



IMPACT OF MARSHLAND DEVELOPMENT PROJECT ON AGRICULTURAL IMPROVEMENT IN RWANDA: A CASE OF MISIZI MARSHLAND

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ABSTRACT

The concern of this study was to explore the role of marshland development on success of agricultural improvement project in Musizi sector, Gisagara District. Specifically, the study finds out the impact of marshland irrigated land on agricultural improvement specifically Misizi marshland, assess the impact of marshland valorization on agricultural improvement specifically Misizi marshland and assess the impact of farmers organization on agricultural improvement specifically Misizi marshland. The study adopted descriptive research design using quantitative approach. The population involved in this study was 300 farmers from Musizi irrigation scheme. Random sampling method was used to sample respondents 133 respondents taken as sample size. Structured questionnaire was used as instruments to collect primary data. Descriptive and inferential analysis such as frequencies and percentages, correlation analysis was used to present quantitative data in the form of tables and graphs using SPSS version 20. From findings, the study revealed that there was an impact of marshland irrigated land on agricultural improvement specifically in Mugombwa sector. Besides, the study indicated that marshland valorization has an impact on agricultural improvement in Mugombwa sector. Besides, the study found that there is insignificant positive correlation $r=0.589$, $p=0.000$ between variables statistically correlated given the p value is <0.005 . Finally, the study also showed that farmers organization has an impact of agriculture improvement in Mugombwa sector. The study recommended that due to its importance, the government should sensitize farmers to variables gather themselves in association and cooperatives.

Keywords: Marshland, irrigated land, marshland valorization, agriculture improvement, farmers Organization

1.INTRODUCTION

Rwanda is a landlocked country of 26,338km² surface area. The latest demographic surveys show that the population is 11,370,425. Given that the growth rate is 2.8%, the population is expected to be 12millinos by 2015 (IndexMundi, 2011)¹. This country is among the

¹ Index Mundi (2011). *Rwanda Demographics Profile*, Available:
http://www.indexmundi.com/rwanda/demographics_profile.html (Accessed: 2011, July, 20)

poorest in Africa, the GDP per capita was US\$1100 in 2010. Some of the causes of this poverty are the constraints which undermine the agricultural development whereas agriculture is the backbone of the national economy and it contributes more than 40% of the GDP. Those constraints are like high population density living on increasingly scarce land and high growth rate while economic growth is lagging behind, erosion and climatic hazards and lack of modern technology in agriculture (IFAD, 2009)².

The agriculture sector employs 90% of the population. Rain fed agriculture which is largely practiced on small farms of relatively 0.5 hectare produces a relatively low production for subsistence. The low crop yields situation worsened in the 1980's when the agricultural policy makers failed to transform from low-value agriculture to high value farming. There were not enough policies to encourage agricultural transformation. Other factors are continuous environmental degradation, soil fertility decline, poor water management, and deforestation (Ministry of Finance and Economic Planning, 2002). "Because Rwanda's economy is heavily dependent on agriculture, the key to poverty reduction lies in stimulating rapid and sustainable growth in the agricultural sector." (Diao et al, 2018)³.

Therefore, marshland transformation to agricultural land will increase the people's livelihoods. Besides the government the government supports wetland development with the aim to boost agriculture, revitalize the rural economy and reduce poverty (REMA, 2012)⁴. The majority of farmers engage in traditional ways of farming, they grow food crops for subsistence such sweet potatoes, cassavas, dry beans in highland and wetlands with little irrigation. Currently irrigation sector is being developed due to unpredictable rainfall patterns and also because the Government is investing in cultivation in order to increase food production and poverty reduction. The rice is cultivated in the marshlands with sufficient water to irrigate this high water consuming crop. (IFAD, 2013)⁵.

Due to the continuous availability of water and relatively higher fertility of marshland, generally yields in marshland are higher than in uplands. Farming activities are major economic pursuits in and around many marshlands, where various crops are cultivated, seasonally inundated floodplains are often particularly important farming resources because they frequently have fertile soils with high clay content (Nabahungu, 2012)⁶. Various methods have been developed to maximize the use of these areas throughout the seasons.

PURPOSE

The general objective of this study is to assess the impact of marshland development project on agricultural improvement in Rwanda. A case of Misizi marshland in Gisagara District.

AIM

Specifically, this research paper attempted to:

- i. To find out the impact of marshland irrigated land on agricultural improvement specifically Misizi marshland.

² IFAD, 2009, Rural Poverty portal, Available:

<http://operations.ifad.org/web/guest/country/home/tags/Rwanda> (Accessed: 2021, October 25)

³ Diao X, Fan S., Kanyarukiga S. Yu b. (2009). "Technical Assistance for Public Expenditure Management", Background Paper 5: *Agricultural Growth and Investment* (Options for Poverty Reduction); Rwanda

⁴ REMA (2009) *Rwanda State of Environment and Outlook Report*, Kigali, Rwanda

⁵ IFAD (2009) *Making Rice a Cash Cow in Rwanda*

⁶ Nabahungu, N. & Visser, S. (2012). *Farmers' knowledge and perception of agricultural wetland management in Rwanda*. Land Degradation & Development.

- ii. To assess the impact of marshland valorization on agricultural improvement specifically Misizi marshland.
- iii. To assess the impact of farmers organization on agricultural improvement specifically Misizi marshland

SCOPE

This Musizi marshland of is an important wetland found in Mugombwa sector, Gisagara district in southern Province. It has been arranged in the end of year 2018 FAO and UNHCR. This marshland of 120 hectares before its development, farmers grew different crops in an intercropping system where everyone grew any crop they wish. Thus, developing a marshland is of a paramount importance not only in increasing the irrigated land but also in increasing the crop production on a unit area while transforming the livelihood of farmers. As a content scope, this research paper was limited on the impact of marshland development project on agricultural improvement in Musizi Marshland in Gisagara District and it was covered a period of three years from 2017 to 2019.

LITERATURE REVIEW

Marshes can be classified as a type of wetlands which are periodically saturated, flooded, or ponded with water and characterized by herbaceous (non-woody) vegetation adapted to wet soil conditions (MINIREMA, 2011)⁷. According to USDA (2011)⁸, marshlands or wetlands deliver a wide range of services that are critical to the existence and well-being of a country, such as food, clean water and climate control. Marshlands produce a wealth of provisions, including wild and cultivated sources of food, freshwater and valuable biochemical and genetic materials. Local communities traditionally use the marshes and land to harvest food grains such as rice and maize, vegetables, etc., and to raise livestock.

Since wetlands are located between uplands and water resources, many can intercept runoff from the land before it reaches open water. As runoff and surface water pass through, wetlands remove or transform pollutants through physical, chemical, and biological processes. Scientists have estimated that wetlands may remove between 70% and 90% of entering nitrogen (Harris, 2017)⁹. Wetlands with high soil concentrations of aluminum may remove up to 80% of total phosphorus (Ostrom, 2012)¹⁰. Wetlands remove between 20% and 100% of metals in the water, depending on the particular metal and the individual wetland (Moses, 2010)¹¹. Wetland/marshland provides many functions such as flood control, storm protection, groundwater recharge, sediment/pollutant retention, nutrient retention, evaporation, and preservation.

- Increasing irrigated land and agricultural improvement

Agricultural irrigated land refers to agricultural areas purposely provided with water, including land irrigated by controlled flooding. Irrigated agricultural area refers to area equipped to provide

⁷ MINIRENA. (2011). *Water Resources Management Sub-Sector Strategic Plan (2011 – 2015)*, Kigali-Rwanda

⁸ USDA. (2000). Ecosystem Valuation as cited on <http://www.ecosystemvaluation.org>. US

⁹ Harris L. (2017) *Report North East England Wetlands Feasibility Study. A partnership project by the Environment Agency and Royal Society for the Protection of Birds (RSPB)*.

¹⁰ Ostrom, E. (2012). "Background on the Institutional Analysis and Development Framework". *The Policy Studies Journal* 39 (1): pp. 7-27.

¹¹ Moses, D. (2010). *Colonial and contemporary ideologies of community management. A case study of tank irrigation development in south Africa*, Vol.112.302-338

water (via artificial means of irrigation such as by diverting streams, flooding, or spraying) to the crops. Irrigated agricultural area refers to area equipped to provide water (via artificial means of irrigation such as by diverting streams, flooding, or spraying) to the crops (Dugan,2017)¹². In non-irrigated agricultural areas, production of crops is dependent on rain-fed irrigation. Agricultural land constitutes only a part of any country's total area, which can include areas not suitable for agriculture, such as forests, mountains, and inland water bodies. Agricultural land can also be classified as irrigated and non-irrigated land. In arid and semi-arid countries agriculture is often confined to irrigated land, with very little farming possible in non-irrigated areas.

- Farmers organization and agricultural improvement

In developed marshland or irrigation schemes farmers are mostly organized in cooperative, water user association and farmers group, An agricultural cooperative, also known as a farmers' co-op, is a cooperative in which farmers pool their resources in certain areas of activity whereas Water User Associations are formal organizations created to bring together farmers for the purpose of managing a shared irrigation system.(Dixon et al., 2014)¹³

According to Musahara & Huggins (2015)¹⁴ In a developed marshland, these two farmers entities help them to get organized which led to the efficient use of land and water which lead to the agricultural improvement. In Rwanda after developing a marshland or a hillside, farmers get organized in cooperative and irrigation water user association (IWUA).

- Valorization of Marshland and agricultural improvement

Rwanda is experiencing fast socio, demographic and economic transformation since 2000. It has been recording on average of 8% GDP annual growth during that period, mainly driven by agriculture and services. This gives this sector a predominant role in the economy of Rwanda. The cultivable surface area is estimated at 1 385 000 ha. The cultivated area is about 825 000 ha, that is 31.3% of the total surface area of the country and 59.5% of the cultivable surface. According to the same source, hillside slopes (about 660 000 ha) are not exploited in the dry season and marshlands (about 165,000 ha) are partially used in the rainy seasons depending on their degree of flooding. (Tendei, 2016).¹⁵

The development of marshlands and valleys remains one of the sustainable alternatives in response to population pressure on the fragile soils of hillsides (Murekashungwe, 2007)¹⁶. Marshlands contain large water reserves; have lower erosion risks, a natural fertility and offer possibilities to populations to work together in these marshlands, which are considered to be a factor that can contribute to national reconciliation (Barbier, 1997). About 94 000 ha of

¹² Dugan P.J. (2010) *Wetland Conservation: A Review of Current Issues and Required Action*, IUCN, Gland, Switzerland

¹³ Dixon, A. B., & Wood, A. P. (2014). Wetland cultivation and hydrological management in eastern Africa: Matching community and hydrological needs through sustainable wetland use. *Natural resources forum*, 27(2), 117-129.

¹⁴ Musahara, h. & Huggins, C. (2015). *Land reform, land scarcity and post-conflict reconstruction: A case study of Rwanda*. From the Ground Up: Land Rights, Conflict and Peace in Sub-Saharan Africa. Institute for Security Studies

¹⁵ NDETEI, R. (2016). *The role of wetlands in lake ecological functions and sustainable livelihoods in lake environment: A case study on cross border Lake Jipe-Kenya/Tanzania*.

¹⁶ Murekashungwe E. (2007). *Performance evaluation of water distribution in Rugeramigozi irrigation scheme*, NUR, Rwanda

marshlands are currently exploited, the remaining being large marshlands made up of peat or organic soils covered by papyrus, are not cultivated (MINAGRI, 2011)¹⁷.

METHODOLOGY

This research paper adopted descriptive research design using quantitative approach. The population involved in this study was 300 farmers from Musizi irrigation scheme. Random sampling method was used to sample respondents 133 respondents taken as sample size by using Slovene's formula which was used to calculate the sample size. With regard to the level of accuracy, the researcher used a confidence level of 95% as suggested by Kothari (2004)¹⁸. Structured questionnaire was used as instruments to collect primary data. Descriptive and inferential analysis such as frequencies and percentages, correlation analysis was used to present quantitative data in the form of tables and graphs using SPSS version 20.

ANALYSIS

Table 1. Level of agreement on impact of marshland irrigated land on agricultural improvement

Statement	SA Freq (%)	A Freq (%)	N Freq (%)	D Freq (%)	SD Freq (%)
Farmers irrigate according to the schedule (twice/week)	66(55)	36(30)	15(13)	3(7)	0(0)
Few farmers can miss one week without irrigating	42(35)	72(60)	6(5)	0(0)	0(0)
Participation in maintenance of the irrigation system	96(80)	15(13)	9(7)	0(0)	0(0)
To sell harvest for income generation	114(95)	0(0)	0(0)	0(0)	6(5)
Farmers have the fields in different zones and it is difficult to attend all community works in those zones	54(45)	54(45)	12(10)	0(0)	0(0)
Low knowledge of farmers is neglected in cropping practice	0(0)	84(70)	6(5)	30(25)	0(0)
To satisfy household food requirements	75(63)	36(30)	9(7)	0(0)	0(0)
Farmers are represented in the decision making	42(35)	0(0)	6(5)	72(60)	0(0)

Source: Primary data, 2021

The first objective of this study was to find out the impact of marshland irrigated land on agricultural improvement specifically Misizi marshland. The results of this study showed that there was an agreement as the majority of respondents (55%) strongly agreed and 30% agreed

¹⁷ MINAGRI (2011). *Strategies for Sustainable Crop Intensification in Rwanda*

¹⁸ Kothari, C.R. (2004). *Research methodology: Methods and techniques. 2nd revised edition*. New age international publishers. New Delhi

that farmers irrigate according to the schedule especially twice a week. But few farmers can miss one week without irrigation as 60% of respondents as agreed and 35% strongly agreed, and 5% respondents were undecided. Low participation in maintenance of system is strongly agreed by 80%, 13% of respondents agreed that statement. To sell harvest for income is an impact of marshland irrigated land on agricultural improvement as strongly agreed by the majority 95 % but 5% strongly disagreed that statement. Besides, farmers have the fields in different zones and it is difficult to attend all community works in those zones as agreed by 90% of respondents and 10 were neutral. Further, 70% agreed that low knowledge of farmers is neglected in cropping practice but 25% disagree that statement. The biggest percentage (63%) of respondents also indicated that to satisfy household food requirements is among first impact of marshland irrigated land on agricultural improvement project. Finally, 60% of respondents disagreed agreed and 35% strongly agreed that farmers are represented in the decision meeting, and 5% were undecided.

Table 2. Level of agreement on marshland valorization on agricultural improvement

Statements	SA Freq (%)	A Freq (%)	N Freq (%)	SD Freq (%)	D Freq (%)
Marshland support the livelihoods of many people	112(93)	3(3)	2(2)	3(3)	0(0)
Marshlands remains one of the sustainable alternatives in response to population pressure on the fragile soils of hillsides	22(18)	92(77)	6(5)	0(0)	0(0)
Marshlands contain large water reserves and have lower erosion risks	33(28)	60(50)	27(23)	0(0)	0(0)
Irrigation scheme is factor that can contribute to national reconciliation	32(27)	75(63)	9(8)	0(0)	4(3)
Marshland improves crop growth and quality by allowing farmers to grow perennial crops on a consistent schedule	13(11)	95(79)	0(0)	11(9)	1(1)
Lack of rights on plots that they use regularly is very frustrating for farmers	32(26)	31(26)	5(4)	43(36)	9(8)
Farmers are involved in the preparation process of the new marshland management program	11(9)	12(10)	12(10)	85(71)	0(0)
Farmers benefit from marshland production before and after marshland management program	113(94)	4(3)	2(2)	0(0)	0(0)
Marshland also creates more reliable food supplies and ecosystem services	98(82)	4(3)	6(5)	12(10)	0(0)

Source: Primary data, 2021

The second objective of this study was to assess the impact of marshland valorization on agricultural improvement specifically Misizi marshland. The study indicated that there was an agreement of majority of 93% strongly agreed and 3% agreed that marshland support the livelihoods of many people, 2 (2%) were undecided and 2 (2%) strongly agreed that statement.

In addition, 77% of respondents also agreed that marshlands remain one of the sustainable alternatives in response to population pressure on the fragile soils of hillsides, 18% strong agreed and 5% disagreed that statement. Besides, on the statement regarding marshlands which contain large water reserves and have lower erosion risks, 50% agreed and 28% strongly agreed but 23% were undecided. This can contribute to national reconciliation as 63% of respondents agreed and 32% strongly agreed, 8% were undecided and 3% strongly disagreed that statement. Further, marshland improves crop growth and quality by allowing farmers to grow perennial crops on a consistent schedule as 79% agreed and 11% strongly agreed whereas 9% strongly disagreed and 1% agreed. Moreover, lack of rights on plots that they use regularly is very frustrating for farmers as 36% of respondents strongly agreed and even 8% disagreed that statement whereas a small portion of 26 % strongly agreed and 26% agreed. The majority of respondents 71% strongly disagreed because farmers are not involved in the preparation process of the new marshland management program and 10% agreed and 10% strongly agreed. Furthermore, farmers benefit from marshland production before and after marshland management program as the biggest percentage of 94 respondents strongly agreed 3% agreed and 2% were undecided. Regarding the statement of how marshland also creates more reliable food supplies, the majority of 82% strongly agreed and 3% agreed, 5% were neutral and 12% strongly disagreed that statement.

Table 3. Respondents' views on impact of farmers organization on agricultural improvement

Statements	SA Freq (%)	A Freq (%)	N Freq (%)	SD Freq (%)	D Freq (%)
Traditional and customary mutual-assistance organizations	112(93)	3(3)	2(2)	3(3)	0(0)
Water user associations	9(7)	102(85)	6(5)	2(2)	1(1)
Collaboration groups	22(18)	92(77)	6(5)	0(0)	0(0)
Unionized groups	33(28)	60(50)	27(23)	0(0)	0(0)
Cooperative federation	32(26)	75(64)	9(8)	0(0)	4(3)
Mutual help organization of neighbour inhabitants	32(26)	75(63)	0(0)	4(3)	5(5)
Inhabitants' voluntary labor offering towards public works	32(26)	31(26)	43(36)	5(4)	9(8)

Source: Primary data, 2021

The third objective of this study was to assess the impact of farmers organization on agricultural improvement specifically Misizi marshland. There was an agreement of 93% of respondents strongly agreed and 3% agreed about that statement, 2% were undecided, 3% strongly agreed about that statement. Water users' association is another farmers organization used at Musizi irrigation scheme as the biggest number of 85% agreed. Gradually others 7% of respondents strongly agreed while 5% of respondents were neutral and 2% disagree that statement. Concerning the statement of collaboration group as an impact of farmers organization, 77% strongly agreed and 18% agreed about it while 5% were neutral. Moreover, 60% of respondents agreed and 28% strongly agreed but 23% were undecided. Cooperative federation is another impact as 63% agreed and 27% strongly agreed and 8% were undecided and 3% disagreed. Moreover, the biggest percentage of 63% also agreed and 26% strongly agreed that mutual help organization of neighbour inhabitants was an impact of farmers organization on agricultural improvement, consecutively, gradually 4(3%) strongly disagreed and 5% disagreed. Regarding

the inhabitants 'voluntary labor offering towards public works is an impact of farmers organization as 52% of respondents agreed, 36% were undecided, 4% strongly agreed while 8% disagreed.

Besides, regarding correlation analysis, the study found that there is insignificant correction between increased irrigated land and increased agricultural productivity and production ($r=-0.470$, $p=0.000$) and between farmers 'organization and increased agricultural productivity and production ($r=-0.204$, $p=0.025$). Again, between farmers' organization and food security achieved ($r=-0.246$, $p=0.007$) and between increased irrigated land and food security achieved ($r=0.189$, p value= 0.049). Besides, regression analysis also shows that there is insignificant correlation between valorization of the marshland and increased agricultural productivity and production ($r=-0.283$, $p=0.002$) and between valorization of marshland and farmers organization ($r=0.317$, $p=0.000$).

CONCLUSION AND RECOMMENDATIONS

The study concluded that at irrigation scheme, farmers irrigate according to the schedule even though there is low participation in maintenance, they always sell harvest for income generation in order to satisfy household food requirements. Besides, the study also indicated that farmers are not fully participated in the decision making of cooperative. Moreover, marshlands remain one of the sustainable alternatives in response to population pressure on the fragile soils of hillsides as it is a part of economic value specially while improving crop growth and quality by allowing farmers to grow perennial crops on a consistent schedule at the same time it contributes socially to the national reconciliation. Further, the results of this study reveals that farmers organization have different impacts on agricultural improvement such as traditional and customary mutual-assistance organizations, collaboration groups, unionized groups, cooperative federation, mutual help organization of neighbour inhabitants and inhabitants' voluntary labor offering towards public works.

The following recommendations were made from the findings of this research paper:

- i. The government should continue to assist local farmers in the operations and maintenance of the irrigation infrastructures for a certain period of time until local farmers own enough financial capacity and great understanding to manage it themselves. This is to prevent the destruction and step back of development reached so far.
- ii. The government should take into account of the importance of irrigation scheme and develop many as possible as they have objectives of helping agricultural crop growth, landscape maintenance and reduce the effect of inadequate rainfall.
- iii. As farmers organization is very important to household livelihood, the Gisagara District should sensibilization farmers to gather themselves in association and cooperatives.
- iv. Stable and supportive policies should be implemented to improve risk management of subsistence farmers and would require the engagement of core ministries. The core programs of development must encompass the impacts of climate change as it affects poverty, food security, and economic development of the rural poor.

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