Journal of Physical Science and Environmental Studies
Vol. 8 (1), pp. 1-14, February 2022
ISSN 2467-8775
Research Paper
https://doi.org/10.36630/jpses_22003
http://pearlresearchjournals.org/journals/jpses/index.html

Assessment of Causes and Effects of Wetlands Degradation in the Babessi Municipality, Ngoketunja Division of the North West Region in Cameroon

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Accepted 23 February, 2022

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ABSTRACT

Despite the international and national policies on environmental protection ratified and signed by Cameroon, the degradation of wetlands is on the rise in the Babessi Municipality. This study aimed at assessing the causes and effects of wetlands degradation in the Babessi Municipality. Specifically, it investigated from the point of view of the local population: the importance of wetlands, the causes of wetlands degradation, the effects of wetlands degradation on the traditional institutions, and the strategies to reduce wetlands degradation in Babessi Municipality. To do this, stratified random sampling was employed and data was collected from 278 respondents with 75 from Baba 1, 62 from Babessi, 70 from Babungo and 71 from Bangolan using questionnaires. Data were analyzed using descriptive and inferential statistics. Findings revealed wetlands are of significant importance to the people of Babessi municipality. Anthropogenic factors like increase in population which enhance urbanization, grazing and hunting are mostly the causes of wetlands degradation. This phenomenon has an effect on culture. Sensitization of the local population can be used as a strategy to reduce wetlands degradation. Environmentally-friendly farming methods are recommended.

Keywords: Wetland degradation, traditional institutions, and culture

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INTRODUCTION

According to Ramsar Convention secretariat (2015), less than 3% of the world's water is fresh while the rest remain saline, purified by wetlands. Wetlands perform sewage filtering and industrial effluent for free which if taken to a treatment plant, would cost 2 million dollars per day. A single oyster in a tidal flat is capable of filtering nearly 200 liters of water in a day. Preservation of wetlands remains critical in combating climate change. It is evident that 3% of the world's land area is covered by peatlands; however, they hold 30% of all carbon stored on land (Harenda et al., 2018). Wet grasslands act as natural sponges in absorbing rainfall, easing flooding and safeguarding against drought. They serve as an important source of livelihood for 61.8 million people, who directly or indirectly depend on it via fisheries and aquaculture (Ramsar Convention secretariat, 2015). It provides timber for building, medicinal plants, fodder for animals, stems and leaves for weaving and feeds humanity.

This notwithstanding, some wetlands are being threatened through pressures from anthropogenic causes. Since 1900, 64% of the world's wetlands have disappeared, with losses estimated to be 87% worldwide (Ramsar Convention secretariat, 2015). Biodiversity has also been affected as the World-Wide Fund (WWF) Living planet index, reveals that between 1970 and 2010,

the population of freshwater species has been reduced by 76%. Similarly, the damming of the Tana and Athi rivers in Kenya has blocked upstream movement of migratory fish species, while poor water management schemes in the north of Cameroon have reduced natural flooding in Waza National Park, thus leading to a decrease in the populations of two species of antelope, the *Korrigum Damaliscus lunatus korrigum and Buffon's Kob Kobus kob kob* according to Nabahungu (2012). According to EPA (2001), the National Audubon Society ascertains that bird populations continue to decrease as wetlands are destroyed. The continental duck breeding population fell from 45 million to 31 million birds, in the past 15 years alone, representing a decline of 31 percent. The number of birds migrating over the Gulf of Mexico, which rely on coastal wetlands as staging areas (especially in Louisiana and Mississippi), has decreased by one-half since the mid-1960s. Approximately 100 million wetland acres remain in the 48 contiguous states, but they continue to be lost at a rate of about 60,000 acres.

According to principle 22 of the Rio convention which Cameroon is a signatory, indigenous people and their communities, and other local communities, have a vital role to play in environmental management and development due to their level of knowledge and traditional practices. States should recognize and duly support their identity, culture and interests and enable their effective participation in the achievement of sustainable development (United Nations,1992).

In Cameroon's Vision 2035, the Ministry of Economy, Planning and Regional Development (2009), considers climate change as one of the two major challenges in Cameroon's economy. Through the elaboration and application of the policy and legal framework on biological diversity, the Government of Cameroon guarantees amongst others, "the polluter pays" principle according to which the expenses incurred for the prevention and curbing of pollution are borne by the polluter as indicated in the policy guidelines for the protection of the environment and rational management of natural resources by the Ministry of the Environment and Forestry Cameroon (1997). In 2009, a presidential decree creating the National Observatory on Climate Change (ONACC) which aimed at monitoring and evaluating socioeconomic and environmental impacts, to take measures for the prevention of, the mitigation of and/or the adaptation to the harmful effects and the risks connected to climate change was signed. This decree was in relation to the Law N0. 96/12 of 5th August 1996 relating to environmental management was promulgated in Cameroon.

Despite these international and national policies on environmental protection ratified and signed by Cameroon, the degradation of wetlands is on the rise in Cameroon. The common perception that wetlands have little value and should be converted for more productive uses as stated by Wanzie (2003), has led to the destruction of wetlands and reduction in biodiversity.

Judging from the above, it therefore means that wetlands degradation is not caused by climate change. Could it be that it is caused by the over-exhaustion of the wetlands? As stated by Ramsar secretariat (2013), wetlands have a special attribute as part of the cultural heritage of humanity which are linked to religious cultural and spiritual values and forms the basis of social, economic and social tradition. Could it, therefore, mean that the degradation of wetlands could lead to the deterioration of cultural values? While among the very few studies conducted in Cameroon, like the one by Nkontcheu (2021) which duels on the Western Highlands of Cameroon, to the best of our knowledge no study has been conducted in the Babessi Municipality. This study is an attempt to fill these lacunae. This study aimed at investigating the perception of the local population on the causes and effects of wetlands degradation in the Babessi Municipality, Ngoketunja Division of the North West Region of Cameroon. Specifically, the study seeks: to investigate the importance of wetlands on the culture of the people of Babessi municipality, to scrutinize the causes of wetlands degradation in Babessi Municipality, to assess the effects of wetlands degradation on the traditional institutions of the people of Babessi municipality and to investigate the strategies to reduce wetlands degradation by the local community.

The importance of this study relies on its recommendations which if applied would help the government to make policies that would curb wetlands degradation while taking into consideration ecosystem services and cultural values and integrating them into land use during planning. At the level of the council, this shall enable the council to carry out policies on wetlands conservations and vote budgets for the execution of related projects. In addition, this would stimulate the council to carry out policies to invest in wetlands for income generation of the council hence restoring wetlands that have been degraded.

According to the Sustainable development goals number 2 related to achieving zero hunger; 3 related to clear water and sanitation; 13 link to climate action and 15 related to life on land, are very much dependent on biodiversity. In effect, biodiversity is being lost at alarming rates, having declined by more than 30% since 1970 and by an astonishing 60% in tropical regions according to Barasa and Omagor (2018). The need to preserve this biodiversity might be difficult if issues linked to wetland degradation are not taken into consideration.

Empirical Literature

As concerns the causes of wetlands degradation, Barasa and Omagor (2018) with the major objectives to examine the extent of wetland temporal changes between 2000 and 2018 and to establish the causes and consequences of human wetland encroachment on the degradation of Lubigi Wetland System, Kampala City Uganda. GIS and Remote sensing techniques were used to analyze high-resolution satellite imagery captured during 2002, 2015

and 2018, coupled with ground surveys involving interactions among wetland communities. The results revealed that areas covered by diverse wetland vegetation in 2002 represented 96.3% of the total land cover which was the largest; there was a gradual decrease to 82.5% in 2015 and finally 80.6% in 2018. There was a general increase in laterite soil deposited areas within the wetland system. Smallholder agricultural lands also increased from 0.2% in 2002 to 1.6% in 2015 and 7.7% in 2018. There was an increase in settlements from 3.2% to 7.8% in 2015. According to this study encroachments were mainly caused by high population pressure, inadequate enforcement of wetland regulations and political interventions. Chebo, (2009), sanctions that wetlands degradation originates from rapid population growth which leads to environmental and socio-economic alterations.

In addition, with the increase in rapid urbanization and the conversion of wetlands, this brings about environmental problems and the destruction of some spiritual sites (Chebo, 2016). For instance, between 1999 and 2017, the surface area for Ndop urban space increased from 3.7km^2 to 11.7km^2. This was logically accompanied by the encroachment and increasing dependence on wetland environments for their services. Such population pressure now leads to migration.

The effects of infrastructure development, especially road construction and urban settlement, have caused the degradation of sacred areas in Bandjoun (Verschuuren, 2010). According to Verschuuren (2010) when people need space, they turn to sacred areas because they do not belong to anybody. Sacred areas have therefore been transformed for the building of public services like schools, and according to some scholars, modern education has a negative impact on local beliefs. As a result of this system of education, children spend little time with their parents in the villages and therefore do not have enough opportunities to perform traditional initiations or to understand the background and functionality of the traditional System. This causes an intergenerational loss in traditional values.

According to Verschuuren (2006), Cultural and spiritual values play a pivotal role in nature conservation and ecosystem management, but quite often, they are difficult to be represented in decision-making processes. Thus, the failure of the market to effectively allocate wetlands resources according to the demand and supply forces have often led to their conversion which has negative benefits to the society (Hussen, 2004). According to Ngoran (2015), the availability of freshwater resources as well as marine resources has been affected by the overpopulation of the coast of Douala. This has led to the physical deterioration of coastal habitats, resulting in a loss in a variety of rich fauna and flora. The study could be criticized on the grounds that it has limited itself to the effects of wetlands degradation on water resources and not on the culture of the people.

Considering the importance of gender roles distribution in Africa, and given the fact that water collection for domestic use is purely the domain of women in Cameroon's rural areas, the degradation of water resources affects the culture of the people in Babessi municipality. A change in the water resources has led to a change in water fetching distances and lots more. This now brings in boys and men to help fetch water and by so doing obstructing the socialization of girl children into nature and nurture roles thereby gradually changing the culture. In traditional settings, women mostly use water fetching opportunities to socialize with peers and to transmit important cultural values and knowledge to their girl children. Even the production of sacred cultural vessels like the clay pots has been affected, thus affecting the cultural institution.

METHODOLOGY

Study Area

This research was carried out in Cameroon, which is made up of ten Regions. The study area is the Babessi Municipality in the North West Region and is divided into seven divisions. The Babessi Council area is located in Ngoketunjia Division, along the Bamenda – Kumbo road. It is surrounded by Jakiri and Oku Sub Divisions of Bui Division; Belo Sub Division in Boyo Division; Bangorian in Noun Division and Ndop central Sub Division in Ngoketunjia Division. Babessi Council was created in 1995 by Presidential Decree No – 95/082 of 24th April 1995. It went operational in 1996. It has a surface area of 240 km^2 and a population of 63,254. It is made of 4 villages namely: Baba 1, Babungo, Bangolan and Babessi (Babessi Monographic Studies). The location of the Municipality vis-à-vis the chief towns and Cameroon is shown in Figure 1.

Study design

To obtain data for this study, the stratified random sampling techniques were employed and following Krejcie and Morgan (1970), a sample size of 278 was used with 75 from Baba 1, 62 from Babessi, 70 from Babungo and 71 from Bangolan.

To collect this data, questionnaires were used. Both descriptive and inferential research designs were made use of.

Data processing and analysis

The Pearson's Chi-Square (χ^2) test was employed in the study as a measure of association or test of independence. It was used to assess variations in the sampled population's response (dependent variables) across and within localities and other socio-demographic characteristics (independent variables).

This model has been used extensively in studies of this nature as indicated by Ratsimbazafy et al. (2006) and Moudingo et al. (2012). The model is expressed as:

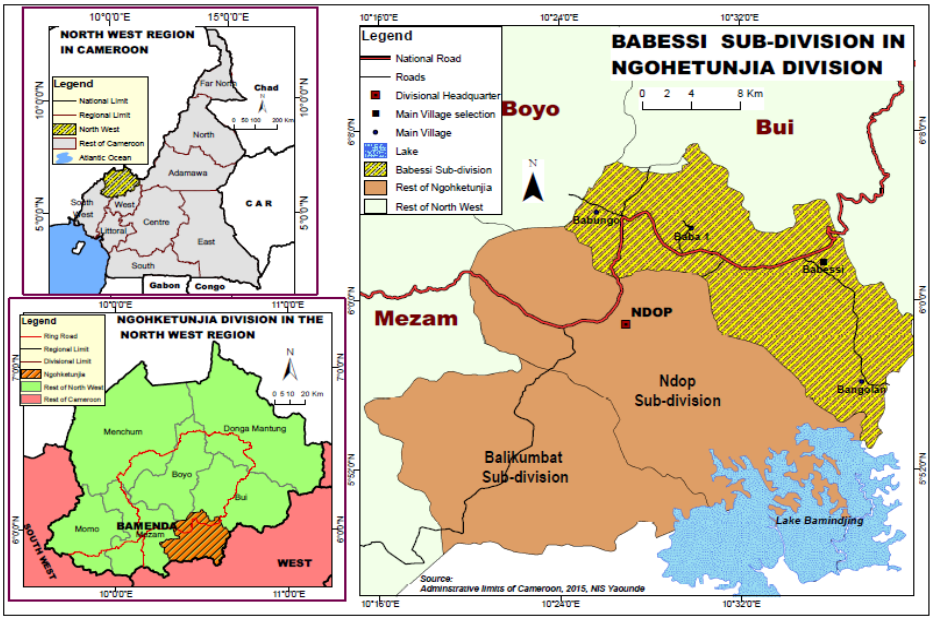

Figure 1: Location of Babessi Municipality. **Source**: Babessi council Development plan (2019).

$$\chi 2 = \sum_{i=1}^{n} \frac{(O_i - E_i)^2}{E_i} \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where χ^2 stands for chi statistics, O_i the Observed frequency on the field while E_i is the Expected (theoretical) frequency, i = the i^{th} observation in the sample n the number of possible outcomes of each event. To test for association (variations), the calculated chi-square would be compared with the tabulated chi-square. Data were analyzed using SPSS software version 2020 and presented in table and the form of figures.

RESULTS AND DISCUSSIONS

Table 1 shows the demographic variables of the respondent. Results show that out of the 278 respondents, 75 were from Baba 1, 62 from Babessi, 70 from Babungo and 71 from Bangolan. 141 women and 137 men responded to the questionnaire. The table further presents the proportion of different education, religion, occupation, income, marital status and age range of the respondent.

Table 2 shows that 278 respondents participated in the study. On the average, the total importance of wetland was 38.78 on 50, while the standard deviation was 5.959. On 100, the total cultural value mean was 47.94, while the standard deviation was 13.336.

Table 3 shows that, on a whole, Wetlands were very important to the culture of the people of Babessi municipality. 86.1% of the respondents agreed and strongly agreed that 'wetlands improve water quality, 57.3% also agreed and strongly agreed Wetlands reduce flood damage, 68.7% believed that Wetlands reduce erosion', 87.4% felt that 'Wetlands recharge/discharge ground water' 89.9% reported that 'Wetlands provide habitat for various species, 88.8% thought 'Wetlands mitigate climate change, 79.1% agreed to the statement 'Wetlands provide recreation and tourism', 72.1% responded favorably to the statement that wetlands 'Are a source of economic produce on which the livelihood of some community members depend', 90.3% felt that 'Wetlands provide medicine', 81.3% believed 'Wetlands provide building material to mankind' and 92.8% held that 'Wetlands provide food'. Obviously, this data set skewed to the positive side, thereby telling of the great value of Wetlands to the community. Table 4 further presents response on the benefit of wetland response by response.

Table 4 also captured the worth of Wetlands to the respondents. Only 37.1% thought that wetlands aided in the provision of building materials. 80.6% thought it was instrumental in food provision.

58.6% felt the wetlands were useful in the supply of medicine. Much more of the respondents (76.4%) associated the value of the wetlands with a source of economic produce on which the livelihood of some community members depends, while an average of 50.3% felt wetlands offered opportunities for tourism and recreation. Food production remained the highest perceived value of the wetlands. Table 4 equally captures the response of the cultural values.

Table 5 shows the results on the respondents' perceptions of the various cultural assets of the community. This table reveals dwindling cultural value strength as most of the cultural values are weighed at

Table 1: Demographic characteristics of respondents.

Variable								
Village	**Baba 1**	**Babessi**	**Babungo**	**Bangolan**				
Frequency (percentage)	75(27.0%)	62(22.3%)	70(25.5%)	71(25.5%)				
GENDER	Female	Male						
Frequency (percentage)	141(50.7%)	137(49.3%)						
EDUCATION	Ordinary level	Advance level	Master level	P.H.D level				
Frequency (percentage)	201(72.3%)	51(18.3%)	25(9.0%)	1(.4%)				
RELIGION	Christian catholic	Christian protestant	Muslim	other	traditional			
Frequency (percentage)	86(30.9%)	93(33.5%)	64(23.0%)	18(6.5%)	17(6.1%)			
OCCUPATION	Farming	Fishing	Grazing					
Frequency (percentage)	246(88.5%)	21(7.6%)	11(10.3%)					
INCOME	0-10000	10000-20000	20,000-30,000	30,000-40,000	40,000-50,000	50,000-100,000	100,000 and above	
Frequency (percentage)	56(20.1%)	96(34.5%)	52(18.7%)	26(9.4%)	30(10.8%)	17(6.1%)	1(.4%)	
MARITAL STATUS	Cohabiting	Divorce	Married	Single				
Frequency (percentage)	8(2.9%)	17(6.1%)	184(66.2%)	69(24.8%)				
AGE	15-20	21-25	26-30	31-35	36-40	41-46	46-50	51 and above
Frequency (percentage)	10(3.6%)	30(10.8%)	27(9.7%)	48(17.3%)	38(13.7%)	38(13.7%)	36 (12.9)	32(11.5%)

Table 2: Descriptive statistic for some key variables.

	N	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**
EDUCATION	278	1	5	1.47	.914
INCOME	278	1	7	2.76	1.495
TOTAL IMPORTANCE OF WETLAND	278	12	48	38.78	5.959
total cultural value	278	24	75	47.94	13.336
AGE	278	1	8	5.13	2.118

less than 50%.

Interestingly, cultural values that are destined for income generation activities are few that are thriving: Provision of traditional dance costumes 56.1%, fishing 69.4%, Raffia wine tapping 68.5%. The other values stand at ratings of 55% and below.

Table 6 presents the chi-square result on the importance of wetland and other variables and culture.

Results from table 6 show that 109(39.2%) of those who highly rated culture found the importance of wetlands on culture to be low. The people of Babungo 59(21.2%) attached the most importance of wetlands to culture (Figure 2).

More women rated the importance of Wetlands on culture as low as opposed to 79(28.4%) who thought the value was high. More Christian Protestants 56(20.1%) thought wetlands were important to culture. The chi-square results found a statistical significant effect of wetland on culture perception (p-value 0.000) age on culture perception (p-value 0.001), village on culture perception (p-value 0.000), gender on culture perception (p-value 0.000), religion on culture perception ((p-value 0.001), occupation on culture perception (p-value 0.011 and marital status on culture perception(p-value 0.018) while educational (p-value 0.319) and income (p-value 0.265) did not significantly influence the cultural perception of the respondent.

Table 7 presents the regression results to further test the group effect of wetland on the perception of the culture.

Looking at the regression results in table 7 showing effects of wetlands degradation on the culture of the people of Babessi, the results give a positive value

Table 3: Respondents' perception about the importance of wetlands.

Variable	Strongly disagree	Disagree	Agree	Strongly agree
		Wetlands improve water quality		
Frequency(percentage)	21(7.6%)	17(6.1%)	147(52.9%)	93(33.5%)
		Wetlands reduce flood damage		
Frequency(percentage)	23(8.3%)	68(24.5%)	134(48.2%)	53(19.1%)
		Wetlands reduce erosion		
Frequency(percentage)	26(9.4%)	39(14.0)	161(57.9%	52(18.7%)
		Wetlands recharge/discharge ground water		
Frequency(percentage)	13(4.7%)	22(7.9%)	122(43.9%)	121(43.5%)
		Wetlands provide habitat for various species		
Frequency(percentage)	10(3.6%)	18(6.5%)	131(47.1%)	119(42.8%)
		Wetlands mitigate climate change		
Frequency(percentage)	9(3.2%)	23(8.3%)	116(41.7%)	130(46.8%)
		Wetlands provide recreation and tourism		
Frequency(percentage)	24(8.6%)	34(12.2%)	108(38.8%)	112(40.3%)
	Wetlands produce valuable animals and plants which can be harvested on sustainable basis			
Frequency(percentage)	15(5.4%)	7(2.5%)	79(28.4%)	177(63.7%)
	Are a source of economic produce on which the livelihood of some community members depends			
Frequency(percentage)	6(2.2%)	8(2.9%)	51(18.3%)	213(76.6%)
		Wetlands provide medicine		
Frequency(percentage)	10(3.6%)	17(6.1)	142(51.1%)	109(39.2%)
		Wetlands provide Building material to mankind		
Frequency(percentage)	17(6.1%)	34(12.2%)	129(46.4%)	97(34.9%)
		Wetlands provide food		
Frequency(percentage)	9(3.2%)	11(4.0%)	102(55.0%)	153(55.0%)

Table 4: Respondents' perception about the benefits of wetlands.

Variable	Very good	Good	Average	Poor	Very poor
	Wetlands provide Building material to mankind				
Frequency(percentage)	37(13.3%)	23(8.3%)	43(15.5%)	96(34.5%)	79(28.4%)
	Wetlands provide food				
Frequency(percentage)	142(51.1%)	63(22.7%)	19(6.8%)	32(11.5%)	22(7.0%)
	Wetlands provide medicine				
Frequency(percentage)	34(12.2%)	23(8.3%)	106(38.1%)	47(16.9%)	68(24.5%)
	Are a source of economic produce on which the livelihood of some community members depends				
Frequency(percentage)	91(32.4%)	92(33.4%)	30(10.8%)	52(18.7%)	13(4.7%)
	Wetlands provide recreation and tourism				
Frequency(percentage)	20(7.2%)	15(5.4%)	97(34.9%)	53(19.1%)	93(33.5%)

(1.030), which means that improved wetlands, will lead to an increase in the cultural values of the people of Babessi Municipality. Increased wetland by 100% will lead to increase cultural values by 103%. The p-value of this result (0.000) shows a statistically significant effect of wetland on culture. This result confirms the chi-square results in table 6. The coefficients of other factors like education (0.587) and age (0.366) are all positive but insignificant. The coefficient of income (-0.309) is negative meaning those with a high level of education perceived culture as low. The coefficient of multiple determinations (Adjusted R-squared) is .217. This shows that 21.7% of the variation in cultural perception is explained by the factors included in the model. The F-ratio or F-statistics (0.000) shows that the overall model is statistically significant at more than 1% percent level of significance. We can thus conclude that our result is more than 99% reliable.

The results show that the perception of drainage, fertilizer, hunting and culture statistically and significantly influence the perception of degradation of wetland. Results show that drainage and increased population negatively influence the perception of the state of degradation of wetlands while the rest of the variables positively influence it.

Presentation of results on the perception of the local population on the causes of wetlands degradation in Babessi Municipality

From Table 8, it can be deduced that the main cause of wetlands degradation in Babessi Municipality is drainage for agriculture 223(80.2%) and this is closely followed by excessive use of fertilizers and pesticides 207(74.4%).

Table 5: Respondents' perception about cultural values.

Variable	Very good	Good	Average	Poor	Very poor	Don't know
Mastery of indigenous language						
Frequency (percentage)	82(29.5%)	42(15.1%)	30(10.8%)	49(17.6%)	72(25.9%)	3(1.1%)
Respect for the institution of marriage						
Frequency (percentage)	46(16.5%)	57(20.5%)	51(18.3%)	35(12.6%)	85(30.6%)	4(1.4%)
The role of the family						
Frequency (percentage)	26(9.4%)	63(22.7%)	59(21.2%)	44(15.8%)	83(29.9%)	3(1.1%)
Initiation into various passage rites like birth, marriage, and funeral						
Frequency (percentage)	25(9.0%)	55(19.8%)	66(23.7%)	46(16.5%)	79(28.4%)	7(2.2%)
DRESS CODE						
Frequency (percentage)	8(2.9%)	35(12.6%)	49(17.6%)	85(30.5%)	93(33.5%)	8(2.9%)
Respect for the elderly by the youth						
Frequency (percentage)	21(7.6%)	32(11.5%)	45(16.2%)	58(20.9%)	166(41.7%)	6(1.1%)
Provision of traditional medicine						
Frequency (percentage)	17(6.1%)	61(1.9%)	81(29.1%)	35(12.6%)	82(29.5%)	2(.7%)
Traditional building construction						
Frequency (percentage)	6(2.2%)	43(15.5%)	60(21.6%)	65(23.4%)	98(35.3%)	6(2.2%)
Provision of traditional dance costumes						
Frequency (percentage)	18(6.5%)	47(16.9%)	91(32.7%)	53(19.1%)	58(20.9%)	11(4.0%)
FISHING						
Frequency (percentage)	63(22.7%)	44(15.8%)	86(30.9%)	32(11.5%)	40(14.4%)	13(4.7%)
Performance of rituals						
Frequency (percentage)	25(9.0%)	51(18.3%)	93(33.5%)	51(18.3%)	46(16.5%)	12(4.3%)
SECRET FOREST						
Frequency (percentage)	28(10.1%)	45(16.2%)	55(19.8%)	72(25.9%)	61(21.9%)	17(6.1%)
Raffia wine tapping						
Frequency (percentage)	48(17.3%)	69(24.8%)	66(23.7%)	33(11.9%)	50(18.0%)	12(4.3%)
WEAVING						
Frequency (percentage)	18(6.5%)	38(13.7%)	48(17.3%)	76(27.3%)	74(26.6%)	24(8.6%)

Thus, to the respondents, agricultural activities were mostly to be blamed for this trend.

Presentation of results on the perception of the local population on the effects of wetlands degradation on the traditional institutions of the people of Babessi municipality

Table 9 measured the perception of the local population of the effects of wetlands degradation on the traditional institutions (Figure 3). The results tell that the study participants with high traditional adherence believed that wetlands degradation severely affected traditional institutions as shown in Figure 3.

The youths of the studied communities, aged 31-35, considered the weight of wetlands degradation on culture to be average. An equal number of respondents 59(21.2%) from Baba I and Bangolan found the impact of wetlands degradation to be severe.

Christian protestants 67(24.1%) mostly believed wetlands degradation severely affected traditions. Income earners of 10 000 - 20 000 range 70(25.2%) felt the effects of wetlands degradation on traditions were severe.

Lastly, people of low cultural values 120(43.2%) rated the effects of wetlands degradation on tradition to be severe. This goes to say that traditional institutions suffer the impact of wetland degradation most.

Table 6: Chi Square Results on the Importance of Wetland and Other Variables and Culture.

Variable	High culture	Low culture	Total
	Importance of Wetland		
High important	18(6.5%)	98(35.3%)	116(41.7%)
Low important	109(39.2%)	53(19.1%)	**162(58.3%)**
Pearson Chi-Square	73.003	1	**.000**
	Age range		
15-20	0(0.0%)	10(3.6%)	10(3.6%)
21-25	17(6.1%)	13(4.7%)	**30(10.8%)**
26-30	13(4.7%)	14(5.0%)	**27(9.7%)**
31-35	28(10.1%)	20(7.2%)	**48(17.3%)**
36-40	20(7.2%)	18(6.5%)	**38(13.7%)**
41-50	22(7.9%)	16(5.8%)	**38(13.7%)**
51 and above	12(4.3%)	20(7.2%)	**32(11.5%)**
Pearson Chi-Square	24.430	7	.001
	Village		
BABA 1	22(7.9%)	53(19.1%)	75(27.0%)
BABESSI	37(13.3%)	25(9.0)	62(22.3)
BABUNGO	59(21.2%)	11(4.0%)	70(71%)
BANGOLAN	9(3.2%)	62(22.3%)	71(25.5%)
Pearson Chi-Square	86.184	3	.000
	GENDER		
FEMALE	48(17.3%)	93(33.5%)	**141(50.7%)**
MALE	79(28.4%)	58(20.9%)	**137(49.3%)**
Pearson Chi-Square	15.625	1	.000
	Education		
ORDINARY LEVEL	97(34.9%)	104(37.4%)	**201(72.3%)**
ADVANCE LEVEL	19(6.8%)	32(11.5%)	**51(18.3%)**
MASTER LEVEL	10(3.6%)	15(5.4%)	**52(9.0%)**
PHD LEVEL	1(0.4%)	0(0.0%)	**1(0.4%)**
Pearson Chi-Square	3.512	3	.319
	Religion		
CHRISTAIN CATHOLIC	39(14.0%)	47(16.9%)	86(30.9%)
CHRISTAIN PROTESTANT	56(20.1%)	37(13.3%)	93(33.5%)
MUSLEM	13(4.7%)	51(18.3%)	64(23.0%)
OTHER	12(4.3%)	6(2.2%)	18(6.5%)
TRADITION	7(2.5%)	10(3.6%)	17(6.1%)
Pearson Chi-Square	27.853	4	.000
	Occupation		
FARMING	119(42.8%)	127(45.7%)	246(88.5%)
FISHING	6(2.2%)	15(5.4%)	21(7.6%)
GRAZING	2(0.8%)	9(3.2%)	11(4%)
Pearson Chi-Square	13.143	4	.011
	Income		
0-10,000	24(8.6%)	32(11.5%)	56(20.1%)
10,000-20,000	38(13.7%)	58(20.9%)	96(34.5%)
20,000-30,000	23(8.3%)	29(10.4%)	52(18.7%)
30,000-40,000	13(4.7%)	13(4.7%)	26(9.4%)
40,000-50,000	19(6.8%)	11(4.0%)	30(10.8%)
50,000-100,000	10(3.6%)	7(2.5%)	17(6.1%)
100,000 AND ABOVE	0(0.0%)	1(0.4%)	1(0.4%)
Pearson Chi-Square	7.650	6	.265
	Marital status		
COHABITING	0(0.0%)	8(2.9%)	8(2.9%)
DIVORCED	5(1.8%)	12(4.3%)	17(6.1%)
MARRIED	92(33.1%)	92(33.1%)	184(66.2%)
SINGLE	30(10.8%)	39(14.0%)	69(24.8%)
Pearson Chi-Square	10.059	3	.018

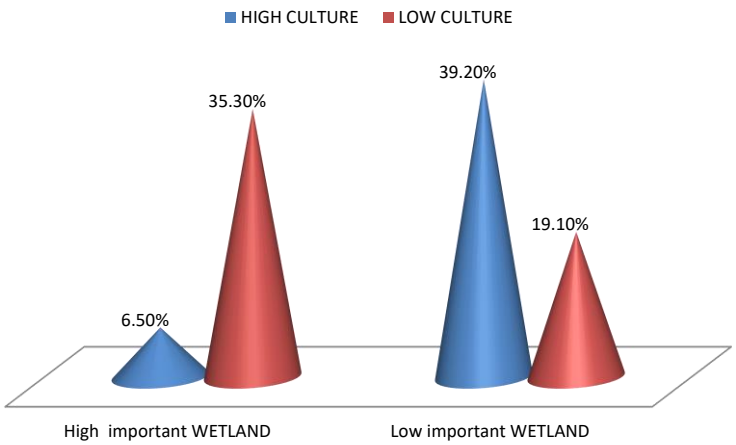

Figure 2: Effects of wetland on culture. Source: Constructed by authors using data from respondents

Table 7: Regression Results on the Importance of Wetlands and other variables on culture.

Variables	Coefficient	t	Sig.
(Constant)	1.490		
DRAINAGE	-.045	5.309	.000
FERTILISER	.028	-1.791	.075
POLUTION	.016	1.193	.234
GRAZING	.048	.718	.473
HUNTING	.012	2.270	.024
SETTLEMENT AND URBANISATION	.003	.547	.585
CLIMATE CHANGE	9.192E-007	.147	.883
INCREASE POP	-.025	.000	1.000
Cultural value	.017	-1.103	.271
F(9, 267)	5.661	4.502	.000
R^2	0.132		

Table 8: Perception of the local population on the causes of wetlands.

Variable	1	2	3	4	5	6	7	8
				Drainage for agriculture				
Frequency (percentage)	201(72.3%)	22(7.9%)	19(6.8%)	7(2.5%)	1(.4%)	11(4.0%)	2(.7%)	12(4.3%)
				Excessive use of fertilizers and pesticides				
Frequency (percentage)	84(30.2%)	123(44.2%)	30(10.8%)	12(4.3%)	6(2.2%)	3(1.1%)	3(1.1%)	17(6.1%)
				Pollution (Dumping of refuse)				
Frequency (percentage)	40(14.4%)	30(10.8)	82(29.5%)	24(8.6%)	28(10.1%)	42(15.1%)	16(5.8%)	16(5.8%)
				Grazing				
Frequency (percentage)	24(8.6%)	20(7.2%)	62(22.3%)	48(17.3%)	22(7.9%)	23(8.3%)	38(13.7%)	41(14.7%)
				Hunting				
Frequency (percentage)	18(6.5%)	13(4.7%)	8(2.9%)	27(9.7%)	46(16.5%)	29(10.4%)	62(22.3%)	75(27.0%)
				Settlement and Urbanization				
Frequency (percentage)	35(12.6%)	9(3.2%)	21(7.6%)	34(12.2%)	67(24.1%)	41(14.7%)	34(12.2%)	37(13.3%)
				Climate Change				
Frequency (percentage)	35(12.6%)	8(2.9%)	23(8.3%)	20(7.2%)	35(12.6%)	41(14.7%)	30(10.8%)	86(30.9%)
				Increase Population				
Frequency (percentage)	44(15.8%)	16(5.8%)	20(7.2%)	58(20.9%)	29(10.4%)	27(9.7%)	37(13.3%)	47(16.9%)

Table 9: Perception of the local population on the effects of wetlands degradation on the traditional institutions.

Variable	Moderately degraded	Severely degraded	Slightly degraded	Total
Tradition adherence		**State of Wetland**		
HIGH	8(2.9%)	105(37.8%)	3(1.1%)	116(41.7%)
LOW	31(11.2%)	89(32.0%)	42(15.1%)	162(58.3%)
Pearson Chi-Square	42.228	2	.000	
		Age		
15-20	0(0.0%)	10(3.6%)	0(0.0%)	10(3.6%)
21-25	3(1.1%)	18(6.5%)	9(3.2%)	30(10.8%)
26-30	4(1.4%)	16(8.5%)	7(2.5%)	27(9.7%)
31-35	5(1.8%)	29(10.4%)	14(5.0%)	48(17.3%)
36-45	11(4.0%)	24(8.6%)	3(1.1%)	38(13.7%)
46-50	8(2.9%)	25(9.0%)	5(1.8%)	38(13.7%)
50 AND ABOVE	5(1.8%)	23(8.3%)	4(1.4%)	32(11.5%)
Pearson Chi-Square	36.294	14	.001	
		Village		
BABA1	10(3.6%)	59(21.2%)	6(2.2%)	75(27.0%)
BABESSI	22(7.9%)	27(9.7%)	13(4.7%)	62(22.3%)
BABUNGO	2(0.7%)	49(17.6%)	19(6.8%)	70(25.5%)
BANGOLAN	5(1.8%)	59(21.2%)	7(2.5%)	71(25.5%)
Pearson Chi-Square	48.763	6	.000	
		Gender		
FEMALE	21(7.6%)	102(36.7%)	18(6.5%)	141(50.7%)
MALE	18(6.5%)	92(33.1%)	27(9.7%)	137(49.3%)
Pearson Chi-Square	2.489	2	.288	
		Education		
ORDINARY LEVEL	30(10.8%)	135(48.6%)	36(12.9%)	201(72.3%)
ADVANCE LEVEL	6(2.2%)	39(14.0%)	6(2.2%)	51(18.3%)
MASTER LEVEL	3(1.1%)	19(6.8%)	3(1.1%)	25(9.0%)
PHD LEVEL	0(0.0%)	1(0.4%)	0(0.0%)	1(0.4%)
Pearson Chi-Square	2.726a	6	.842	
		Religion		
CHRISTAIN CATHOLIC	20(7.2%)	52(18.7%)	14(5.0%)	86(30.9%)
CHRISTAIN PROTESTANT	6(2.2%)	67(24.1%)	20(7.2%)	93(33.5%)
MUSLEM	11(4.0%)	50(18.0%)	3(1.1%)	64(23.0%)
OTHER	0(0.0%)	11(4.0%)	7(2.5%)	18(6.5%)
TRADITION	2(0.7%)	14(5.0%)	1(0.4%)	17(6.1%)
Pearson Chi-Square	28.123	8	.000	
		Occupation		
FARMING	38(13.7%)	165(59.4%)	43(15.5%)	246(88.5%)
FISHING	1(0.4%)	18(6.5%)	2(0.7%)	21(7.6%)
GRAZING	0(0.0%)	11(4%)	0(0.0%)	11(4%)
Pearson Chi-Square	8.254	8	.409	
		Income		
0-10,000	17(6.1%)	27(9.7%)	12(4.3%)	56(20.1%)
10,000-20,000	13(4.7%)	70(25.2%)	13(4.7%)	96(34.5%)
20,000-30,000	6(2.2%)	39(14(.0%)	7(2.5%)	52(18.7%)
30,000-40,000	1(0.4%)	21(7.6%)	4(1.4%)	26(9.4%)
40,000-50,000	0(0.0%)	23(8.3%)	7(2.5%)	30(10.8%)
50,000-100,000	2(0.7%)	13(4.7%)	2(0.7%)	17(6.1%)
100,000 AND ABOVE	0(0.0%)	1(0.4%)	0(0.0%)	1(0.4%)
Pearson Chi-Square	25.114	12	.014	
		Marital Status		
COHADITING	0(0.0%)	8(2.9%)	0(0.0%)	8(2.9%)
DIVORCED	2(0.7%)	12(4.3%)	3(1.1%)	17(6.1%)
MARRIED	27(9.7%)	128(46.0%)	29(10.4%)	184(66.2%)
SINGLE	10(3.6%)	46(16.5%)	13(4.7%)	69(24.8%)
Pearson Chi-Square	4.033	6	.672	
		Coded Culture		
HIGH CULTURE	19(6.8%)	74(26.6%)	34(12.2%)	127(45.7%)
LOW CULTURE	20(7.2%)	120(43.2%)	11(4.0%)	151(54.3%)
Pearson Chi-Square	20.771	2	.000	

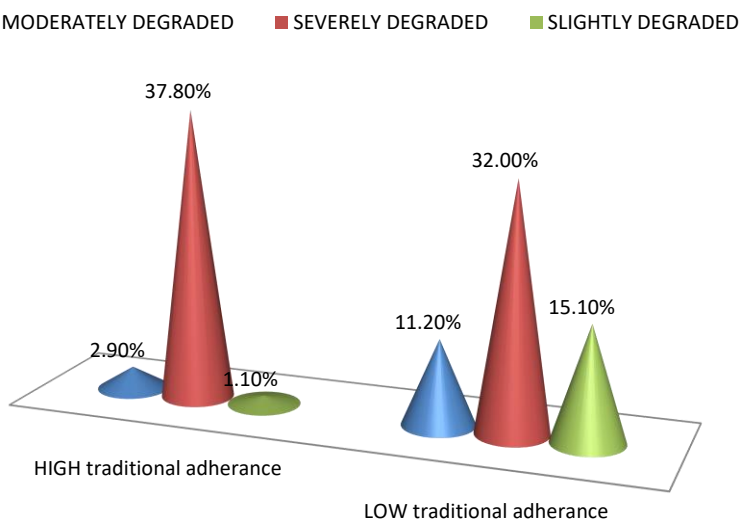

Figure 3: Traditional adherence and wetland degradation. Source: Constructed by authors using data from respondents.

Table 10: Perception of the local population on the strategies to reduce wetlands degradation.

Variable	Strongly disagree	Disagree	Agree	Strongly agree
	Community members are not sensitized on the dangers of degrading the wetlands			
Frequency(percentage)	7(2.5%)	4(1.4%)	148(53.2%)	119(42.8%)
	There is very little or no will to implement and follow up wetland policies in the country			
Frequency(percentage)	6(2.2%)	10(3.6%)	131(47.1%)	313(47.1%)
	The municipal council does not take initiatives to support wetland farmers from degrading the land			
Frequency(percentage)	5(1.8%)	16(5.8%)	118(42.4%)	139(50.0%)
	The concept of decentralization in Cameroon is not fully implemented and so most of the municipal councils have no authority over the protection of the wetlands			
Frequency(percentage)	11(4.0%)	12(4.3%)	72(25.9%)	183(65.8%)
	Land owners have moral obligation to preserve wetlands on their land but under the Ramsar convention individuals do not own wetlands			
Frequency(percentage)	7(2.5%)	20(7.5%)	113(40.6%)	138(49.6%)
	The Upper Noun Valley Development Authority which is a big rice producer should assist the farmers in conserving the wetlands through environmentally friendly farming methods			
Frequency(percentage)	2(7%)	4(1.4%)	91(32.7%)	181(65.1%)
	Traditional authorities should be part of wetlands management scheme			
Frequency(percentage)	11(4.0%)	41(14.7%)	115(41.4%)	111(39.9%)
	Government should allocate more money in the budget to improve on wetlands.			
Frequency(percentage)	1(4%)	2(7%)	77(27.7%)	198(100.0%)

Presentation of results on the perception of the local population on the strategies to reduce wetlands degradation

As a way forward, three main strategies have overridden the proposals: allocating more money in the budget to improve on wetlands198(100.0%); The Upper Noun Valley Development Authority which is a big rice producer should assist the farmers in conserving the wetlands through environmental friendly farming methods (97.1%); The concept of decentralization in Cameroon is not fully implemented and so most of the municipal councils have no authority over the protection of the wetlands, 91.7%; sensitizing community members on the dangers of degrading the wetlands 96%. This section further presents chi-square results on the level of agreement of the respondents on the possible strategies to reduce wetlands degradation (Table 10).

Going by villages, Table 11 shows that Baba I community were most in support of the need for the municipal council to take initiatives to support wetland farmers from degrading the land 67(21.1%); assistance from the Upper Noun Valley Development Authority which is a big rice producer to the farmers in conserving the wetlands through environmental friendly farming methods 64(23.0%); and the allocation of more funds to improve on wetlands 63(22.7%). Hence, these three strategies are the most recommended way to go as far

Table 11: Chi Square Table on Strategies to Reduce Wetland by Village.

Variable	Baba 1	Babessi	Babungo	Bangolan	Total
	Community members are not sensitized on the dangers of degrading the wetlands				
STRONGLY DISAGREE	0(0.0%)	3(1.1%)	3(1.1%)	1(0.4%)	7(2.5%)
DISAGREE	0(0.0%)	3(1.1%)	0(0.0%)	1(0.4%)	4(1.4%)
AGREE	21(7.6%)	38(13.7%)	59(21.2%)	30(10.8%)	148(53.2%)
STRONGLY AGREE	54(19.4%)	18(6.5%)	8(2.9%)	39(14.0%)	119(42.8%)
Pearson Chi-Square	71.729a	9	.000		
	There is very little or no will to implement and follow up wetland policies in the country				
STRONGLY DISAGREE	0(0.0%)	2(0.7%)	3(1.1%)	1(0.4%)	6(2.2%)
DISAGREE	4(1.4%)	5(1.8%)	0(0.0%)	1(0.4%)	10(3.6%)
AGREE	19(6.8%)	32(11.5%)	58(20.9%)	22(7.9%)	131(47.1%)
STRONGLY AGREE	52(18.7%)	23(8.3%)	9(3.2%)	47(16.9%)	131(47.1%)
Pearson Chi-Square	73.943a	9	.000		
	The municipal council does not take initiatives to support wetland farmers from degrading the land				
STRONGLY DISAGREE	0(0.0%)	1(0.4%)	3(1.1%)	1(0.4%)	5(1.8%)
DISAGREE	0(0.0%)	13(4.7%)	2(0.7%)	1(0.4%)	16(5.8%)
AGREE	21(7.6%)	20(7.2%)	56(29.1%)	21(7.6%)	118(42.4%)
STRONGLY AGREE	54(19.4%)	28(10.1%)	9(3.2%)	48(17.3%)	139(50.0%)
Pearson Chi-Square	98.924a	9	.000		
	The concept of decentralization in Cameroon is not fully implemented and so most of the municipal councils have no authority over the protection of the wetlands				
STRONGLY DISAGREE	0(0.0%)	8(2.9%)	2(0.7%)	1(0.4%)	11(4.0%)
DISAGREE	1(0.4%)	10(3.6%)	1(0.4%)	0(0.0%)	12(4.3%)
AGREE	7(2.5%)	9(16.2%)	45(16.2%)	11(4.0%)	72(25.9%)
STRONGLY AGREE	67(21.1%)	35(12.6%)	22(7.9%)	59(21.2%)	183(65.8%)
Pearson Chi-Square	119.660a	9	.000		
	Land owners have moral obligation to preserve wetlands on their land but under the Ramsar convention individuals do not own wetlands				
STRONGLY DISAGREE	1(0.4%)	1(0.4%)	2(0.7%)	3(1.1%)	7(2.5%)
DISAGREE	0(0.0%)	11(4.0%)	4(1.4%)	5(1.8%)	20(7.2%)
AGREE	14(5.0%)	25(9.0%)	56(20.1%)	18(6.5%)	113(40.6%)
STRONGLY AGREE	60(21.6%)	25(9.0%)	8(2.9%)	45(16.2%)	138(49.6%)
Pearson Chi-Square	94.645[a]	9	.000		
	The Upper Noun Valley Development Authority which is a big rice producer should assist the farmers in conserving the wetlands through environmentally friendly farming methods				
STRONGLY DISAGREE	0(0.0%)	1(0.4%)	0(0.0%)	1(0.4%)	2(0.7%)
DISAGREE	1(0.4%)	2(0.7%)	0(0.0%)	1(0.04%)	4(1.4%)
AGREE	10(3.6%)	15(5.4%)	43(15.5%)	23(8.3%)	91(32.7%)
STRONGLY AGREE	64(23.0%)	44(15.8%)	27(9.7%)	46(16.5%)	181(61.5%)
Pearson Chi-Square	44.816	9	000		

Table 11. Contd.

	Traditional authorities should be part of wetlands management scheme				
STRONGLY DISAGREE	4(1.4%)	3(1.1%)	2(0.7%)	2(0.7%)	11(4.0%)
DISAGREE	20(7.2%)	4(1.4%)	10(3.6%)	7(2.5%)	41(14.7%)
AGREE	5(1.8%)	32(11.5%)	53(19.1%)	25(9.0%)	115(41.3%)
STRONGLY AGREE	46(16.5%)	23(8.3%)	5(1.8%)	37(13.3%)	111(39.9%)
Pearson Chi-Square	86.440a	9	.000		
	Government should allocate more money in the budget to improve on wetlands				
STRONGLY DISAGREE	0(0.0%)	0(0.0%)	0(0.0%)	1(0.4%)	1(0.4%)
DISAGREE	1(0.4%)	1(0.4%)	0(0.0%)	0(0.0%)	2(0.7%)
AGREE	11(4.0%)	14(5.0%)	39(14.0%)	13(4.7%)	77(27.7%)
STRONGLY AGREE	63(22.7%)	47(16.9%)	31(11.2)	57(20.5%)	198(71.2%)
Pearson Chi-Square	42.143a	9	.000		

Table 12: Map colour representation of landscape in Babessi municipality.

Landscape	Colour used	Value	Hue	Red	Green	Blue	Alpha Channel	HTML code
Forest	green	170	120	0	170	0	255	#00aa00
Swamp	greenish blue	170	164	0	170	127	255	#00aa7f
Paddy Rice cultivation	Yellowish green	255	80	170	255	0	255	#aaff00
Bamendjing Lake extension	Blue	255	220	0	85	255	255	#0055ff

as saving wetlands is concerned.

From the research findings, we have observed that the people of Babessi municipality perceive wetlands to be of high importance to their culture because; they improve water quality, reduce flood damage, reduce erosion, recharge and discharge groundwater, provide habitat for various species, mitigate climate change, provide recreation and tourism, are a source of economic produce on which the livelihood of some community members depend, and provides medicine. In a study carried out by Chebo (2009), similar results were obtained. The people of Babungo 59(21.2%) attached the most importance of wetlands to culture. This has a high significance given the fact that the people of Babungo are more culture-centric than the rest of the villages (Baba1, Babessi and Bangolan). This is evident by the proliferation of cultural halls and traditional meeting houses in Babungo. The importance of wetlands has been traced as far back as the days of old. From the creation story of Genesis 2:8, God created the first wetland which was the Garden of Eden. A river, which finally separated to form four streams; Pishon, Gihon, Tigris and Eupharetes always watered the garden. As an environmentalist, he was conscious of anthropogenic activities on wetlands and ordered man to take care of it (Genesis 2:15). This was the first-ever environmental law against the degradation of wetlands. Hurautt (1995) revealed drainage for agriculture stands out as the main cause for wetlands degradation. From Table 8, it can be deduced that the main cause of wetlands degradation in Babessi Municipality: 223(80.2%) and this is closely followed by excessive use of fertilizers and pesticides 207(74.4%). Businge (2017) carried out similar studies in western Uganda and his findings were similar. However, some other researchers blame the main cause of wetlands degradation on urbanism (UNDP 2009; Chebo 2009). According to results from this study, participants with high traditional adherence believed that wetlands degradation severely affected traditional institutions. Verschuuren (2016), affirms that wetlands are sacred places, venerated by local indigenous people. Degrading such wetlands therefore will lead to a disconnection between the material being and the spiritual.

Three main strategies for wetlands degradation were identified: allocating more money in the budget to improve on wetlands 198(100.0%); The Upper Noun Valley Development Authority which is a big rice producer should assist the farmers in conserving the wetlands through environmental friendly farming methods (97.1%); The concept of decentralization in Cameroon is not fully implemented and so most of the municipal councils have no authority over the protection of the wetlands, 91.7%; sensitizing community members on the dangers of degrading the wetlands 96%. It is therefore incumbent to use strategies such as protection and restoration to reduce the degradation of wetlands as indicated by Zhang et al. (2013). Table 12 represent the

Table 13: Statistics of wetlands coverage in Babessi municipality.

Village	Forest (Sq. km)	Swamps (Sq. km)	Paddy Rice cultivation Sq. km)	Total	Lake Extension (Sq. km)
Babungo	23.2	3.77	46.03		0.00
Baba 1	10.18	2.1	15.91		0.00
Babessi	57.73	22.85	45.1		0.00
Bangolan	97.31	13.91	56.71		30.7
Total	188.42	42.63	163.75		30.7
Total	**188.42**	**42.63**	**163.75**	**394.8**	

map colors as far as the landscape of Babessi is concern. As indicated by Table 13, the total surface area of wetland is 394.8 sq. Km.

CONCLUSION AND RECOMMENDATION

The study found out that wetlands are of significant importance to the people of Babessi municipality. Anthropogenic factors like increase in population which enhance urbanization, grazing and hunting are mostly the causes of wetlands degradation. This phenomenon has an effect on culture. From the results of this study, we recommend that the UNVDA should assist the farmers in conserving wetlands through environmentally friendly farming methods and that traditional authorities should be fully integrated in the management of wetlands. In addition, government should allocate more money in the budget to improve wetlands.

ACKNOWLEDGEMENT

We are honored by both technical and financial support received from the Babessi Council to make this study a reality.

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