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Wetland Restoration Dilemma in Uganda: Investigation of Alternative Livelihood Options for Restoring Limoto Wetland in Eastern Uganda

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Abstract

Purpose: Motion 145 adopted by the 5th IUCN World Conservation Congress in 2012, called for an evaluation of alternative livelihood programs' contributions to biodiversity conservation. And since then, alternative livelihood opportunities are employed globally as a way to protect biodiversity, notably for wetlands. This study aims to advance the evaluation of alternative livelihood options' effects on biodiversity. The objective of the study is to describe the effectiveness of alternative livelihood options in the restoration of the Limoto wetland.

Methodology: A cross-sectional research design was adopted. Both quantitative and qualitative data were collected using Focus Group Discussions (FGD) and interviews. FGDs were conducted with five groups of beneficiaries of livelihoods options. Interviews were carried out with seven key informants who were considered to be knowledgeable about the wetland restoration alternative livelihood options. These included village local council chairpersons from communities near the wetland, opinion leaders, district natural resources officers, IUCN Representative, NEMA official and wetland department.

Findings: The study revealed that the livelihood options initiated for Limoto wetland restoration were ineffective and unsustainable. While, the study further revealed that the wetland restoration program had led to food shortages due to loss of wetland farmland. The study findings showed that re-encroachment was substantially due to a lack of perceived relevance and dissatisfaction with the alternative livelihood options.

Unique Contribution to Theory, Practice and Policy: The study concludes that wetland reencroachment is caused by the beneficiaries' dissatisfaction of the alternative livelihood options introduced. Therefore, the study recommends the alternative livelihood options be determined using a co-creating design, where the communities are involved and this is in accordance with National Environment Act No.5, 2019 Uganda.

Keywords: *Livelihood*, *Wetland Degradation, Wetland Restoration*.

1.0 INTRODUCTION

As a result of pressure from the growing global population, many people in various countries depend on and overuse wetlands, which are seen as "wasteland" and have a vulnerable ecosystem. (An & Verhoeven, 2019; Sakataka & Namisiko, 2014; Ministry of Water and Environment., 2019). Wetlands make up 6% of the world's land area. In Uganda, 13% of its land area is wetland (NEMA, 2017). Wetlands are unquestionably the most fertile life-supporting systems in the world and are vital to human survival on both a socioeconomic and ecological level (Mombo, 2017). To support Uganda's population, which is one of the fastest growing in the world at an average of 3.32% each year (UBOS, 2020), a variety of livelihood activities are carried out in the country's wetlands (Barakagira & de Wit, 2017). It must be stressed that agriculture, the foundation of Uganda's economy, is one of these activities carried out on wetlands that are thought of as "free and fruitful" for crop growth to feed a constantly growing population. In fact, more than 80% of people who live in riparian wetlands areas depend on them for their livelihoods (MWE, 2019). According to some estimates, 2.7 million people are supported directly and 4 million people indirectly by wetland-related commercial activity (Waswa & Satognon, 2020). Community dependence on the wetland for community livelihoods places unheard-of strain on its survival, which in turn impacts how well the wetland performs its natural functions. (An & Verhoeven, 2019). 36% of Uganda's wetland area was converted to agricultural land between 1994 and 2014 (UNDP, 2020). This pattern, according to Namaalwa et al. (2013), is more pronounced in eastern Uganda, where people have quickly embraced rice production. It is stated that due to increased rice cultivation and urbanization, the Limoto Wetland, a branch of the Mpologoma Wetland System in eastern Uganda, lost about 80% of its cover between 1994 and 2014 (UNDP, 2016). The streams that feed lake Lemwa, the only source of water for Pallisa town, dried up and turned saline, causing both the amount and quality of the lake's water to diminish (NEMA, 2017). This resulted in the wetland degradation leading to the disappearance of wild animals, disease outbreaks, bird migration away from the large wetland, pollution, decreased fish productivity, and a sharp reduction in crop yields due to the prolonged dry spell, which negatively impacted food security and community livelihoods (MWE, 2019; UNDP, 2019).

In order to restore and protect wetlands ecosystem functions that has been destroyed, governments have designed alternative livelihood options for communities who depend on wetlands as a strategy to reduce their wetland activities associated with wetland resource degradation (Roe *et al.,* 2015) Alternative livelihood options refer to strategies or approaches to accomplishing biodiversity conservation by displacing a livelihood strategy that is negatively impacting a biodiversity target (Roe *et al.* 2015). These strategies could take three forms, first, offering an alternative resource to the one being exploited, like in the case of encouraging locals to raise cane rats for food instead of going on a bush meat hunt (Vliet, 2011). Secondly, concentrating on initiatives that could offer an alternate job or source of income, such as beekeeping and craftmaking as alternatives to growing subsistence agriculture surrounding protected areas (Mahulu *et al.,* 2019).Thirdly, promoting a less harmful alternative to the original technique of resource use, lessen the demand for firewood, one example of such initiatives could be the promotion of fuelefficient stoves. The three methods clearly demonstrate that initiatives to promote alternative livelihoods may occasionally succeed as stand-alone initiatives or as a part of a larger, more comprehensive integrated conservation and development program. The programs for alternative livelihoods are designed to vacate local communities from the wetlands to allow for restoration and conservation.

According to Roe *et al* (2015) critical review of twenty-one alternative livelihood projects selected from around the world and their contribution to biodiversity conservation, the use of alternative livelihoods, raising local community awareness through training, and implementing community-based conservation strategies can reduce environmental threats. Additionally, if the local inhabitants are given the tools to use the resources sustainably, they will undoubtedly support their conservation. (Marambanyika *et al.,* 2021). In the Limoto Wetland, the development of fish ponds, heifers, turkeys, a piggery, and minor irrigation schemes were introduced as an alternative source of income to vacate the encroachment, rejuvenate the degraded Limoto Wetland, and ensure sustainable wetlands utilization (GCF, 2015). It is argued that Limoto wetland had recovered and regained most of its ecological functions with vegetation regenerating, quantity and quality of water improved thereby supporting a vibrant wetland ecosystem (MWE, 2019; UNDP, 2019). Limoto wetland became national reference on successful wetland restoration program using alternative livelihood options model (MWE, 2019). However, a study to assess the restoration programs in 2020 revealed that local community had started re-encroaching on the restored Limto wetland (UNDP, 2020). The puzzle now is whether there are new encroachers or whether the incentive mechanisms have met the alternative livelihood's objective of restoring the wetland.

Research Problem/Gap

Alternative livelihood options employed in the bid to restore Limoto wetlands included among others construction of fish ponds, livestock keeping, poultry, and mini irrigation schemes introduced to stop the encroachment, restore the degraded Limoto wetland and ensure sustainable wetlands utilization (GCF, 2015). By 2019, Limoto wetland had recovered and regained most of its ecological functions with vegetation regenerating, quantity and quality of water improved thereby supporting a vibrant wetland ecosystem (MWE, 2019; UNDP, 2019). Soon the wetland became National reference on successful wetland restoration using alternative livelihood options model (MWE, 2019). However, an appraisal report on the restoration program at the end of the year 2020 showed emerging re-encroachment of the restored Limto wetland (UNDP, 2020). There remains a dearth of information on the enablers of this re-encroachment. The puzzle now is, either the incentive mechanism could have been poorly modeled or there are new encroachers. The study therefore assessed the effectiveness of the alternative livelihoods options in vacating new encroachers from the wetland. It was critical in creating an understanding the dynamics that are leading to continued deterioration in Limoto wetland cover as such trends can undermine the already registered and the previous gains in restoration of Limoto wetland.

2.0 MATERIALS AND METHODS

2.1 The Study Area

This research was carried out at the Limoto wetland in the Kyoga lowlands of eastern Uganda. *(Figure 1).* It is situated between latitudes 1010'0N' and longitudes 33057'0E, between an average elevation of 1040m above sea level surrounding the lake Lemwa to 1060 m above sea level within the floodplains. It is an arm of the Mpologoma wetland system, which is more extensive and common in these lowlands. The wetland has a total area of 136 square kilometers, of which 30% are in the Kibuku District and 70% in Pallisa District. Small-scale subsistence agriculture, primarily of annual crops, limited pastoralism, and a high level of food insecurity are characteristics of the Limoto wetland area (UNDP, 2016). According to national criteria, the population density is average at 260 people per km^2. The vegetation is primarily made up of savanna species, and the annual rainfall ranges from 900 to 1500 mm (Bunyangha *et al.*, 2022).

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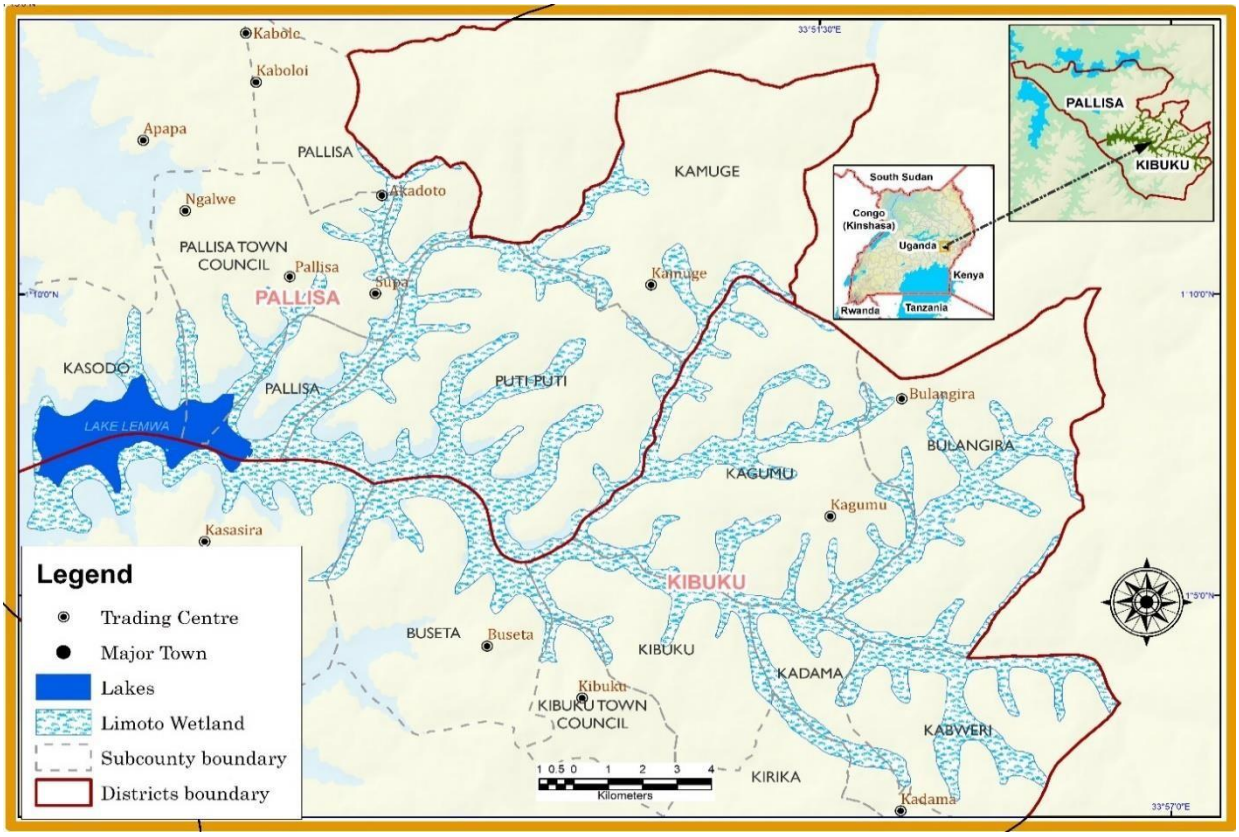

Figure 1: Location and Map of Limoto Wetland

Source: (Author, 2022)

2.2 Research Design

The effectiveness of alternative livelihood option is a construct of multiple issues. The purpose of this study was to understand the situation of Limoto wetland before the introduction of livelihood options, wetland users' knowledge on wetland restoration activities, their perception about livelihood options and their relevance as well as the perceived satisfaction. In order to efficiently gather information on these issues, a questionnaire and checklist for a household survey were designed. A cross-sectional research design was used in this study. While quantitative data was gathered using a questionnaire. A total of 405 respondents were chosen at random from households in and around the Limoto wetland in both Pallisa and Kibuku. Household survey data were collected using a pre-tested questionnaire in Kobo tool box administered through face-to-face interviews. Qualitative data was collected through household interviews, key informant interviews, and field observations. While, qualitative data was elicited from five groups of beneficiaries of livelihood options through focus group discussion. Interviews were conducted with seven key informants purposively selected from eight villages and government agencies. They comprised of local council chairpersons, village opinion leaders, Pallisa district natural resource representative, Ministry of water and environment representative, and IUCN representative.

2.3 Data Instruments

To gather data, the researcher used a questionnaire, which was augmented by interviews, and observation. Scholars emphasize use of these data collection methods. For instance, Silverman (2013); credits interviews as an important instrument for providing a wide range of data collection opportunities to the researcher to get more deeply insights into problem being investigated. It also

offers the potential to capture a person's perspective of an event or experience (Silva, 2008). Interview was a rich source of reliable data as it involved a specialized form of communication between or among participants in the study (Boyce & Palena, 2006). In the same line of argument, oobservations for qualitative investigations should, according to Zhou *et al.* (2010), be purposely free-flowing and unstructured to enable the researcher to adjust their attention as new, potentially significant items or events emerge. These instruments were used with the help of Kobotool following the participants' explicit consent, assurance of the confidentiality of their information, and making clear to them that the study's goal was academic. The researcher therefore made use of any fresh or unexpected data sources.

Using Kobotool box uploaded to tablets, the researcher created a survey questionnaire to get quantitative data from wetland users. Under the careful field supervision of the author, data were gathered by research assistants from the randomly chosen families. Prior to the data collection, research assistants got training in data collection, and during a focus group discussion, the data collection tools were discussed and translated into Ateso and Lugwere, which are commonly spoken local languages in the study area. This was done for those respondents who did not understand English. A husband or wife of wetland users per household was considered. It was made clear to participants that the study's goal was academic and that their responses would be kept anonymous and confidential.

2.4 Data Analysis/Processing

The raw data from Kobotool box were downloaded to Excel for further cleaning, which involved removing incomplete surveys. After that, it was exported to IBM SPSS V25 so that descriptive and inferential statistics could be produced. Descriptive data generated in form of percentages, cross-tabulated tables, and graphs, provide an overview of the local knowledge of restoration and livelihood options and their effectiveness. A paired t-test was conducted to test the hypothesis to establish if there was no significant difference in the levels of dependence before and after the introduction of alternative livelihood options to reduce reliance on Limoto Wetland. Using a chi square, the relationship between local preferences and the alternative livelihood options was done. A hierarchical loglinear model was utilized to detect significant connections among components of the effectiveness of alternative livelihood options while, a binary logistic model was used to identify factors causing re-encroachment. Qualitative data gathered were analyzed thematically.

3.0 FINDINGS

3.1 Socio-Economic Characteristics of the Respondents

The majority of responders (93.9%) were married, had homes with 10.6 people, and could afford two meals every day (Table 3.1). They were mostly male (58.3%), 41.9 years old, and engaged primarily in farming (94.1%) on their land (82.5%). Additionally, the majority (62.2%) had only an elementary education, and 45.5% lived in permanent residences. A significant number also lived in grass thatched houses (36.32%) (Table 1).

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Table 1: Respondent Socioeconomic Characteristics

Socio-economic characteristics		**Counts**
Age	**Mean (Std D.)**	41.860 (13.810)
Household size	**Mean (Std D.)**	10.578 (7.867)
Gender	Female	41.70%
	Male	58.30%
Highest level of education	Primary	62.23%
	Lower secondary	27.07%
	No education	9.83%
	Tertiary	0.66%
	Degree	0.22%
Marital status	Married	93.87%
	Single	3.28%
	Widow	2.63%
	Divorced	0.22%
Main Occupation	Farming	94.10%
	Fishing	4.59%
	Trader	0.66%
	Formal employment	0.44%
	Student	0.22%
Housing structure	Permanent structure	45.51%
	Grass thatched Hut	36.32%
	Temporary structure	18.16%
Meals per day	2 meals	82.31%
	1 meal	9.61%
	More than 2 meals	8.08%
Land ownership	Own	82.53%
	Hire	17.47%

More than 90% of respondents claimed that farming is their primary occupation, and more than 50% said that they live in grass-thatched huts or other temporary structures. A total of 82% of the participants contacted own land and can afford two meals per day. The wetland frontline communities surveyed had only primary education (62%), while 9.8% had had no formal education at all, and less than 1% had higher education. The low levels of education in the area explains the wetland frontline community's poverty. This is agreeable with Appleton's, (2nd.), contention that illiteracy contributes to poverty in Uganda.

3.2 Restoration Information and Livelihood Options Introduced

Before a policy can be implemented, the stakeholders must understand its guidelines, frameworks, and purpose. This study sought to establish whether Limoto wetland users were aware of the government's intention to prevent further degradation, restore its ecosystem, and conserve it by embracing government-initiated livelihood options for their livelihoods. A total of 81.2% responded that they were aware of the government's intention to prevent them from using wetland

for livelihood activities, prior to the implementation of government restoration livelihood options. A total of 82.3 percent of respondents said that the government's initial attempt was to discourage wetland frontline communities from using the wetland for their livelihoods. One key informant revealed that stopping people from accessing Limoto wetland for their livelihood activities, came after multiple warnings to wetland users to vacate the wetland. It was stressed that government enforced forceful eviction and encouraged wetland users to opt for alternative livelihood options initiated to reduce their dependence on the wetland for their livelihoods which was degrading it. Mini-irrigation for vegetable cultivation, fish ponds, heifers, turkeys, apiaries, and piggeries were among the alternative choices (Table 2). During a focus group discussion with the chairpersons of selected villages surrounding the Limoto wetland, it was revealed that some villages benefited more than others. They specifically said that only 36.5% of the wetland users received these alternatives livelihood. This figure is low, however, one key informant stated that the goal of the program was not to compensate, but to enable wetland users to learn best practices and apply this knowledge and practices in their own. It was noted during the study that the most received alternative livelihood options were Turkeys (17.3%) followed by heifers (13.9%) (Table 2).

Table 2: Restoration and Alternative Livelihoods

Variables		**Counts (%)**
Knowledge of previous restoration efforts	No	18.8
	Yes	81.2
Restoration activities	Stopping the community from accessing the wetland for human activities	82.3
	Created for us other sources of income/livelihood	17.3
	Others	0.4
Importance of restoring Limoto wetland	Fresh water	39.7
	Good fodder	23.7
	Conserve for future use	18.3
	Help in rainfall formation	10.7
	I don’t know	6.8
Livelihood alternatives received	No	63.5
	Yes	36.5
Alternative livelihood options	Mini- irrigation	2.3
	Fish ponds	10.5
	Nothing	64.2
	Heifer	13.9
	Turkeys	17.3
	Apiary	0.7
	Piglets	6.0
Relevancy of alternative livelihood options	No	87.7
	Yes	12.3

Over 80% of responders acknowledged there was inadequate sensitization regarding restoration initiatives. They stated that the communities were aware of previous restoration initiatives aimed at stopping their livelihood activities in the wetland. They also stated that alternative livelihood opportunities were distributed as follows: mini-irrigation (2.3%), fish ponds (10.5%), heifer

(13.9%), turkeys (17.3%), apiary (0.7%), piglets (6.0%), and 64.2% did not receive anything at all. This corroborates what one key informant stated that the alternative livelihood options were not intended to compensate wetland users for stopping their degrading livelihood activities in Limoto wetland but rather to learn new alternative ways to restore its lost ecosystem functions. However, 20% of the respondents had contrary thought that the alternative livelihood options were meant to compensate the community from accessing the wetland for livelihoods. It might be argued that the lack of clear and adequate sensitization in line with the Limoto wetland restoration goal contributed to frustration among those who did not benefit from the alternative livelihood options. Therefore, the objective of the alternative livelihood options should be clearly understood by all stakeholders. This is consistent with the ideas of Kakuba and Kanyamurwa, (2021), who emphasize the importance of involving all wetland users in the process of ensuring continued sustainable livelihood options through meaningful and adequate sensitization.

3.3 Relevancy of the Alternative Livelihood Options

Restoring and preserving degraded wetland requires that relevant alternative livelihood options be introduced to communities living near wetland who rely on it for their socio-economic livelihood. This study probed whether government had initiated relevant livelihood option for the communities living nearing Limoto wetland. The majority of respondents (87.7%) thought that the government initiated alternative livelihood options were ineffective, mostly because they were insufficient. Key informant interviews revealed that the Turkeys and fingerings brought were of poor quality. It is worth noting that, according to descriptive statistics, wetland restoration activities reduced reliance on the Limoto wetland. It is also worth noting, however, that the greatest decrease was in the number of people who are extremely dependent on the wetland (12.25%). However, the paired t-test revealed that the reduction in reliance was not statistically significant (p=0.996). (Table 3).

Table.3: Reasons for Effectiveness and Ineffectiveness of Alternative Livelihoods

Reasons for ineffectiveness	**90.54%**
Not enough	72.52%
Poor quality	8.33%
Not people's choice	2.25%
Difficult to manage	2.03%
Unfair distribution	1.35%
Not sensitized enough about the options	1.13%
Community not consulted	0.90%
Needs funding	0.90%
Not compensated	0.68%
Not training and funds	0.23%
Uncertainty of their future	0.23%
Reasons for the effectiveness	**9.46%**
Earning from it	4.28%
Animals have various uses	2.03%
It is what I wanted	1.58%
Easily to manage	0.90%

It is helping to eradicate poverty	0.23%
Learned how to keep fish	0.23%
Irrigation has improved our farming	0.23%

Table 4: The Effectiveness of Livelihood Options in Minimizing Dependence on the Wetland

Scale	Dependence on Limoto wetland before introduction of alternative livelihoods (%)	Dependence on Limoto wetland after the introduction of alternative livelihoods (%).	Difference (%)
Not at all dependent	5.91	9.85	3.94
Not dependent	3.94	5.69	1.75
Neutral	0.44	1.0	0.65
Dependent	14.44	20.35	5.91
Very dependent	75.27	63.02	-12.25

Paired T-Test and CI: Dependence before, Dependence after
Paired T for Dependence before - Dependence after

	N	Mean	StDev	SE Mean
Dependence before	5	20.0000	31.3238	14.0084
Dependence after	5	19.9820	25.0980	11.2242
Difference	5	0.018000	7.139480	3.192872

95% CI for mean difference: (-8.846835, 8.882835)
T-Test of mean difference = 0 (vs not = 0): T-Value = 0.01 P-Value = 0.996

In order to successfully restore and sustain degraded wetlands, you must offer sufficient and viable local livelihood options. Majority of respondents (73%), reported that the livelihood options were not effective mainly because they were not adequate. However, it was observed that there was a misperception among the wetland users that these livelihood options were designed as a compensation for them to vacate the wetland. But, according to data obtained from key informants revealed that implementation of these programs were intended to provide an eye opener and learning point for the local people to learn from and subsequently recreate on their own. According to Roe et al. (2015), this strategy of offering alternative livelihood options or sources of income should involve significant sensitization to avoid being misunderstood by the target community for compensation and possibly being deemed insufficient or poorly managed. This study agrees with the findings of Mahulu et al., (2019) that, in order to mitigate humanbiodiversity loss, a sustainable use method that benefits local communities while conserving natural resources is required. The study also supports the findings of Kakuba and Kanyamurwa, (2021); and Meng *et al.,* (2020) that involving the public (Community-based biodiversity conservation approach) in wetlands management may be the best option because people will have a sense of ownership and will be willing to protect biodiversity and provide information about encroachers and other threats to biodiversity.

This study observed that in the second year of restoration, the community had owned up the conservation approach and were defending the wetland from encroachers by reporting them to the

authorities. However later this changed and the protectors became the encroachers. This is attributed to the misconception that the alternative livelihood options were a compensation to vacate the wetland. Hence the majority who did not receive alternative livelihood had been patiently waiting and when they did not come by after five years, they returned to the wetland on the assumption that the livelihood options were not enough for all. Also the reduced monitoring due to Covid 19.

3.4 Wetland Users Preferences versus Government Initiated Alternative Livelihood Options

Majority of the local people received livelihood options that they did not prefer except for heifers and mini- irrigation. Based on local key informants and field observations, the heifers and miniirrigation turned out to be the most successful. Majority of the farmers who were attached to fish ponds, piglets and Turkeys preferred heifers. Thus, heifers were the most preferred livelihood options. However even those who received any livelihood option, it was less than what they expected (Table 5). There appears to have been a change in preference of the livelihoods. Through key informant interviews, it came out that during project planning, fish ponds were the most preferred but this was a complete failure during implementation (Table 6). On the other hand, the heifer option was more successful and households who took it up acknowledge to have benefited. The alternative livelihood options were largely selected by the local leaders (60.7%) on behalf of the local people *(Figure 2)*. Chi square test showed that there was a significant association between the decision maker concerning livelihood options and receipt of the livelihood alternatives ($X^2_{(df=4)} = 23.048$, $p=0.000$).

Table 4: Received Vs Preferred Alternative Livelihood

Livelihood options given	Livelihood options preferred	Percentage Counts
Fishponds		**15.74%**
	Heifers	12.04%
	Fish ponds	1.85%
	Land	0.93%
	Grinding meals	0.93%
Heifers		**33.33%**
	Heifers	24.07%
	Local cows	3.70%
	Turkeys	1.85%
	Goats	1.85%
	Cash	0.93%
	Piglets	0.93%
Mini irrigation system		**0.93%**
	Irrigation system	0.93%
Piglets		**3.70%**
	Heifers	2.78%
	Piglets	0.93%
Turkeys		**46.30%**

	Heifers	32.41%
	Turkeys	5.56%
	Land	2.78%
	Motorcycle	0.93%
	Goats	0.93%
	Piglets	0.93%
	Cash	0.93%
	Motor cycles	0.93%
	Local cows	0.93%

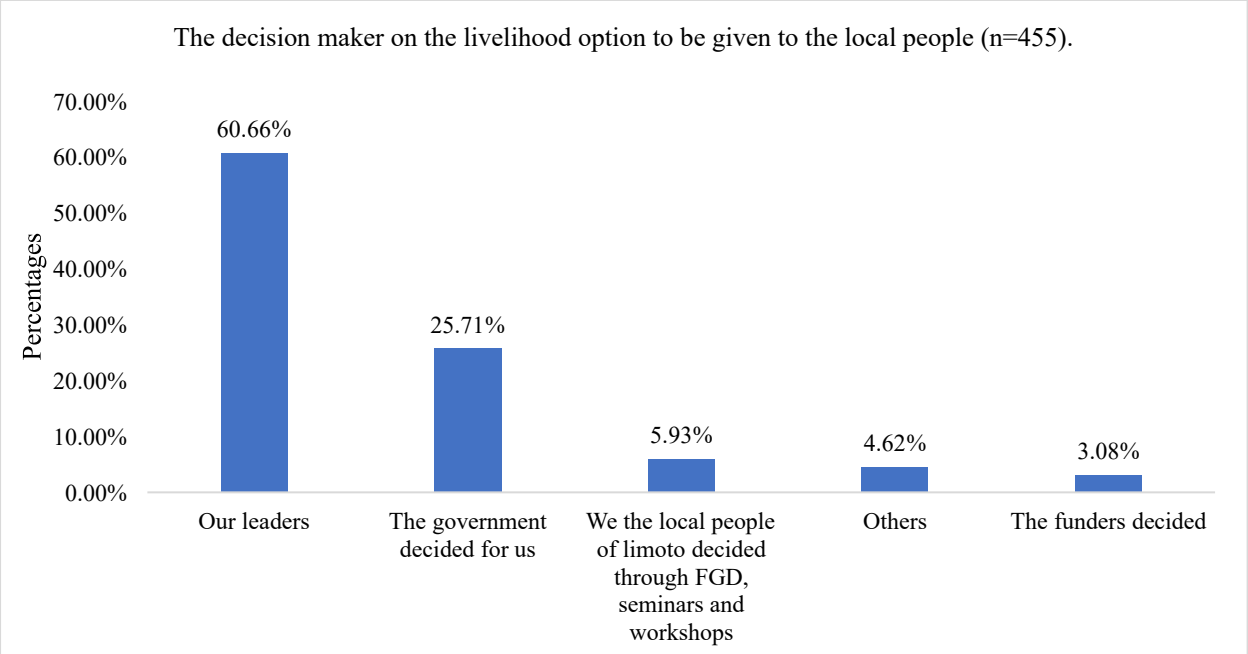

Figure 2: The Choice Maker of the Livelihood Option to Be Given To the Local People

Table 5: Causes of Failure of Fishing Farming Project in Limoto Wetland Based on Key Informant Interviews

1.	Poor design of the ponds. The intended design of the ponds did not work yet resources had been spent. The ponds started flooding during peak rainy seasons because they were at the same water level with the swamp.
2.	Poor quality of the fingering and feeds. The quality and the sources of the fingerings were not known to the local people.
3.	Poor security of the fish ponds that accelerated illegal fishing in the ponds. According to multiple key informants, the people brought in to provide security were instead silently harvesting the fish without the knowledge of the concerned locals.

4	The un expected low returns. Based on research and expert advice during project planning and implementation it was derived by the project implementers that the five ponds on one acre produce a net of 70 million shillings and ordinary rice farming returns a net of 700,000 shillings per acre. This made it easy to convince farmers to abandon rice growing for fish farming. However, according to one chairperson who also doubled as the chairperson fish project, involved members were getting 20,000 shillings per season. This demotivated them.
5	Inadequate training given to farmers concerning fish farming.
6	Inadequate fish feeds. Feeds were being supplied twice a year and these only worked for four months and yet the local people did not know the source.
7.	Infrequent monitoring of the fish ponds by the implementing parties

Table 6: Adequacy of Livelihood Options

Livelihood options	N	Mean given	Std D3.			N	Mean preferred	St D	T- test
Fish ponds	17					2			0.00
Cash						2	29,000,000	29698485	0.00
Goats						3	17.67	11.24	0.00
Grinding meal						1			0.00
Heifer	36	1.639	1.676			77	17.39	25.02	0.00
Mini irrigation	1					1			0.00
Land						4	29.5 acres	34.4	0.00
Local cows						5	19.20	8.56	0.00
Motor cycle						2			0.00
Piglets	4	2.500	1.732			3	11.67	5.77	0.00
Turkeys	50	6.920	3.984			8	82.8	63.0	0.00

3.5 Impact of Alternative Livelihood Options on Peoples' Livelihood

From the results, it is interesting that generally the introduction of alternative livelihood options negatively impacted the livelihoods of the local people (Table 7). Respondents claimed that it promoted loss of farm land and food shortage (Figure 3).

Table 7: The Impact of Alternative Livelihood Options Introduced on People's Livelihood

Scale	Impact of introduced alternative livelihood option on peoples' livelihood?
Very positive (2)	5.03%
Positive (1)	24.29%
Positive/Negative (0)	22.10%
Negative (-1)	28.23%
Very negative (-2)	20.35%

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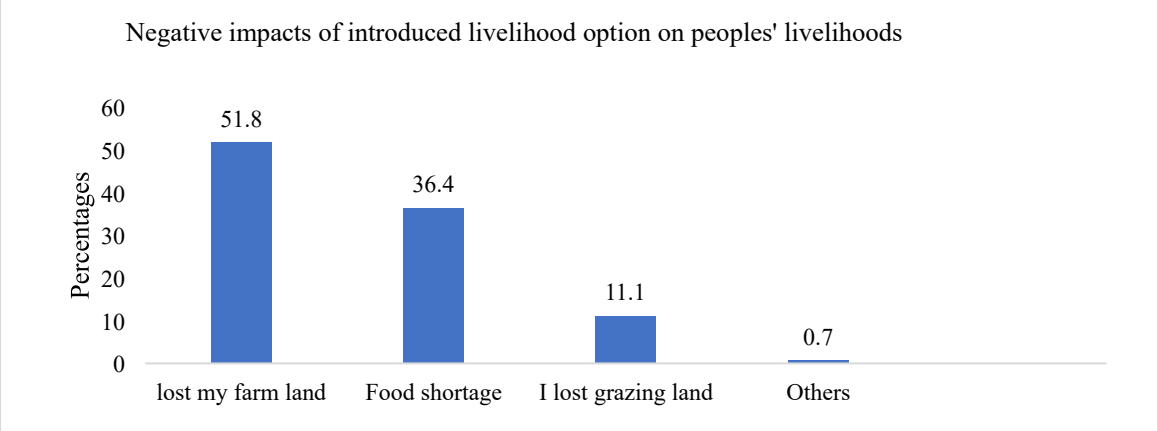

Figure 3: Negative Impacts of Restoration and Introduced Livelihood Options on Peoples' Welfare

3.6 Further Analysis of Effectiveness of Alternative Livelihood Options in Restoration

First, a hierarchical loglinear analysis was performed to identify significant associations among components of effectiveness of alternative livelihood options. Results from a loglinear analysis produced a final model that retained one to two-way effects. Thus, multiple interactions of the variables significantly influenced the model. The likelihood ratio for the final model was X^2 (df =448) = 0.189, P=1. Hence, the null hypothesis that, the observed and the expected values are not significantly different, is retained and concluded that the model is a good fit for the data. At a three-way level, Re-encroachment was significantly associated with satisfaction derived from livelihood options and the perceived relevancy of the livelihood options. At a two-way level, reencroachment was associated with the level of dependence on the wetland and the decision maker about who receives and what is received. Thus, effective livelihood options should be relevant to the local people and in position to yield satisfaction.

Secondly, a binary logistic model was used, dependent variables were re-encroached versus not re-encroached. Independent variables and their codes are in Table 9. A full model containing all variables was statistically significant, X^2 (16, N=445) =37.788, p=0.002, indicating that the model was able to distinguish respondent who reported versus did not report re-encroachment. In Table 10, only level of dependence on Limoto wetland made a statistically significant contribution to the model. The strongest predictor of re-encroachment was very high dependence on Limoto wetland. Thus the effectiveness of alternative livelihood options in restoration is dependent on the levels of dependence on the wetland prior to restoration.

Table 8: Categorical Variables and Their Codes (N=405)

Variables		Frequency	Parameter coding			
			(1)	(2)	(3)	(4)
Dependency	Not at all dependent	25	1.000	0.00	0.00	0.00
	Not dependent	17	0.00	1.00	.00	0.00
	Neutral	2	0.00	0.00	1.00	0.00
	Dependent	66	0.00	0.00	0.00	1.00
	Very dependent	334	0.00	0.00	0.00	0.00
Impact	Very negative	88	1.00	0.00	0.00	0.00
	Negative	126	0.00	1.00	0.00	0.00
	Neutral	97	0.00	0.00	1.00	0.00

	Positive	110	0.00	0.00	0.00	1.00
	Very positive	23	0.00	0.00	0.00	0.00
Decision maker	Others	20	1.00	0.00	0.00	0.00
	Our leaders	268	0.00	1.00	0.00	0.00
	Funders	14	0.00	0.00	1.00	0.00
	Government agencies	116	0.00	0.00	0.00	1.00
	local people	26	0.00	0.00	0.00	0.00
Relevance/Worthness	Not	394	1.00			
	Yes	50	0.00			
Satisfaction from alternatives	No	380	1.00			
	Yes	64	0.00			
Livelihood options received	No	281	1.00			
	Yes	163	.00			
Restoration knowledge	No	80	1.00			
	Yes	364	0.00			

Table 9: K-Way and Higher-Order Effects from a Loglinear Analysis of the Components of Effectiveness

	K	df	Likelihood Ratio		Pearson		Number of Iterations
			Chi-Square	Sig.	Chi-Square	Sig.	
K-way and Higher Order Effects	1	3999	3413.938	1.000	39556.000	**0.000**	0
	2	3982	989.094	1.000	13629.714	**0.000**	2
	3	3864	473.513	1.000	1852.044	1.000	8
	4	3430	44.394	1.000	31.749	1.000	18
	5	2505	2.388	1.000	1.283	1.000	6
	6	1324	.349	1.000	0.180	1.000	3
	7	432	0.138	1.000	0.070	1.000	2
	8	64	0.000	1.000	0.000	1.000	2
K-way Effects[b]	1	17	2424.845	0.000	25926.286	**0.000**	0
	2	118	515.581	0.000	11777.670	**0.000**	0
	3	434	429.120	0.557	1820.295	**0.000**	0
	4	925	42.006	1.000	30.466	1.000	0
	5	1181	2.039	1.000	1.103	1.000	0
	6	892	0.210	1.000	0.110	1.000	0
	7	368	0.138	1.000	0.070	1.000	0
	8	64	0.000	1.000	0.000	1.000	0
df used for these tests have NOT been adjusted for structural or sampling zeros. Tests using these df may be conservative.							
a. Tests that k-way and higher order effects are zero.							

b. Tests that k-way effects are zero.

Table 10: Variables in the Binary Logistic Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	Restorationknowledge(1)	-0.83	0.492	2.855	1	0.091	0.435	0.166	1.142
	Satisfaction(1)	0.25	0.575	.195	1	0.659	1.289	0.418	3.981
	Impact			.477	4	0.976			
	Impact(1)	-0.88	1.299	.461	1	0.497	0.414	0.032	5.280
	Impact(2)	-0.81	1.299	.391	1	0.532	0.444	0.035	5.662
	Impact(3)	-0.73	1.289	.321	1	0.571	0.482	0.038	6.030
	Impact(4)	-0.76	1.257	.369	1	0.543	0.466	0.040	5.475
	Decision maker			6.482	4	0.166			
	Decision maker(1)	-1.31	1.222	1.148	1	0.284	0.270	0.025	2.963
	Decision maker(2)	0.08	1.087	0.007	1	0.935	1.093	0.130	9.202
	Decision maker(3)	18.76	10207.9	0.000	1	0.999	139869600.	0.000	.
	Decision maker(4)	-0.86	1.084	0.628	1	0.428	0.424	0.051	3.546
	Releveance	-0.63	.783	.657	1	0.418	0.530	0.114	2.458
	Livelihood option received	0.47	0.427	1.198	1	0.274	1.595	0.691	3.683
	Dependency			20.598	4	0.000			
	Dependency(1)	-1.29	0.677	3.605	1	0.058	0.276	0.073	1.042
	Dependency(2)	-2.38	-0.613	15.008	1	0.000	0.093	0.028	0.309
	Dependency(3)	-2.85	1.514	3.549	1	0.060	0.058	0.003	1.122
	Dependency(4)	-1.20	.484	6.201	1	0.013	0.300	0.116	0.774
	Constant	4.31	1.547	7.773	1	0.005	74.57		

a. Variable(s) entered on step 1: Restoration knowledge, Satisfaction, Impact, Decision maker, Relevance, Livelihood option received, Dependency.

4.0 CONCLUSION AND RECOMMENDATIONS

The results of the study found no doubt that Limoto wetland plays a critical role in providing livelihoods and ecological functions for communities within Pallisa and Kibuku districts. However, its sustainability is threatened by the very high dependence mainly for intensive

farming, livestock keeping and direct extraction of natural resources. The study set out to assess the effectiveness of the alternative livelihood options in the restoration of Limoto wetland. The focus being the 7 year period disaggregated by the 5 years and 2 years intervals under which restoration activities supported by distribution of alternative livelihood options were implemented. The study results showed that the alternative livelihood options between 2015-2020 were able to vacate encroachers from Limoto wetland thus restoring the ecological functions of the wetland. However, after five years of the project, the alternative livelihood options were no longer sustainable, drastically failing to economically meet the expectations as predicted compared the initial paddy rice growing returns. The advent of Covid-19 cannot be under estimated, as the lockdown only left agriculture as the economic activity to sustain livelihood within the study area. The Covid-19 lockdown also came with movement restrictions which further curtailed monitoring and control of restoration activities hence eating away the previous gains made in vacating encroachment. This study demonstrates that in Limoto wetland, reencroachment is associated with the level of dependence on the wetland. Thus, effective livelihood options should be relevant to the local people and in position to yield satisfaction to cause meaningful vacation from the wetland. The strongest predictor of re-encroachment was very high dependence on Limoto wetland. Thus the effectiveness of alternative livelihood options in restoration is dependent on the levels of dependence on the wetland prior to restoration coupled to the adequacy and sustainability of the alternative livelihood options. However, it is important to note that these livelihood options were not meant to compensate but to enable the local people learn from these and thereafter go forth practice the alternatives on their own. Sensitization on the project goals should have emphasized this objective which did not come out clearly to the beneficiaries and community who considered the alternative livelihood options as a compensation to vacate the wetland. The majority who didn't receive any went back to the wetland after a five years wait for their consideration which did not come.

The study recommends (1) Owing to the need for farmlands influencing the rate at which reencroachment occurs, it is recommended that relevant government organs collaboratively support communities that have accepted to be settled outside the wetlands are supported to increase onfarm productivity in the areas where if can be managed sustainably, (2) Due to the high level of dependence on wetlands, affected communities should be supported to practice controlled edge farming of suitable crops that do not compromise on the natural state of the wetland, (3) The alternative livelihood options be determined using a co-creating design, where the communities are involved in so doing, the alternative livelihood options identified should bring relatively higher returns than wetland use. This co-creation design will also ensure the identified alternative livelihoods are in tandem with the skills and capacity within the community and finally (4) The Ministry of water and Environment in collaboration with Ministry of Agriculture Animal Industry and Fisheries should conduct financial feasibility studies prior to implementation of the restoration project hinged on alternative livelihood options to ascertain the sufficient funding needs for both the restoration and monitoring of wetlands to sustain the gains made from the restoration program.

Statement of Conflict

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Data Availability

The data that support the findings of this study are available from the corresponding author upon formal request.

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