An Appraisal on the Role of Local Communities in Vegetation Dynamics at Kainji Lake National Park, Nigeria

*Muhammed M.[1*] --- Okhimamhe A.A.[2] --- Shaba H.A.[3] --- Ojigi L.M.[4]*

[1,2] Department of Geography, Federal University of Technology Minna, Nigeria
[3,4] National Space Research and Development Agency (NASRDA) Abuja, Nigeria

Abstract

The fact that more people are becoming poorer by the day means that more natural resources around the world would continue to be depleted at a faster rate than usual and this is because the poor are mostly depended on the availability of natural resources around them for their sustainability and Borgu sector of Kaiji lake National Park is not an exception. Just as protected areas may reduce deforestation compared to unprotected areas, they do not entirely eliminate human activities in and around them. This paper assess role of local communities in the dynamics of vegetation within the Borgu sector of Kainji Lake National Park. Questionnaires were administered to selected three communities within two kilometer (2km) of the park boundary. The questionnaires retrieved for each community, were coded and the data entered into the Statistical Package for the Social Science (SPSS) and analyzed using the simple analytical method of descriptive statistics. The frequency of occurrence of responses was used in the discussion as well as one way ANOVA to test the level of significance of the two hypotheses set for the study. The 2-tailed test carried out showed that there is a significant relationship between the educational background and occupation of the people just as the occupation of the people also affects the kind of resources that is being harvested from the park. The result also shows that Level of Education has a relationship with perception on sensitization carried out and ways of tackling the environmental problems. There are serious human activities around the fringe of the park and this has contributed to the continuous degradation of park resources without the communities understanding the true effects of their actions. The attention of the management of the park should be geared towards involving members of the communities in some decision regarding the park management.

Keywords: Vegetation, Dynamics, Awareness, Environment, National park.
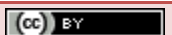
Contents

1. Introduction

Awareness and concern on how fast the environment is degrading have grown in the past few years and poverty which is defined as a condition of being poor is sometimes considered to be responsible. The fact that more people are becoming poorer by the day means that more natural resources around the world would continue to be depleted at a faster rate than usual and this is because the poor are mostly depended on the availability of natural resources around them for their sustainability. The sole dependent on these resources for food, medicine, shelter, energy and water brings about their use and overuse and this leads to environmental degradation. Most of the rural poor are illiterate and the lack of education also prohibits them from practicing environmentally sustainable agriculture, protect natural resources against degradation or rehabilitate degraded resources like rivers [1]

Many studies have been carried out in some forest reserves and parks, it is evident that within the same region, forest reserves managed by local or indigenous communities for the production of goods and services are more effective in maintaining forest cover than those managed under solely protection objectives [2, 3] Other research attempts to seek if there are relative patterns that support the findings mentioned above in the quest for alternatives to strict forest protection. It is now widely recognized that plans for the management of protected areas should take into account the needs of those living within these areas. According to Naughton-Treves, et al. [4] after decades of expanding protected areas, the necessity of integrating human-rights concerns and fairness into management objectives is now unquestionable. In addition, several international agreements fully recognized that biodiversity conservation should include economic benefits at multiple scales, reduce poverty, protect threatened cultures, and promote peace [4] A recent research on assessments of change in land use/cover indicate that while protected areas can help to reduce tropical deforestation [5] they are nevertheless becoming increasingly isolated [6] thus disregarding ecological, cultural, and social processes that are known to influence the permanence of forest ecosystems at landscape scales [7]

The Borgu sector of the Park is increasingly coming under pressure from excessive human activities such as hunting, overgrazing, logging, slash and burn agriculture, shifting cultivation, etc. Rapid urban development in the area has created large human concentration around the park with high demand for natural resources. Increased reliance on floral diversity services for energy, food, and other product for human sustainability constitute a growing threat to the physical integrity, richness, biodiversity productivity of woodland in the park. All of these should not be underrated as their devastation of the natural environment can be costly, socially, ecologically and financially. How then can we preserve or conserve the diversity of flora, which make up our living biosphere and maintain healthy natural systems, while at the same time meet the material needs of an increasing number of people especially in the rural communities around this Park. As we erode the ecosystem and reduce diversity of flora through exploitation, based on the various services we get from it, we start to lose and the cost of replacing them (that is if possible) would be extremely expensive. Kainji Lake National Park (KLNP), despite its legal status, designation as protected areas does not in itself guarantee protection of the ecosystem they contain. According to Clark, et al. [8] whilst protected areas generally reduce deforestation relative to unprotected areas, they do not entirely eliminate land use change within them.

The paper assess role of local communities in the dynamics of flora within the Borgu sector of Kainji Lake National Park and the following questions were set for the study;

a. Is there a relationship between Resource Harvested and the type of type of environmental degradation affecting the Community?
- H_0 there is no significant relationship between resources harvested and the type of environmental degradation that affects the Community
- H_1 there is significant relationship between resources harvested and the type of type of environmental degradation that affects the Community

b. Is there a relationship between the resources harvested and the educational background of the community
- H_0 there is no significant relationship between resources harvested the educational background of the community
- H_1 there is significant relationship between resources harvested the educational background of the community

1.1. The Study Area

Kainji Lake National Park is Nigeria's first experiment of establishing and managing a National park. The Park has a total area of 5340.82 sq. km out of which Borgu sector alone accounts for 3,970km^2 which is about 74.3% of the total land area, and is located in the northwest central part of Nigeria. The park is located between latitudes 9º40'N to 10º30'N and longitudes 4º30'E to 5º50'E. It enjoys the savanna climate of Nigeria with two distinct seasons of wet and dry seasons. The mean temperature during the wet season is about 30ºC and drops to about 28º C during the dry season being affected by the north east harmatan winds. Rainfall is a major climatic element in the park being responsible for vegetal growth and the hydrology of the rivers. The mean annuals rainfall is about 1200mm. The rainfall amount increases to the southeast from Borgu towards the Niger valley. This is due to leeward nature of the park site being east of the Yoruba hills.

Borgu sector is well drained by River Oli and Eri. River Oli, the main river of the Borgu sector takes its source from outside Nigeria and drains the western two-third of the park. While river Eri drains the remaining northern one –third of the sector

2. Methodology

Questionnaires were administered to selected communities within two kilometer (2km) of the park boundary. The park is surrounded by about fifteen Communities and three communities representing 20% of the total communities were selected include: Wawa, Luma and Dekara. One Hundred and Fifty (150) questionnaires were administered to

each of the community using the simple random method of sampling. While one hundred and thirty six (136), one hundred and twenty seven (127) and one hundred and forty three (143) questionnaires were retrieved and analyzed for Wawa, Luma and Dekara communities' respectively.
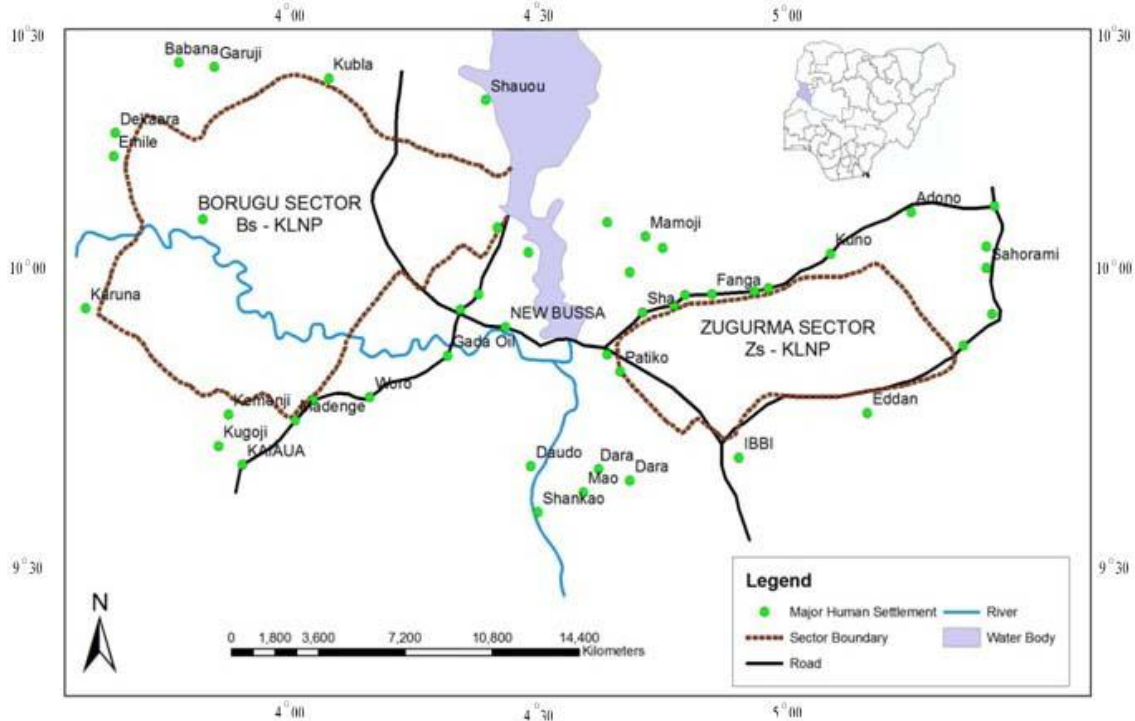

Figure-1. KLNP- two non contiguous sectors with surrounding Communities.

All questionnaires retrieved for each community were coded and the data entered into the Statistical Package for the Social Science (SPSS) and analyzed. The frequency of occurrence of responses provided by the respondent was used in the discussion as well one way ANOVA to test the level of significance of the two hypotheses set for the study. A t-test analyses as well as paired sample test with 95% confidence interval difference level were also carried out to ascertain the relationship within and between the variables.

3. Results and Discussion
3.1. Occupation of the Respondent in the Three Communities
The predominant occupation in the three sampled communities showed that most of them are farmers, followed by civil servant in percentage as presented in figure 2.
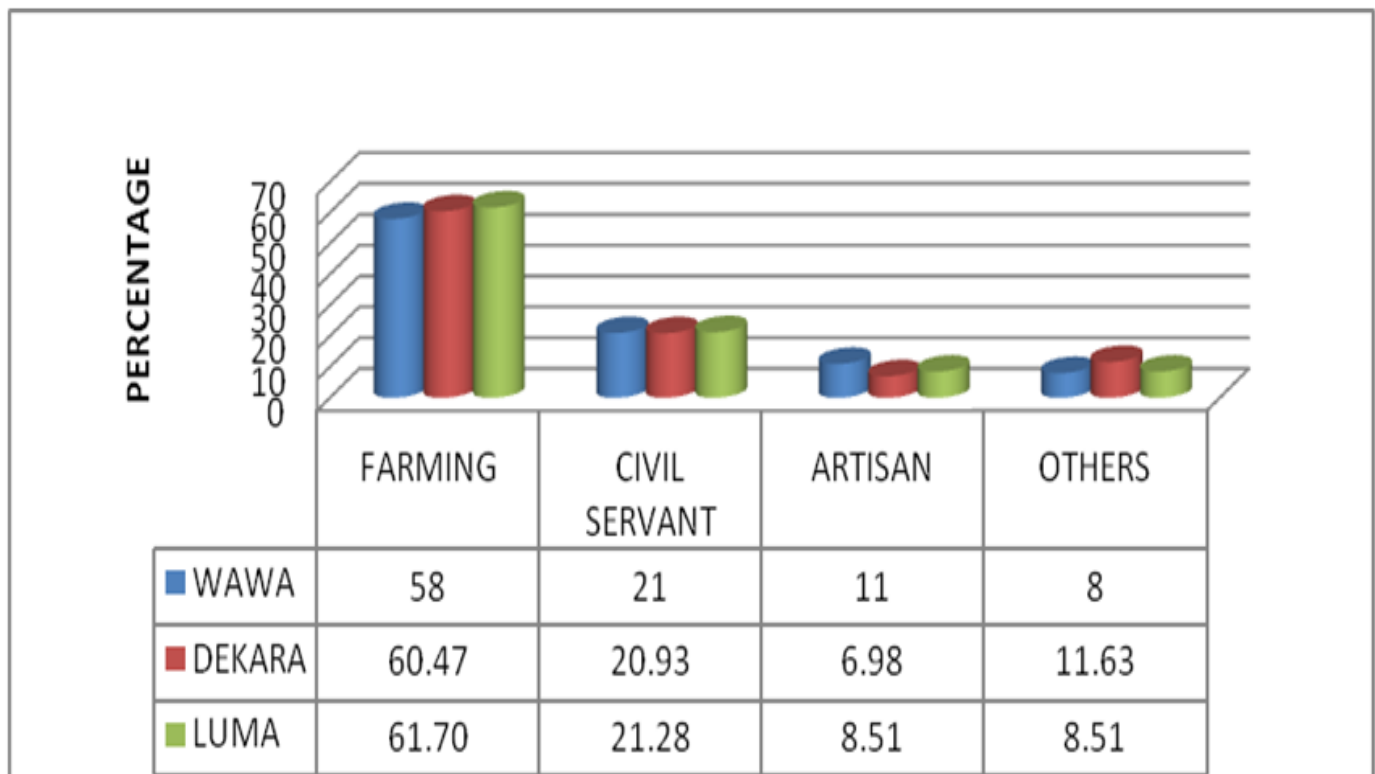

	FARMING	CIVIL SERVANT	ARTISAN	OTHERS
WAWA	58	21	11	8
DEKARA	60.47	20.93	6.98	11.63
LUMA	61.70	21.28	8.51	8.51

Figure-2. Occupations of Respondents

The occupation of the Respondent was necessary to ascertain the relationship between it and the resources harvested from the park.

3.2. Educational Background of the Respondent Communities

The level of education shows a large percentage of the people in Wawa and Luma (55% and 56.2%) have post primary education, while Dekara has low percentage (38%) of those with post primary education in Luma Community (Figure 3).
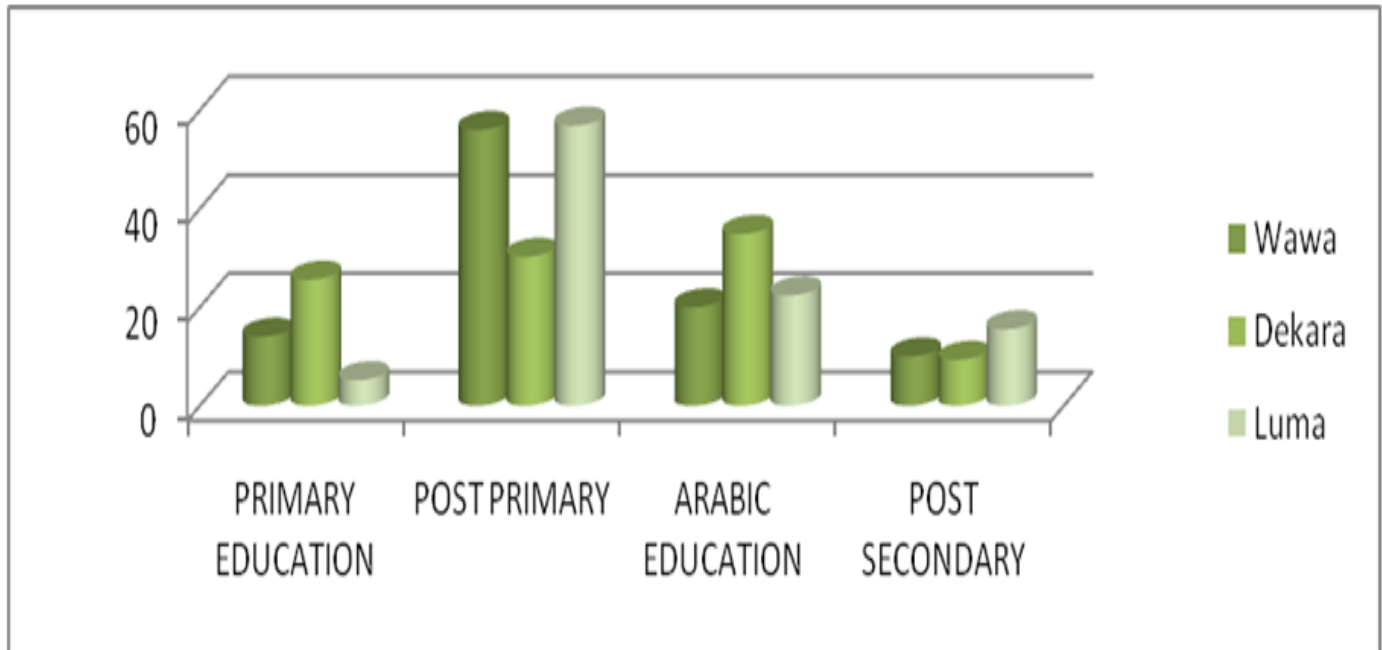

Figure-3. Educational background of respondent.

This implies that majority of the population in the three communities are not educated beyond the post primary and this has affected the literacy level in the area and this in turn affects how the environmental resource around them is used.

3.3. Resource Harvested from the Park in the Communities

The types of park resources mostly harvested by the people in the three communities are non timber products which include those harvested for food, medicine, and for other craft purposes in Wawa and Dekara communities as presented in figure 4.
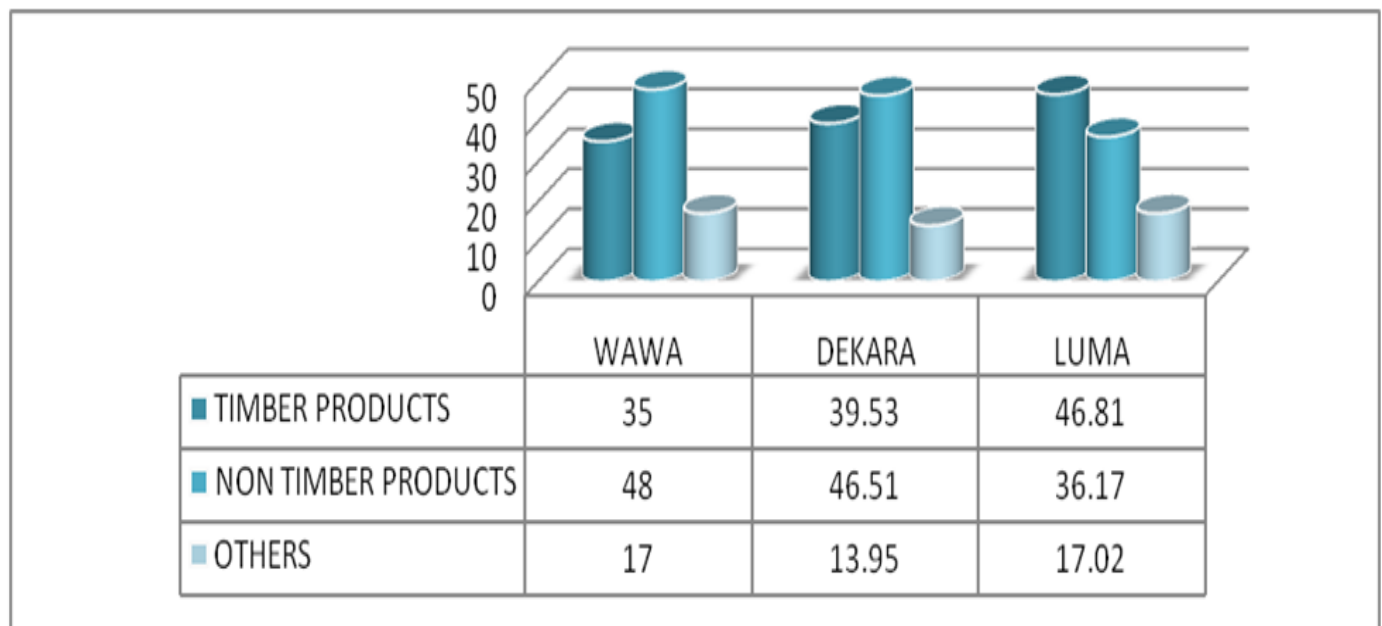

	WAWA	DEKARA	LUMA
■ TIMBER PRODUCTS	35	39.53	46.81
■ NON TIMBER PRODUCTS	48	46.51	36.17
■ OTHERS	17	13.95	17.02

Figure-4. Resources Harvested from the Park

While timber products were the major harvested material from the park in Luma. The next closely harvested product for Wawa and Dekara is the timber product harvested mostly for either roofing or for commercial production of charcoal. Luma on the other hand has non timber product as the second harvested resource from the park having a percentage respondent of 36.2%. Due to the high production of charcoal by Luma community as observed during field visits, this contributed to having the highest percentage of forest product harvested. This implies that as the flora is harvested, the Park Net primary Production (NPP) is altered because instead of the carbon dioxide to the sequestered, Carbon dioxide emission is inevitable.

3.4. Environmental Problems That Affects the Communities

The problems associated with the three communities are deforestation, Flood and erosion as clearly presented in the figure 5. With majority of resource harvested from the park being timber product (figure 4), it is inevitable to see deforestation resulting as a problem associated with the communities just as one may lead to another.
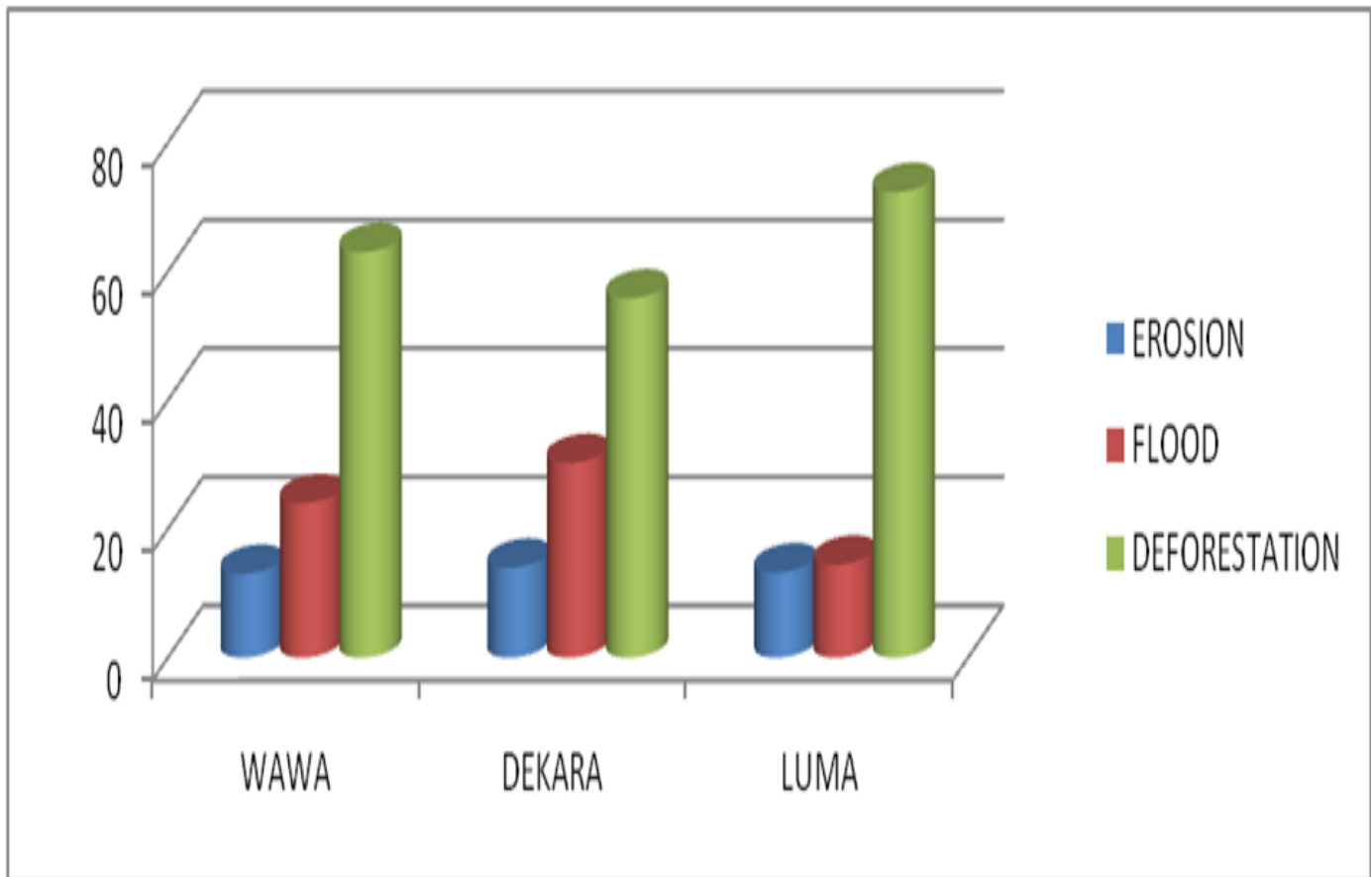
Figure-5. Environmental problems that affect the Communities

3.5. Responsible for Environmental Problems

The result shows that the communities are responsible for their problem (figure 6). With an 85%, 81% and 76.6% responses (Wawa, Dekara and Luma respectively) agreeing to this fact while just a few of the respective communities members objected to the communities being responsible for the environmental problems affecting them rather the government should be held responsible for the problems.
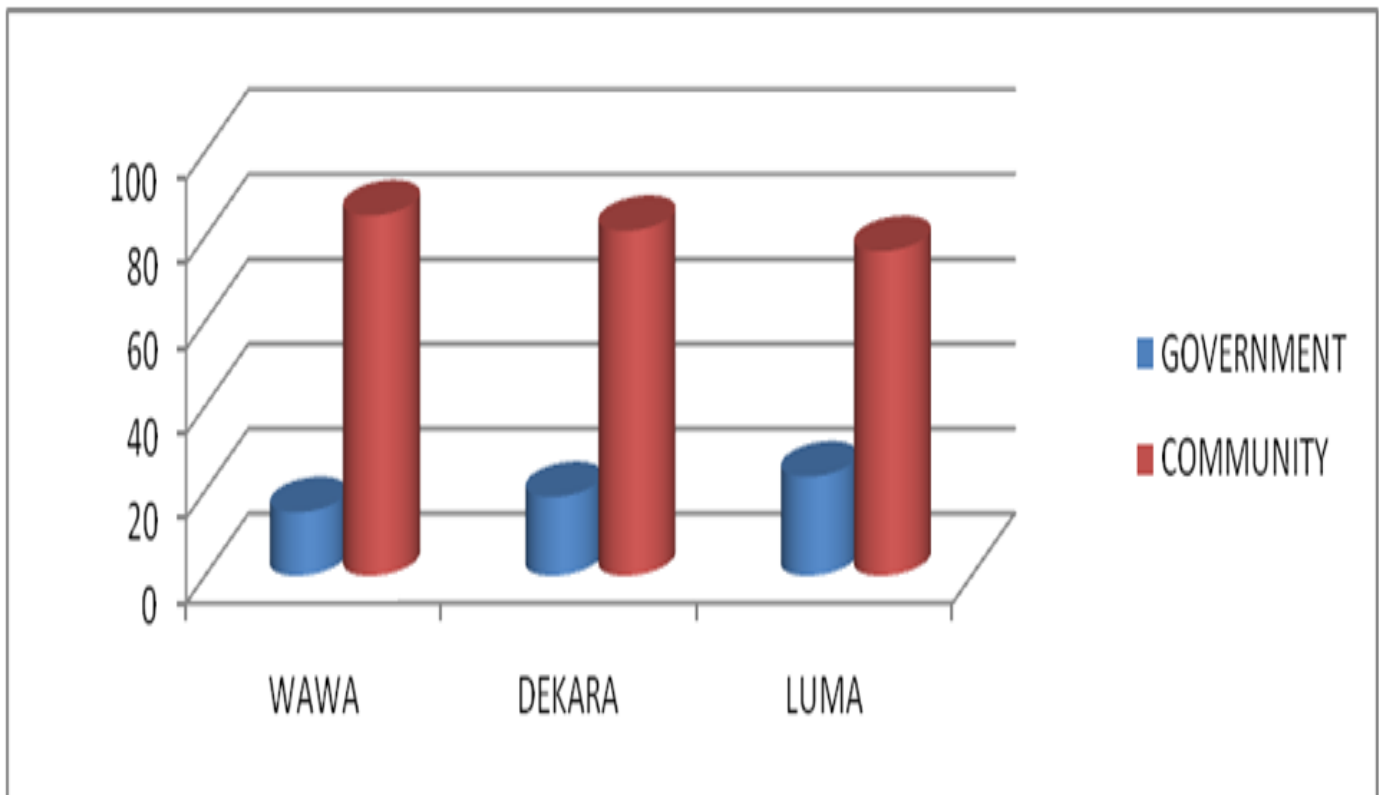

Figure-6. Those Responsible for the Environmental Problems

By implications the communities are responsible for whatever environmental problem affecting them due to the kind of activities they carry out most especially of deforestation.

3.6. Sensitization carried out in the Communities

The results on sensitizations carried out in the community are presented in figure 7, showing an average of 80% to 85% of Wawa community agreed that sensitization had been carried out in the community while 15% disagreed.
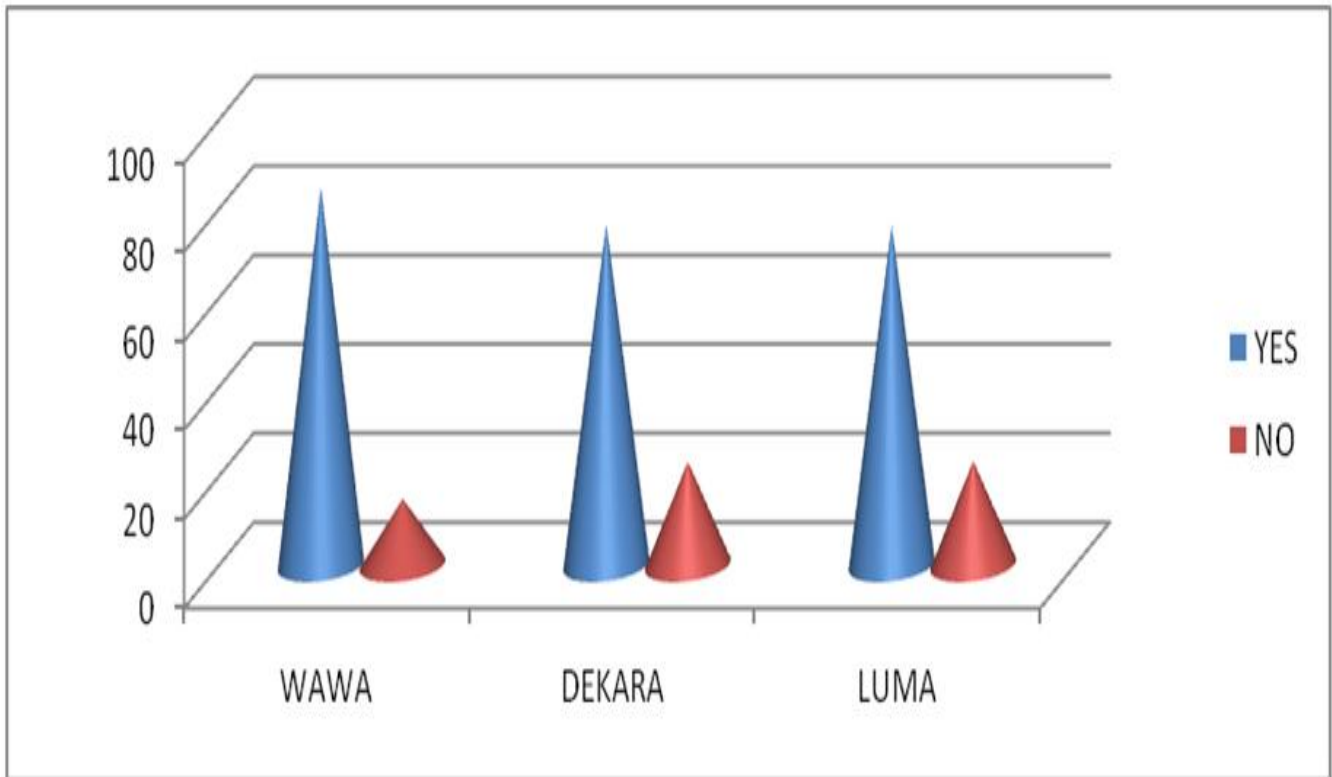
Figure-7. Sensitization carried out in the Communities

This shows an overall average response that sensitization was carried out in the three Communities. It implies that despite the sensitization carried out in the three Communities regarding degradation of their environment some of the communities' members were not ready to change their ways even though they believe it can minimize some of the problems affecting them.

3.7. Sensitization Campaigns and Environmental Management Strategies at the Communities

The results on sensitization shows majority of communities' member with the views that the state officials were responsible for the sensitization activities (figure 8) with very few having the perception that Local Government Area Official and Non Governmental Organizations were responsible for the sensitizations carried out.
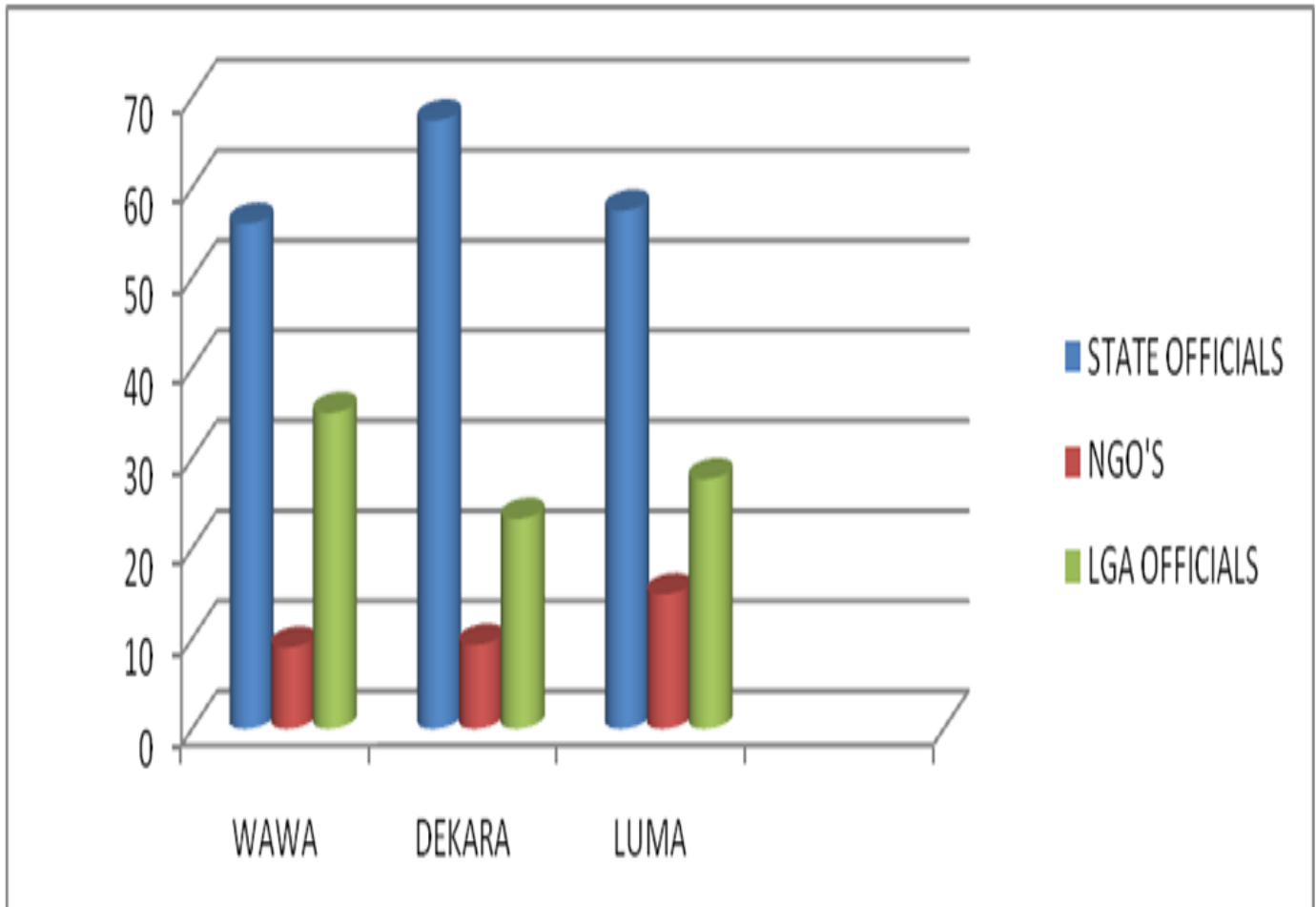

Figure-8. Sensitization campaigns at the communities

Environmental management strategies adopted by the Communities is presented in figure 9. All the communities(Wawa, Dekara and Luma) agreed to sensitization of the people in the community as the best option to tackle the environmental problems.
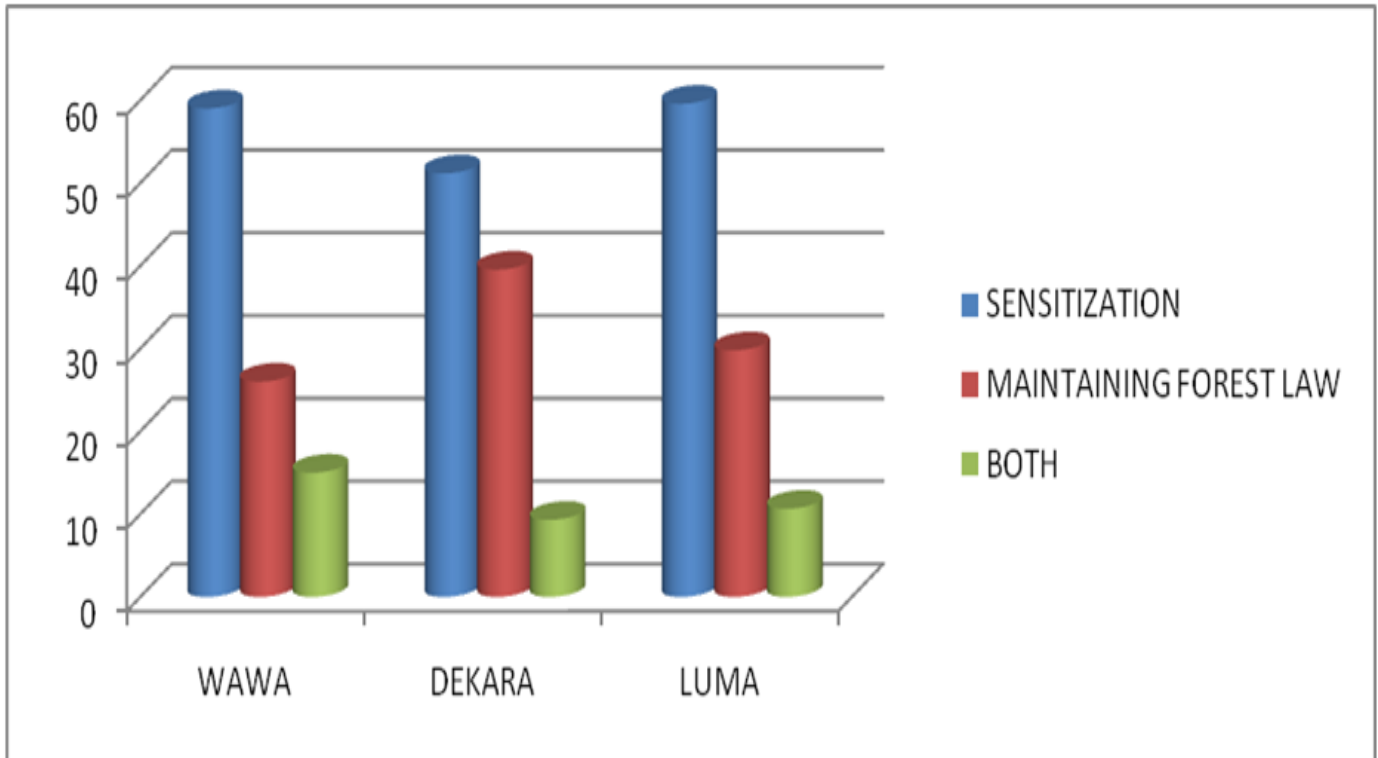
Figure-9. Environmental Management strategies

While 26% (Wawa), 39.5% (Dekara) and 30% (Luma) of the respondent were of the view that maintaining forest law would do good in minimizing some of the problems and just 15%, 9.3% and 11% in Wawa Dekara and Luma respecttively gave their views of using both strategies of sensitizing the people as well as maintaining forest law as the best option in reducing or minimizing the problems associated with their communities.

3.8. Impact of the Sensitization Exercise Carried out in the Communities

The three communities were of the opinion that sensitization carried out had a positive impact on them as presented in figure 10.
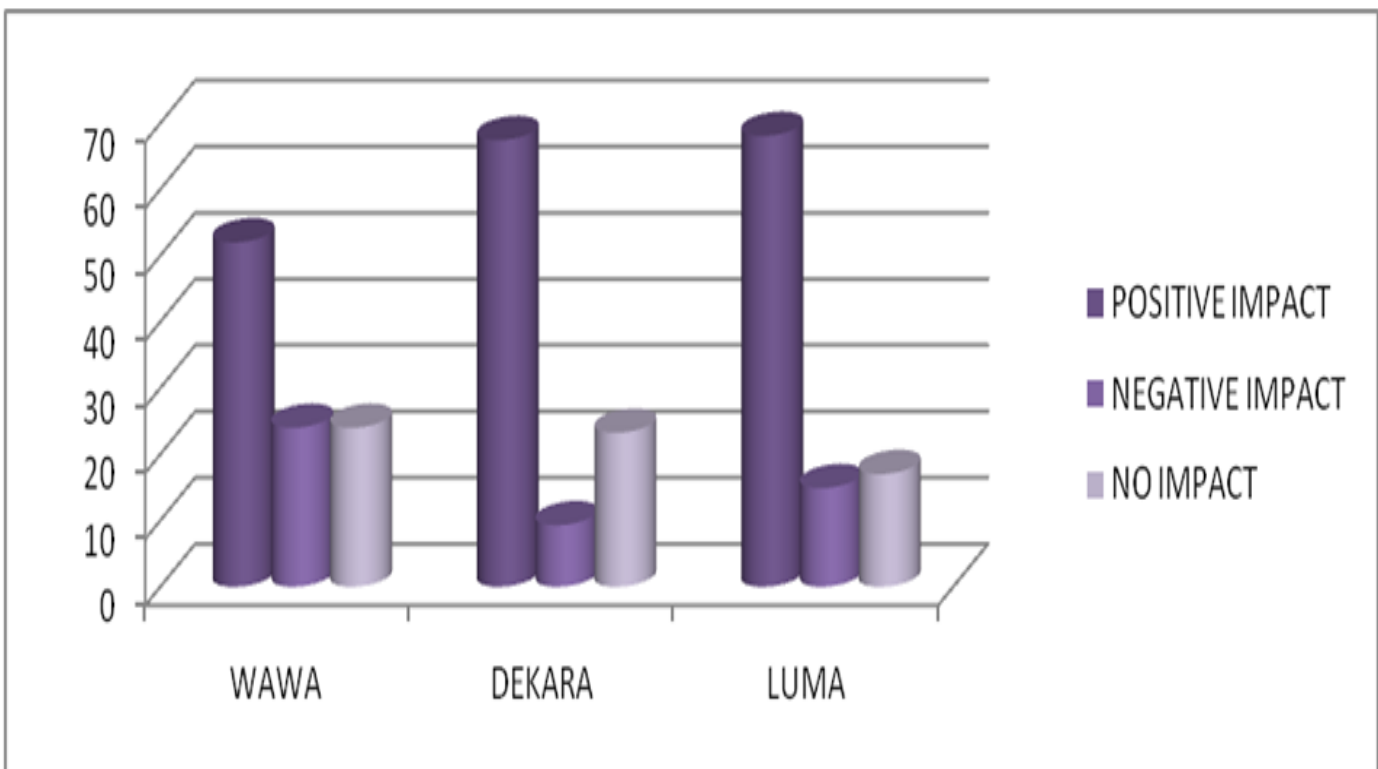
Figure-10. Impact of Sensitization Exercise

Few members of the three communities had the perception of sensitization having negative and no impact on their livelihood this response is due to the literacy level of the community members.

3.9. Effect of Environmental Degradation on Livelihood in the Three Communities

The results regarding effect of environmental degradation on livelihood of the communities is presented in figure 11.
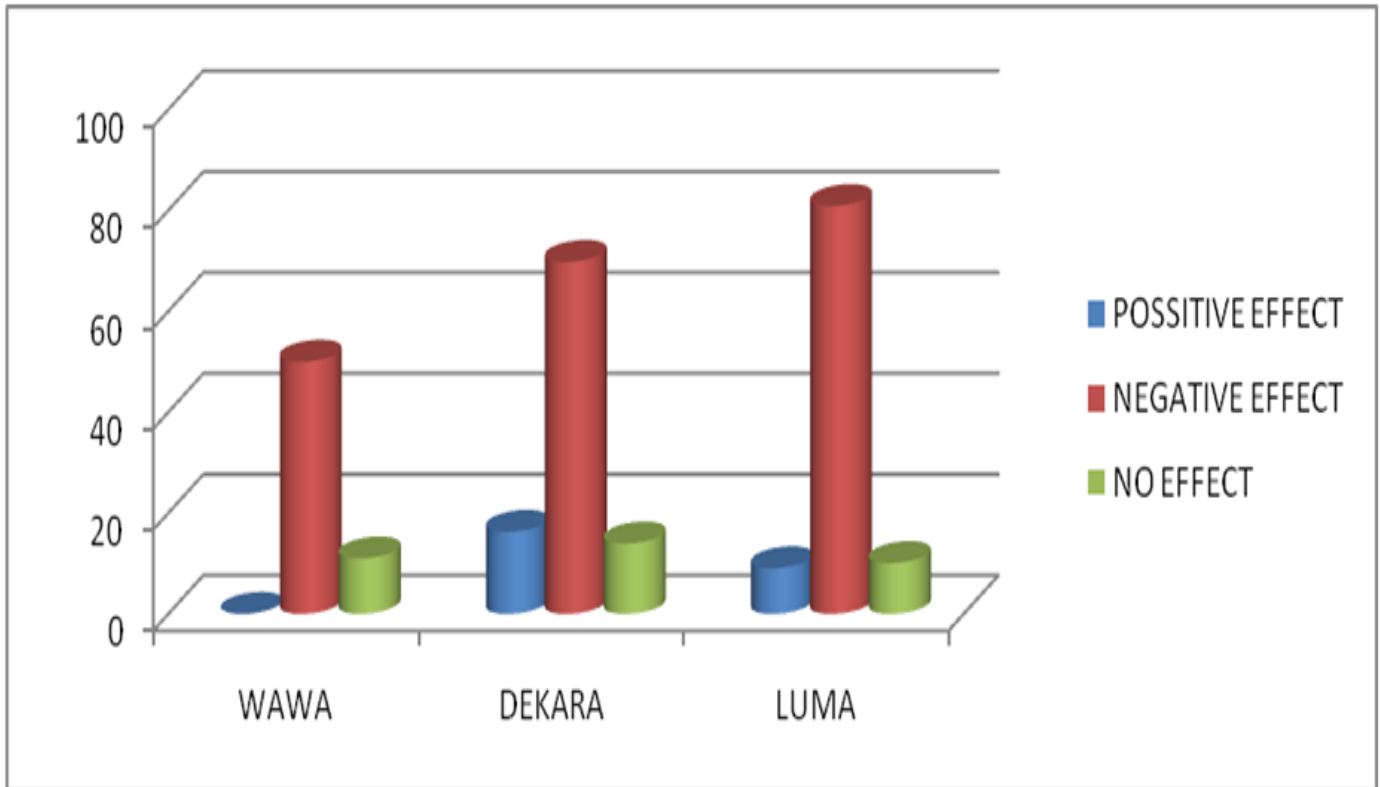
Figure-11. Effect of Environmental Degradation on Livelihood

It shows a gradual increase of the responses from Wawa to Dekara and to Luma that environmental degradation have a negative effect on livelihood while just a few agreed that environmental degradation has a positive effect and no effects on their livelihood. By implication, the negative effect has to do with the reduction in the availability of the resources around them.

3.10. Community Participation in Park Management

The result shows about 85% were of the view that the communities do not participate in park management while just a few agreed to their being involved in decision making regarding the Park management figure 12.
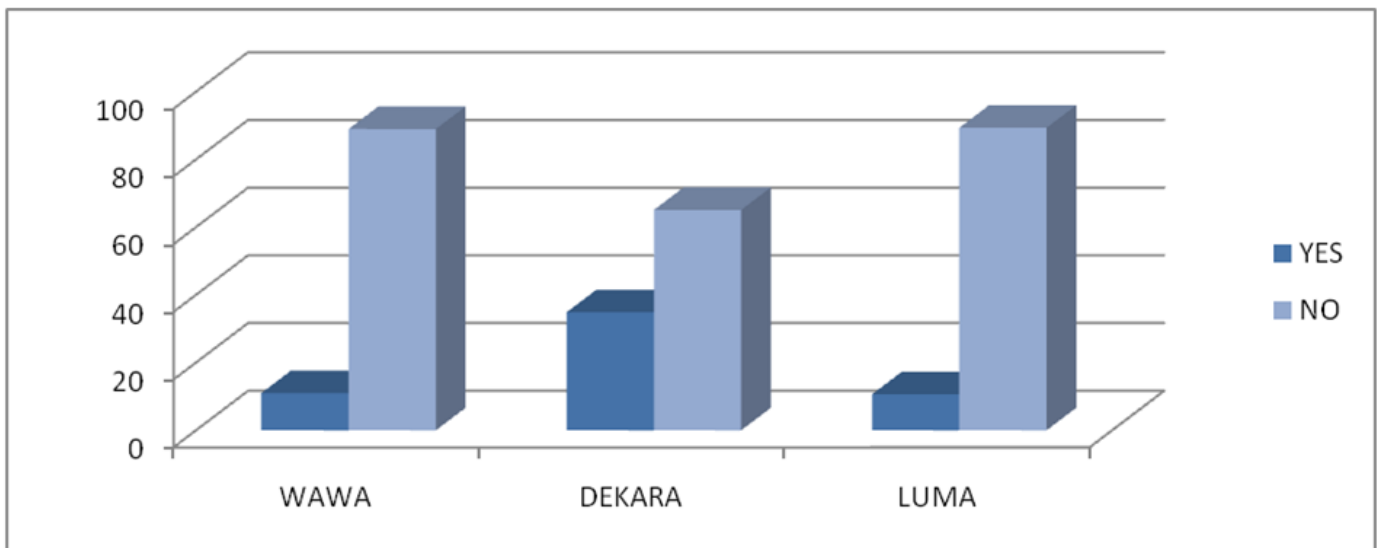
Figure-12. Community Participation in Park Management

From the responses it implies that the Communities are usually not involved in any decision regarding the park management

3.11. One Way Analysis of Variance for the Communities

The one way analysis of variance was carried out to test the hypotheses set for the forth objective of this study. The table 1 presents the Analysis of variance for the communities and out of the variables compared that is, impact of sensitization exercise, impact of environmental degradation on livelihood, sensitization carried out and community participation in decision making in the management of the park, only sensitization carried out in the community had a significant level of 0.011 with the educational background of the respondent meaning that, educational background of the respondent affected the response on whether sensitization was carried out in the community or not. The level of education as presented figure 2 shows over 50% of the respondent having post primary education.

Table-1. One way Analysis of variance of Wawa Community

		Sum of Squares	df	Mean Square	F	Sig.
Impact of Sensitization Exercise	Between Groups	3.119	3	1.04	1.548	0.216
	Within Groups	28.207	42	0.672		
	Total	31.326	45			
Effect of Environmental Degradation on Livelihood	Between Groups	1.274	3	0.425	2.514	0.071
	Within Groups	7.095	42	0.169		
	Total	8.37	45			
Sensitization Carried out	Between Groups	1.37	3	0.457	4.204	0.011
	Within Groups	4.564	42	0.109		
	Total	5.935	45			
Participation in Decision Making Regarding Park Management	Between Groups	0.211	3	0.07	0.697	0.559
	Within Groups	4.245	42	0.101		
	Total	4.457	45			

This is reflected in the 70% agreeing to sensitization carried out in their community and with over 50% convinced that the sensitization carried out had positive impact on them.

Table-2. One way ANOVA on Educational Background

		Sum of Squares	df	Mean Square	F	Sig.
Resource Harvested	Between Groups	5.23	3	1.74	4.54	0.01
	Within Groups	14.96	39	0.38		
	Total	20.19	42			
Those Responsible for Environmental Problems	Between Groups	0.37	3	0.12	0.79	0.51
	Within Groups	6.14	39	0.16		
	Total	6.51	42			
Impact of Sensitization Exercise	Between Groups	2.36	3	0.79	1.08	0.37
	Within Groups	28.25	39	0.72		
	Total	30.60	42			
Participation in Decision Making Regarding Park Management	Between Groups	1.03	3	0.34	1.53	0.22
	Within Groups	8.74	39	0.22		
	Total	9.77	42			

The analysis of variance shows only the resources harvested have a significant relationship with educational background of the people in the communities, with a level of significant value of 0.01as presented in table 2. This implies that we can accept the second hypotheses that there is a significant relationship between the educational background of the people and the resource harvested from the Park while the null hypothesis is rejected.

3.12. Paired Difference for Dekara Community

The result of paired test with 95% confidence interval of difference is presented in table 3. Of the four variables paired, only pair 3, that is ways of tackling the environmental problems and impact of sensitization exercise does not have significant relationship with each other with a significant (2 tailed) value of 0.86 which is higher than the standard value of 0.05.

Table-3. Paired Differences for Dekara

Paired Samples Test

		Paired Differences			95% confidence intervals of the difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	sig(2-tailed)
Pair 1	Occupation - Educational Background	-0.58	1.05	0.16	-0.91	-0.26	-3.62	42	0.001
Pair 2	Environmental Problem that Affects them - Resource Harvested	0.67		0.15	0.38	0.97	4.56	42	0.000
Pair 3	Ways of Tackling the Problems - Impact of Sensitization Exercise	0.02	0.89	0.14	-0.25	0.30	0.17	42	0.864

Pair 1 on the other hand, that is educational background and occupation had a significant (2 tailed) value of 0.001 while the pair 2, that is environmental problems that affects them and the resources harvested have a significant (2 tailed) value of 0.000. This shows that pair 1 has a very strong relationship with a value of 0.001 just as pair 2 also with a value of 0.000 (table 3). This implies that the educational background of the community members affect the kind of occupation they do just as the kind of resources harvested from the park also affects the kind of

environmental problems associated with these communities. This also test the two hypotheses set for the study as the paired sampled test has allowed for the acceptance of the first hypotheses of , there is a strong relationship between the resource harvested and the kind of environmental degradation that affects the communities implying that the null hypotheses can be rejected.

3.13. Paired Sample Test for Luma Community

Table 4 shows the paired sample test carried out that at 95% confidence between occupation and educational background (pair 1), occupation and resource harvested (pair2). In comparing the two pairs, only pair 1 which is occupation and educational background has a strong relationship with one another due to the p- value of 0.00 which is less than α (0.05).

Table-4. Four paired sample test with educational background for Luma

Paired Samples Test									
		Paired Differences							
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2tailed)
Pair 1	Occupation - Educational Background	-0.77	1.202	0.175	-1.12	-0.413	-4.4	46	0.00
Pair 2	Occupation - Resource Harvested	-0.09	1.299	0.19	-0.47	0.296	-0.4	46	0.66
Pair 3	Educational Background - Resource Harvested	0.681	1.024	0.149	0.38	0.981	4.6	46	0.00
Pair 4	Educational Background - Sensitization Carried out	1.17	0.985	0.144	0.88	1.459	8.1	46	0.00

The table also shows pair 3 and pair 4 has strong relationship with each other with a p-value for both variables to be 0.000. That is, educational background of the community affects the kind of resources that is being harvested from the park just as educational background of the respondent also affect the responses on whether sensitization was carried out or not and the impact of sensitization on their livelihood.

Table 5 also show that all variable paired have p- values of less than 0.05 with pair 1 having a p-value of 0.00, pair 2 and 3 having a value of 0.00 and 0.04 respectively. Meaning they all has a strong relationship with each other. That is the kind of resources that is being harvested determines the kind of environmental problems that affect the community implying that the null hypothesis was rejected. Their response on whether sensitization was carried out also determined their opinions on how to tackle the environmental problems they believe is associated with the communities.

Table-5. Three paired samples test for Luma

Paired Samples Test									
		Paired Differences							
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 1	Occupation - Educational Background	-0.77	1.202	0.175	-1.12	-0.413	-4.4	46	0.00
Pair 2	Environmental Problem that Affects them - Resource Harvested	1	0.978	0.143	0.71	1.287	7	46	0.00
Pair 3	Ways of Tackling the Problems - Sensitization Carried out	0.277	0.902	0.132	0.01	0.541	2.1	46	0.04

The socioeconomic human activities have seriously affected the dynamic of vegetation within the Borgu Sector of Kainji Lake National Park. The results of the three different communities surveyed (Wawa, Luma and Dekara) showed that they all have the same views on park degradation and management. The communities agreed that environmental degradation has affected their livelihood negatively but were of the opinion that the only way the environmental problem can be tackled, minimized and solved is by continuous sensitization of the communities on the dangers associated with degrading the park resource, others believed that both sensitization and maintaining the laid down laws would solve the problem better. But the fact still remain that whichever option is taken, maintaining the forest law would still come after the communities must have been fully sensitized and convinced about the laws that may be put in place, just as shown in their responses on the impact of sensitization (see figures 9 and 10).

The 2-tailed test carried out on some of the variables also showed that there is a significant relationship between the educational background of the respondent and occupation of the people just as the occupation also affects the kind of resources that is being harvested from the park. Level of Education also has a relationship with sensitization carried out and ways of tackling the environmental problems. The three communities also disagree that their opinions are usually sought when decision regarding the park management is carried out and this has contributed to the level and amount of resource degradation within and around the park environment.

4. Conclusion

The study confirms evidence of serious human activities around the fringe of the park and this has contributed to the continuous degradation of park resources without the communities understanding the true effects of their actions. The attention of the management of the park should be geared towards involving members of the communities in some decision regarding the park and also the need to sensitize the villagers around the park to avoid and mitigate continuity in such activity at the fringe of the park reserve to save the Park ecosystem from destruction and human interference. The more sensitized the communities are and incorporated into management plans, the more the flora that would be conserved while also preserving the diversity of biological resources and the degradation can only be minimized if the local communities are involved in the management of the Park Resources.

Reference

[1]   P. P. Andersen and P. C. Rajul, "Poverty, food security, and the environment." Available: http://www.ifpri.org/2020/briefs/number29.htm [Accessed 23/4/2012], 1995.

[2]   D. B. Bray, E. Duran, V. H. Romas, J. F. Mas, A. Velazquez, R. McNab, B. D. Barry, and J. Radachowsky, "Tropical deforestation, community forests, and protected areas in the maya forest," *Ecology and Society,* vol. 13, p. 56, 2008.

[3]   E. A. Ellis and L. Porter-Bolland, "Is community-based forest management more effective than protected areas? A comparison of land use/land cover change in two neighboring study areas of the Central Yucatan Peninsula, Mexico," *Forest Ecology and Management,* vol. 256, pp. 1971–1983, 2008.

[4]   L. Naughton-Treves, M. Holland, and K. Brandon, "The role of protected areas in conserving biodiversity and sustaining local livelihoods," *Annu. Rev. Environ. Resource,* vol. 30, pp. 219–252, 2005.

[5]   A. G. Bruner, R. E. Gullison, R. E. Rice, and G. A. B. Da Fonseca, "Effectiveness of parks in protecting tropical biodiversity," *Science,* vol. 291, pp. 125–127, 2001.

[6]   H. Nagendra, "Do parks work? Impact of protected areas on land cover clearing," *Ambio,* vol. 37, pp. 330–337, 2008.

[7]   J. Sayer, "Reconciling conservation and development: Are landscapes the answer?," *Biotropica,* vol. 41, pp. 649–652, 2009.

[8]   S. Clark, K. Bolt, and A. Campbell, "Protected areas: An effective tool to reduce emission from deforestation and forest degradation in developing countries?," *Working Paper, UNEP World Conservation Monitoring Centre. Cambridge, UK,* 2008.