to meet their nutritional requirement and improve their livelihood. Also, a positive impact on neighborhood food environment was arguably observed and noted. The study encourage the population to undertake water management methods to boost the agro economy systems and benefit its advantages.

REFERENCES

- [1]worldbank.org/en/topic → provide the link and refer : <https://ijasre.net/index.php/ijasre/authorguidelines> **Online document**
- [2] Kwizera Chantal, Ntunzwenimana Mélance, Basil T.Iro Ong'or, Niyonzima Hermes, & Hakizimana vianny. (2018). Effects of Irrigation Levels on bean Growth and Yield parameters. International Journal of Advances in Scientific Research and Engineering (IJASRE), ISSN:2454-8006, DOI: 10.31695/IJASRE, 4(11), 195–200. <https://doi.org/10.31695/IJASRE.2018.32926>
- [3] Chapter 1. The role of water in agricultural development. <https://www.fao.org/3/y5582e/y5582e04.htm>
- [4]<http://www.isteebu.bi/images/rapports/projections%20provinciales%20%20%20reajustees.pdf3.pdf>
- [5]https://fscluster.org/sites/default/files/documents/rapport_ipc_chronique_burundi_2016-vf01_version_finale.pdf
- [6]Seema Sheoran et al. 2014. Grain legumes: Recent advances and technological interventions, Elsevier, Advances in Agronomy. Volume 127, 2014, Pages 157-258. On line at <https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/micro-irrigation>
- [7]Allen L, Williams J, Townsend N, Mikkelsen B, Roberts N, Foster C, Wickramasinghe K. Socioeconomic status and non-communicable disease behavioural risk factors in low-income and lower-middle-income countries: a systematic review. Lancet Glob Health. 2017; 5:e277–89.