

Assessing Local Farmers' Awareness and Perceptions towards Wetland Protection and Conservation Strategies: The Case of Bugesera District, Rwanda

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This research paper aims at assessing the level of awareness and perception of local people towards wetlands' protection and conservation in Bugesera District, Rwanda, by focusing on Tubumba - Nyakariba wetland system, one of the widely exploited wetlands in the area. Both primary and secondary sources of data collection were used. The sample size of 80 local farmers owning a piece of land in the wetland system was randomly selected to represent a population of 219 cooperative members, and a structured questionnaire was used to interview heads of households. In addition, unstructured interview with local government authorities or officers in charge of environmental management or agricultural activities at sector and district level was conducted. Finally, all collected data were analysed and interpreted by using existing tools and methods in social sciences. Results showed that, impressively, the totality of all interviewed local farmers are positively perceiving the importance of protecting and conserving wetland resources in the study area. However, their level of awareness regarding major challenges constraining their effective protection and conservation are low. In addition, that level is still low regarding the awareness towards the existing strategies, policies and laws on wetland protection and management in Rwanda. Finally, the study highlighted the role of public sensitization through regular trainings, day-to-day government supervision, and a regular support to local farmers' practices as key sustainable solutions towards an effective protection and conservation of the wetland resources in Bugesera district.

Keywords: Wetland, Wetland protection and conservation, Local farmers' awareness, Local farmers' perceptions.

INTRODUCTION

Wetlands are the link between the land and the water [1]. They are considered as transition zones where the flow of water, cycling of nutrients, and energy of the sun meet to produce a unique ecosystem characterized by hydrology, soils, and vegetation. This makes the wetlands important features of a watershed. The wetlands play important roles for humans. They are the most biologically productive ecosystems in the world [2]. They are sources of wildlife, fish, wood and several non-timber products with soils which can have great agricultural potential when properly used [3].

Wetland resources are widely used by local communities for their subsistence and economic well-being [4]. Nevertheless, the general public and government lack a comprehensive understanding of the importance of wetlands benefits, leading to a blindly exploitation of the resources, and thus the decrease and loss of biodiversity [5]. It was figured out that wetland degradation in Africa is mostly due to agricultural

activities and use of wetlands as dumping sites [6]. These activities lead to secondary threats such as erosion due to the clearance of the wetlands for cultivation or other human activities.

In Rwanda, human activities including agriculture and animal husbandry, energy and transport, human settlement, and man-induced disasters including those related to deforestation, are the main factors of wetlands degradation [7]. To fight these challenges for environmental sustainability, the Government of Rwanda (GoR) put in place various measures including, but not limited, the 2005 Organic Law determining the modalities of protection, conservation and promotion of environment in Rwanda [8], the 2005 Organic Law determining the use and management of land in Rwanda [9], and the 2007 revised National Land Policy. These laws and policy make some restrictions to the use of wetlands resources such as the non-use of wetlands as dumping waste water and hazardous

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waste, establishment of buffer zones restricting pastoral and agricultural activities at a distance of 20 meters away from the banks of rivers and 50 meters away from the lake banks, etc.

Nonetheless, though the effort of the Rwandan government, it is still observed that wetlands have been continually degraded so far. It was noticed that it is not only enough to establish the laws and policies, but also to ensure the high level of awareness and positive perception of local population towards wetlands protection and conservation. The present study investigates the current level of awareness of local farmers towards wetlands protection and conservation in Rwanda by focusing on the case of Tubumba - Nyakariba wetland system in Bugesera district.

MATERIALS AND METHODS

Study Area

Bugesera district is composed of 14 sectors including Nyarugenge sector where Tubumba - Nyakariba wetland system is located. It covers a surface area of 1337 Km². The district is known as one of the driest regions in the country. In the past, dryness led to the migration of some local farmers from Bugesera region to several green pastures of the country. However, the district counts a number of water bodies including Cyohoha Lake in the South and other small water bodies in its eastern part. It counts also more than 50 wetlands which play a very important role in crops production and distribution in the region [10].

The two wetlands of the study area, both located in Nyarugenge sector, are connected by a very narrow part of another wetland known as Rwabusoro. Tubumba wetland has a surface of 4 hectares and is known for rice cultivation; while Nyakariba wetland has a surface of 6 hectares and is known for rice cultivation as well [10]. Tubumba - Nyakariba wetland system is currently under the control of an agricultural cooperative called "JYAMBERE": a cooperative composed by 219 members cultivating rice in the wetland system.

For the purpose of this study, only two cells of Nyarugenge sector (out of five) namely Ngenda and Kabuye II have been sampled during our field work. This was due to the fact that these two cells are covering a large surface of Tubumba - Nyakariba wetland system within Nyarugenge sector. The following figure (Fig. 1) presents a map showing the geographical location of the study area in Rwanda. It also highlights Ngenda cell; a cell where is located the most of Tubumba wetland, and Kabuye II cell; a cell where is located most of Nyakariba wetland.

Data Collection

Secondary Data

The literature was reviewed to get accurate information about the current situation on local people's awareness and perceptions towards wetlands protection and conservation in Rwanda. Furthermore, it contributed to getting information about the perceived role of wetlands resources in Rwanda by local people, and the way the country integrates the management of wetlands into government strategies, laws and policies. This had led to the possibility to evaluate the level of awareness of the local population around Tubumba - Nyakariba wetland system, given the statements in the government plans, laws and policies, and the population's practices and perceptions.

Primary Data

Reliable data from the field were collected in order to get the real situation of the study area in terms of wetland degradation, wetland farming activities, and existing wetland protection and conservation measures. This allowed further analysis to respond to the research questions, from the direct point of view from local farmers and government field officers or Non-Government Organizations in charge of environmental protection, agricultural practices, etc.

The applied methods and techniques for primary data collection included field observation, household questionnaire survey and interviews. Regarding the field observation, some physical aspects of Tubumba – Nyakariba wetland system as well as the existing agricultural practices in the area were observed and some photos and measurements were taken. During that phase, a pilot field survey was also conducted.

For the household questionnaire survey, the target population for this study was all members of Tubumba and Nyakariba cooperative who are 219 local farmers in total. From the 219 cooperative members a sample size of 80 was arbitrarily selected. Among 80 interviewed heads of households; 54 were from Tubumba wetland; a wetland with many farmers (154 out of 219), while the remaining interviewed households were from Nyakariba wetland, a wetland with fewer local farmers (65 out of 219).

The criteria of choosing key informants included gender dimension, the fact that each interviewed local farmer is an owner of at least a piece of land under cultivation in the wetland system, and the starting date in exploiting wetland resources in the study area.

The questionnaire was focusing on the rationale about the role of wetland resources in the study area, level of local farmers' awareness and perceptions about different national strategies, policies and laws restricting different activities in the wetlands, major challenges faced by local people in protecting and conserving wetlands resources, etc.

Finally, unstructured interviews were mainly addressed to the local government authorities (executive secretaries of the two concerned cells, environmental manager at the district level, and agronomists at sector and cell level). Those interviews were focusing on existing measures and practices of local government authorities in enhancing Tubumba – Nyakariba wetland system protection and conservation. In addition to this, they focussed on future plans.

RESULTS

The results were evaluated by considering three broad categories of responses: 1° current status of Tubumba – Nyakariba wetland system protection and conservation; 2° local farmers' awareness and perceptions about the existing strategies on the existing strategies on wetland protection and conservation 3° major challenges faced by local farmers and effective solutions towards a sustainable protection and conservation of Tubumba – Nyakariba wetland system.

Current Status of Tubumba – Nyakariba Wetland System Protection and Conservation

In the past, wetlands were considered economically useless for local farmers. According to our field survey, they were used only for dumping sites and some minor farming activities such as agriculture and grazing.

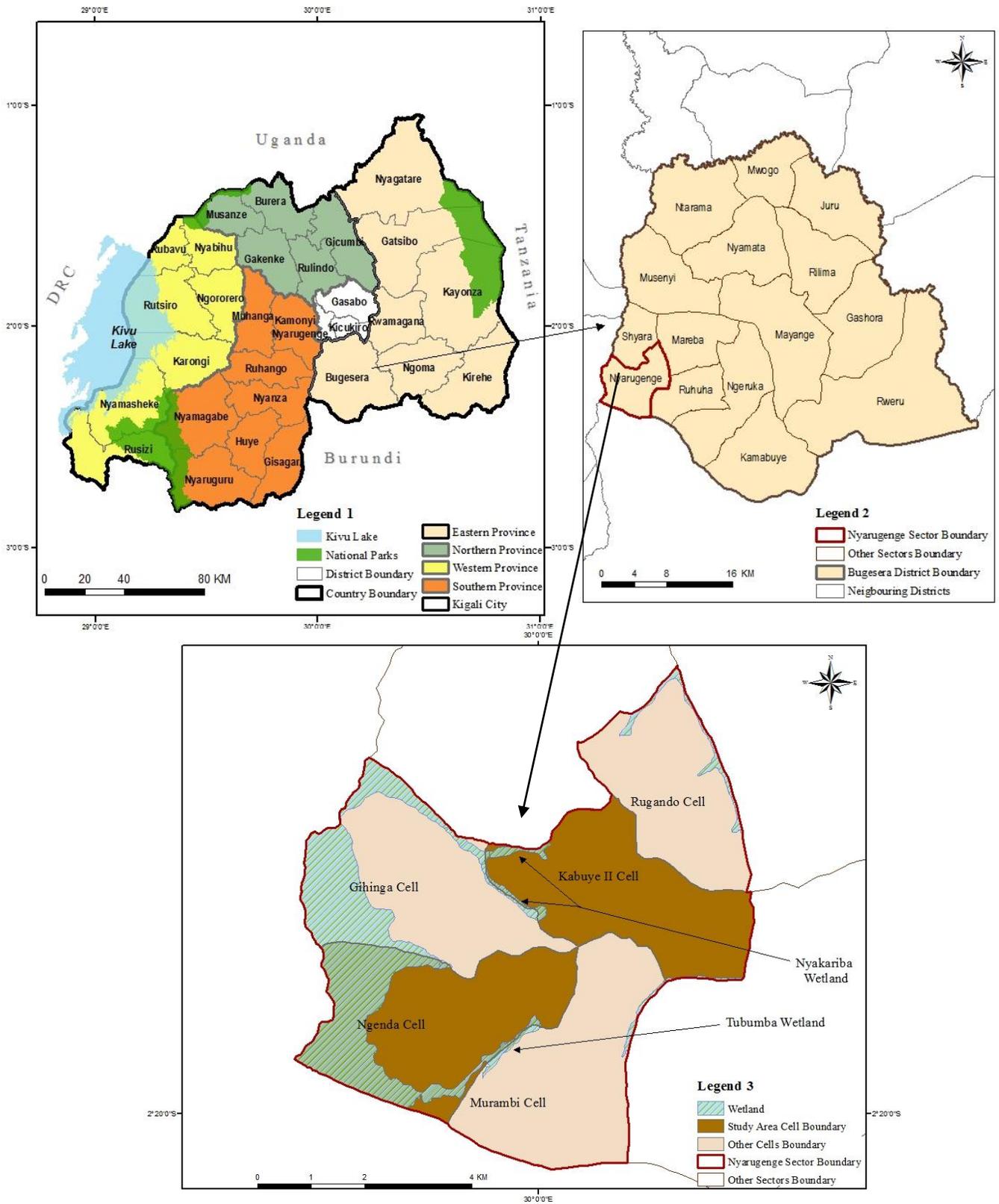


Figure 1: Map of Tubumba - Nyakariba Wetland System in Rwanda (CGIS, 2016)

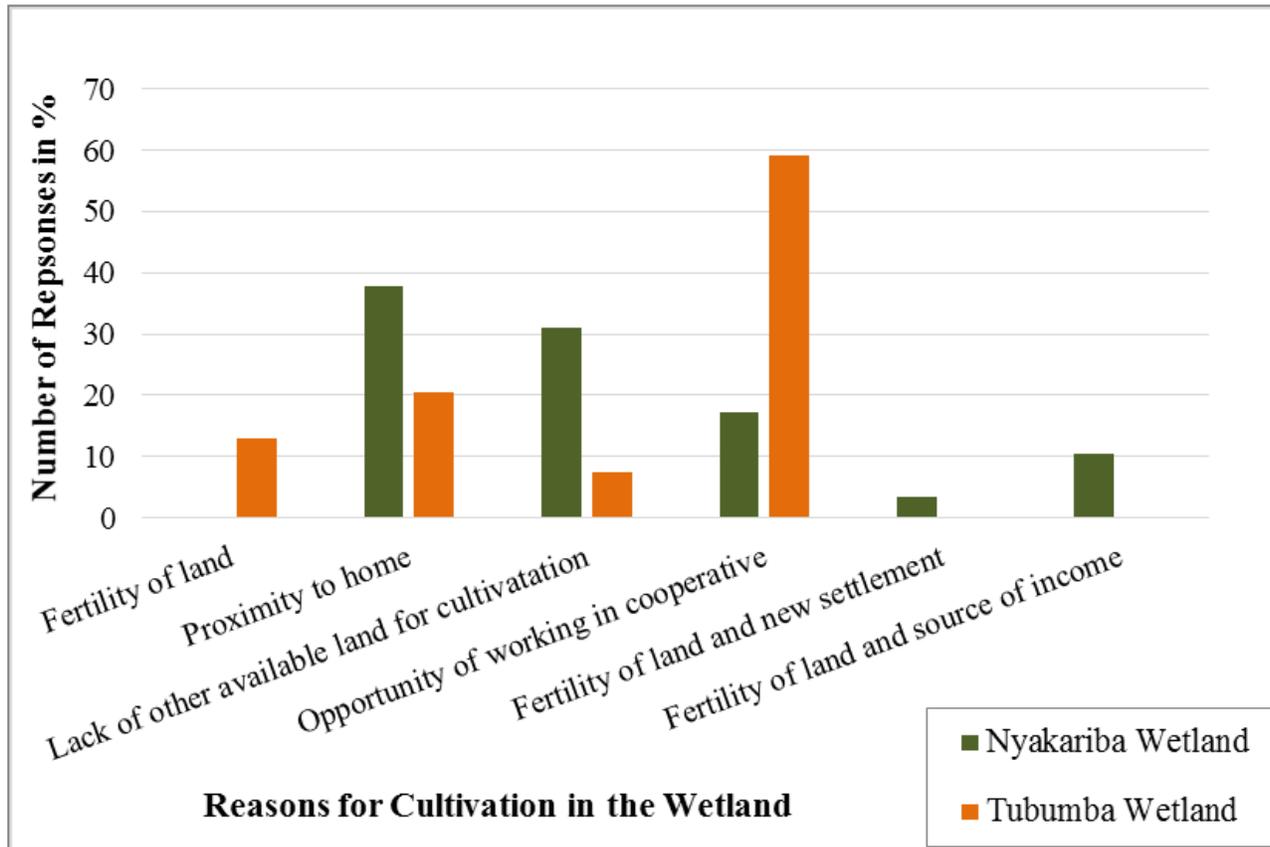


Figure 2: Reasons behind Tubumba - Nyakariba Wetland System Cultivation

In general, Tubumba - Nyakariba wetland system started to be used for agricultural activities mostly after 1980. According to our survey, a large number of local farmers in Nyakariba wetland have indicated that they started cultivating it between 1990 and 2000 (around 58 %). According to them, they did it because there were no other many choices. In fact, that period was characterized by many problems related to land ownership between old refugees (who left the country in 1959 1963) and their successors after the independence. This situation created some landless people in the study area. For local farmers who cultivated Nyakariba wetland before 1980 (8 %), the only explanation was the fact that it was the only land that was available for them during that period.

For the case of Tubumba wetland, most of the interviewed local farmers (around 75 %) have indicated that they started cultivating the area after the year 2000, the period when their agricultural cooperative started its activities. In fact, they were more attracted by the cooperative opportunity in terms of more agricultural and social benefits rather than agricultural lands.

Other reasons for both wetlands include fertility of the land, opportunities in working in cooperative, lack of other available land, source of income, etc. The figure below (Fig. 3) summarises the responses from the interviewed local farmers about major factors that pushed them to cultivate in Tubumba – Nyakariba wetland system. As a conclusion, research findings have revealed that most of the local farmers did not start to cultivate in the Tubumba – Nyakariba wetland system because it was their first choice or preference. They did it due to other reasons as indicated in previous paragraphs.

Regarding the perceived roles of wetland resources among local farmers, and considering the fact that a wetland is one of the main factors influencing perception and willingness of the surrounding population towards its protection and conservation, the interviewed local farmers around Tubumba wetland have mentioned two major roles which are facilitation of food production, and source of income for other needs. Consequently, 33% of the interviewed farmers around Nyakariba wetland revealed that the wetland system has a role of producing food only, whereas this percentage is 57 % for Tubumba wetland. The rest of the interviewed farmers, 67 % and 43 % respectively, are convinced that wetlands facilitate both food production and income generation for other needs. Unfortunately, other factors such as wetland, habitat of biodiversity conservation, water reservoir, tourism sites, etc., were not considered or ignored.

Concerning the perceived actual level of protection and conservation of the wetland system, 100% of local farmers living around Nyakariba wetland have confirmed its effective protection and conservation due to a regular common community work involving all cooperative members, where the existing harmful materials are removed from the wetland. The same statement has been also revealed by 93.3% of local farmers living around Tubumba wetland. The remaining 6.7 % have reported the non-protection and conservation of the wetland system due to the problem of sporadic floods from the nearby lake Cyohoha South during the rainy season. During the Season A of 2013 for example, 43 members of the cooperative did not cultivate their own lands due to the problem of floods. Beside this high performance in protecting

and conserving the wetland system, these two wetlands were found to be under gradual degradation. For Tubumba wetland, this degradation is due to the problem of demographic pressure leading to its overexploitation. Contrastingly, the major causes of Nyakariba wetland degradation are, but not limited, insufficient technical support for wetland protection and conservation, and low level of awareness of local people about wetland protection and conservation.

Local Farmers' Awareness and Perceptions about the Existing Strategies on Wetland Protection and Conservation

In general, the level of awareness among local farmers towards the protection and conservation of Tubumba – Nyakariba wetland system is very high. However, there is a difference between the two wetlands. The main reason behind this difference was found to be the way cooperative members participate to the proposed trainings on good agricultural practices. For Nyakariba wetland for example, it has been noticed that this participation is rotational. This means that each cooperative member can benefit from the proposed trainings while in Tubumba wetland only cooperative leaders attend all proposed trainings.

In addition, local farmers pointed out that strategies of raising their awareness about wetland protection and conservation measures, other than trainings, should include the use of media (radio receivers, televisions and newspapers) as well as conducting regular meetings with local government authorities. Moreover, they revealed that the use of media is more effective (60 %) than having regular meetings with local government authorities/officers (40 %).

Regarding the level of awareness and perceptions on the existing Organic Law determining the modalities of protection, conservation and promotion of environment in Rwanda, especially in its article 83 talking about the restrictions to dump in wetlands [8], it was revealed that the majority of the interviewed local farmers were unaware at the level of 61.5 % and 60 % for Nyakariba and Tubumba respectively. In addition, they did not consider dumping wastes in the wetland as an issue. Given that it is needed to have the entire surrounding population's collaboration for the successful wetland protection and conservation in the study area, and in the whole country as well, these statistics are considered to be high level. In the same Rwandan Organic Law, in its article 87, it is stated "all buildings shall be constructed in a distance of at least twenty (20) meters away from the banks of the swamp. If it is considered necessary, construction of buildings intended for the promotion of tourism may be authorized by the Minister having environment in his or her attributions".

For the level of local farmers' awareness about the existing law creating a buffer zone around each wetland in the country, results from the field survey highlighted a high difference between the farmers from the two wetlands which were 69.3% and 6.7% for Nyakariba and Tubumba respectively. As explained in the previous paragraphs, this high difference between the two wetlands is due to the existing level of trainings on the importance of wetland protection and conservation among local farmers which is very high in Nyakariba wetland (85 %) compared to Tubumba wetland (27 %).

Major Challenges and Alternative Solutions towards a Sustainable Protection and Conservation of Nyakariba – Tubumba Wetland System

The results about the perception of the local farmers towards wetland protection and conservation are fascinating. In fact, 100 % of all respondents for both Nyakariba and Tubumba wetlands said that they positively perceive the importance of the wetland system protection and conservation. As explanations, they said that the wetland system is of great importance because it remains the area with fertile soil for farming activities. In addition, it has a strong ability to provide other services including grazing land, fishing activities, tourism activities and support of biodiversity conservation. Moreover, and according to the research findings, local farmers are willing to protect and conserve their wetland system. However, some challenges are hindering their attitudes and perception.

These challenges include flood phenomenon that was confirmed by the totality of interviewees for Tubumba wetland. Nevertheless, floods appeared not to be an issue for the farmers in Nyakariba wetland, where only 15.4% of the interviewees pointed it out as a challenge. Other challenges include insufficient technical support for wetlands protection and conservation, low level of awareness among local farmers, and unplanned settlement around the two wetlands. However, the low level of awareness among local farmers was said to be the base for some other challenges including soil erosion and soil infertility in some parts of the wetland system.

Regarding the existing strategies against the identified challenges, local farmers around Tubumba - Nyakariba wetland system expressed their own strategies to fight those challenges. Firstly, a community work involving all cooperative members is regularly organized in order to clean the perceived harmful materials in the wetlands. This is more practiced in Nyakariba than in Tubumba where 92.3% and 66.7 % of local farmers respectively declared that the above-mentioned activity happens more than twice a year in their respective wetlands. Secondly, the question of responsibility in terms of protecting and conserving wetland resources has to be highlighted. For that reason, it was mentioned the shared responsibility among the existing stakeholders who include local Non-Government Organizations, central government, local government entities, and local farmers as a key strategy.

Regarding the sustainable measures to raise awareness about wetland protection and conservation in the study area, the interviewed local farmers suggested the regular participation to the trainings on agricultural best practices as well as a regular supervision of local extension agents or agronomists as effective measures.

DISCUSSION

In the present study, the level of awareness and perceptions of local farmers living around Tubumba - Nyakariba wetland system are not completely the same for the two wetlands. Nonetheless, the general observations are mostly similar. Regarding the starting time to cultivate in the above-mentioned wetlands, it has been noted that most local farmers started to cultivate in Nyakariba wetland between 1990 and 2000, while for Tubumba wetland they started after 2000.

This is an important parameter that relates to the history of the country and its implications on wetland resources management. In fact, due to the 1994 genocide against Tutsi, its effects have been also extended to the natural environment,

including wetlands. In this line, local farmers around Nyakariba wetland reported that their use of wetlands was pushed by the problem of land eviction that occurred during and after 1994 genocide tragedy. In few words, there was no other alternative solution for them. This is fully in accordance with the statement found in our Organic Law n° 04/2005 of 08/04/2005 determining the modalities of protection, conservation and promotion of environment in Rwanda [8], related to the interdependence and indivisibility between peace, development and environmental protection. Thus, it is emphasized that for sustainable environmental management and effective protection, peace should be maintained.

Differently, in Tubumba wetland, farmers were mostly attracted by the commencement of working in agricultural cooperative in order to gain common available benefits from the cooperative. In the same line, the Food and Agriculture Organization of the United Nations (FAO), International Fund for Agricultural Development (IFAD), and World Food Programme (WFP), put also emphasis on the important role played by agricultural cooperatives in life improvement of local people, especially for some marginalized groups such as youth and women [12]. In fact, the economic and social benefits available in the cooperative attracted more farmers to join. In addition, it has been realized that it can be easier to implement wetland protection and conservation measures through the existing agricultural cooperatives accessing the wetlands, because their respective members consider wetlands as storage of their wealth.

Generally, to successfully protect the environment, availability of adequate financial resources and public's interest toward environmental conservation play a key role [13]. In that line, the present research found that most of the farmers consider wetlands resources as areas, which facilitate them not only to produce food but also to generate income. However, it was noticed that that factor doesn't attract the full attention of local farmers towards the effective protection and conservation of their neighbouring wetlands. Instead, more blind exploitation is practiced with aim to gain more in terms of food and various sources of income.

Unfortunately, other factors which could attract local farmers' attention and interest to enhance the level of protection and conservation such as being habitat for biodiversity conservation, water provision, tourism activities were found unknown by the interviewed local farmers, giving them a room for low consideration of the importance of wetlands protection and conservation. This means that if the interest in wetland protection would increase, the local farmers would involve themselves in fighting the factors contributing to the degradation of their neighbouring wetlands.

Regarding the proposed suggestions that can contribute to increase the level of local farmers' awareness and perceptions towards a successful protection and conservation of wetlands resources, regular trainings on some best practices were found to be the most effective tool to reach the goal. The positive effects of these regular trainings were also indicated while assessing the level of awareness of local people about different strategies and laws related to wetland protection and conservation. In this regard, it has noticed that the level of local farmers' awareness towards most of laws and regulations governing various bodies and activities in wetland zones at country level is low.

Similarly, their level of awareness about the law governing the buffer zone restricting them to practice various activities as well as the law prohibiting the use of wetland as waste dumping site is still low too [8]. It is where the use of regular

trainings as a strategic tool to raise awareness among them remains an excellent sustainable solution. Media (radio, TV and newspapers) is also an excellent tool but its influence is limited in rural areas. To conclude, it is important to consider regular trainings for local farmers and their meetings with local government authorities or officers when it comes to talking about laws and regulations governing wetland resources in Rwanda. This helps them to not only raise their level of awareness and perceptions towards wetland protection and conservation strategies but also to avoid possible causes of degrading those available natural resources.

Concerning the major challenges which can hinder the effort made by local farmers and other stakeholders towards an effective and sustainable wetland protection and conservation in the study area, the identified challenges include flooding phenomenon, insufficient technical support from the government and other stakeholders, soil erosion, soil infertility in some places of the wetland system, and unplanned settlement around the wetland system. As pointed out by Polajnar [14], physical, biological, and chemical component including soil, water, flora and fauna are all elements of the wetland, and should be sustainably maintained for effective, successful and sustainable wetland protection and conservation.

This should be realized through the increase of the awareness of local farmers operating over the wetlands, as they are the ones with direct contact and influence to the resources. Interestingly, local farmers around Nyakariba - Tubumba wetland system have been found to have strategies to fight the above-mentioned challenges, including regular community work for cleaning the wetlands. This has been considered as a good habit for wetland protection and conservation enhancement that could be adopted by other local farmers with direct and regular contact with the wetlands. Furthermore, accountability among all involved stakeholders has to be another strong strategy towards an effective and successful wetland protection and conservation in Bugesera district.

CONCLUSION

The level of awareness and perceptions of local people is one factor, among others, towards a sustainable protection and conservation of wetlands resources worldwide. For the case of Nyakariba - Tubumba wetland system, located in Bugesera district, that level is still low as shown by this study. In fact, only 59.1% of the interviewed local farmers around Nyakariba wetland are aware of the existing wetland management measures such as buffer zone restrictions, prohibition of dumping wastes in the wetlands, and general overview about wetlands protection and conservation.

This number goes a bit up to 60.1% for Tubumba wetland. This means that the remaining percentage (almost 40%) might be pulling down the efforts of the positive 60% in protecting and conserving the wetland system. Hence, the awareness should be raised so that all local farmers have best practices and perceptions towards a sustainable protection and conservation of Nyakariba – Tubumba wetland system.

Regarding the perceptions of people surrounding the wetland system, results showed that the totality of interviewed local farmers have a positive understanding in favour of an effective protection and conservation of wetlands resources due to their importance in terms of potential agricultural lands. This seems to be logic as the population is increasing in the

region. In the same line, population pressure leading to overexploitation of wetland resources was identified to be among the major challenges hindering an effective protection and conservation of Tubumba - Nyakariba wetland system. Another challenge was the unavailability of regular information about effective wetlands protection and conservation. Other challenges include soil erosion, floods, and unplanned settlements. As sustainable solutions to the above-mentioned challenges, the study proposed some measures which include but not limited regular trainings to local farmers about some best agricultural practices, and enhancement of agronomist's supervision among local farmers. Regarding the level of awareness, public sensitizations through local government meetings, and the use of media have been suggested.

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