



ISSN NO. 2320-5407

Journal Homepage: -www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI:10.21474/IJAR01/7285
DOI URL: <http://dx.doi.org/10.21474/IJAR01/7285>



INTERNATIONAL JOURNAL OF
ADVANCED RESEARCH (IJAR)
ISSN 2320-5407
Journal homepage: <http://www.journalijar.com>
Journal DOI:10.21474/IJAR01

RESEARCH ARTICLE

THE EFFECTS OF LIVESTOCK GRAZING ON THE SOCIO-ECONOMIC LIVELIHOODS OF THE COMMUNITIES ALONG THE RIPARIAN OF RIVER BENUE, ADAMAWA STATE NIGERIA.

Madube Tumba Kwabe^{1,2}, Nuwe John Bosco², Opara A. Jacinta² and Anne Tumushabe².

1. Federal College of Education Yola Adamawa State, Nigeria.
2. Department of Biological and Environmental Sciences, Kampala International University, Kampala, Uganda.

Manuscript Info

Manuscript History

Received: 14 April 2018
Final Accepted: 16 May 2018
Published: June 2018

Keywords:-

Grazing, Socio-economy, Riparian, Livelihood, Communities.

Abstract

The study analyses the socioeconomic consequences of grazing in the riparian of River Benue in Adamawa State of Nigeria on the livelihood of its communities. It utilizes survey involving 232 respondents selected randomly from the communities along the riparian area. Data was collected by administering questionnaires to the respondents, while descriptive statistics and Pearson's correlation were used in analyzing the data.

The findings revealed a strong negative relationship at ($r = 0.852$, $p < 0.05$), which indicates a negative implication on the sustainability of socio-economic activities among communities situated along River Benue. The study reveals that grazing along the banks of River Benue has affected the socio-economy of the riparian communities which include decrease in habitat for fish production, decrease in wild foods and medicinal plants, decrease in cultural and recreational potentials etc. The study further reveals disparity in the socio-economic effects of grazing on the livelihoods of the riparian in the upper and lower section of the river.

Copy Right, IJAR, 2018.. All rights reserved.

Introduction:-

Grazing abounds across the world with differences in effects due to variation in climate and culturally conceptualization of grazing management strategies by communities. Regardless of the conceptualization of grazing management strategies, grazing still seems to be the most disastrous action in few countries where uncontrolled or unregulated practices exist. Upland vegetation grazing is as old as crop cultivation among most of the communities in Nigeria, especially among communities in the savanna region of North Eastern Nigeria, where an unguided open cattle grazing has caused a serious problem of overgrazing (Adefioye, 2013). However, prior the post-independent era, grazing activities were not common along the riparian due to limited economic, technological adaptation and prevalence of tsetse fly (Adefioye, 2013). Although riparian grazing seems to be a recent development, it seems to be more devastating across Africa countries, especially in Nigeria along the riparian of river Benue.

The effects of livestock grazing on the environment has been identified to include defoliation, trampling and browsing on plants (Zoheir, 2011). This has led to a redistribution of nutrients, redistribution of plant seeds by passive transportation and by other propagules. Livestock management has been and still is a huge source of livelihood for a large percentage of both rural and urban dwellers in Nigeria (Oyinloye, 2011). Like in the pre-

Corresponding Author:- Madube Tumba Kwabe.

Address:-Federal College of Education Yola Adamawa State, Nigeria.

settlement time, grazing is mostly traditionally managed in Nigeria with variation in the practices limited to communities or regions.

For a long time, there has been conflict between livestock grazing and sustainability of the riparian vegetation. There is need for sustainability of the riparian environment because of its critical support to the biodiversity and the society. Thus, this calls for sustainable and proper management of livestock grazing in every society. Despite improvements in economic and technology in Nigeria the traditional methods of grazing are still in use in the north east of Nigeria among communities and the nomadic pastoralists. This has become a serious concern to the communities of the Savanna region of Nigeria, where livestock grazing has become a challenge (Adefioye, 2013; Blench, 2010).

The riparian vegetation in Nigeria was well developed with stable vegetation heterogeneity before the improvement in Nigeria economy coupled with population growth (Blench, 1999; Onoaha, 2008). Also, prior to post-independence, the profound influence of grazing was associated with terrestrial vegetation (Aremu & Onadeko, 2010) with the communities having their own traditional ways of managing resources (Meagher and Yunusa, 2012). Consequently, every community in Nigeria has its own customary policies used in safe guarding land and other natural resources (Meagher & Yunusa, 2012). Thus, the riparian vegetation conditions were then in good conditions and stable with efficient ecological services, which were relatively free from human activities. Also, the vegetation community was wide matured with standard succession level which provided to the community's efficient ranges of non-farming social and economic opportunities (Olaotse, *et al.*, 2013).

At the post-independent Nigeria, grazing drifted into the riparian areas due to the exhausted conditions of the terrestrial vegetation, and the demands for animal protein (Adefioye, 2013). Subsequently, uncontrolled grazing became a serious problem in the riparian thereby affecting the farming and non-farming opportunities along the riparian on which most of the community's livelihood depends (Meagher and Yunusa, 2012). Thereby, studies carried out on livestock grazing (Capper, 2013, Scholtz.*et al.*, 2013, IFAD, 2013.) showed that there has been a major environmental impact of livestock on plant community, land, water and biodiversity.

According to Seré (2012), livestock systems occupy 45 percent of the earth's surface. In South Africa 70 percent of the agricultural is utilized by livestock (Meissner. *et al.*, 2013) while 75 percent of land in Namibia is used for extensive livestock ranching (Lange. *et al.*, 2011) and cattle production alone occupies 75 million hectares in Northern Australia (Macleod. *et al.*, 2014). However, livestock production is generally assumed to be adversely affected by land degradation, which eventually reflects on the economic performance (Macleod. *et al.*, 2014).

Poor management of livestock grazing is evident of overgrazing resulting from overstocking beyond the lands' carrying capacities, which exposes pastureland and riparian loss of vegetation. Macleod *et al.*, (2014) examined the productivity of livestock under different grazing regimes; and they found that changes in plants and land conditions had both positive and negative effects on livestock production. The link between vegetation condition, livestock grazing, and economic outcomes was determined using a combination of experimental data and simulating models. It was established that as plants and land conditions deteriorate, reduction in livestock numbers was warranted (Meissner. *et al.*, 2014). Extreme cases of poor floristic and land conditions with high livestock numbers resulted in poor livestock performance, with poor market value and hence low profitability.

However, economic activities such as fishing, farming, weaving, hunting, transportation (navigation), among others are the common effects of overgrazing along the riparian (Adefioye, 2013). The communities living along river Benue are mixed-up with a reasonable number of Nomadic and Agro-pastoralists who keep large herds of cattle and some few goats and sheep, which has serious negative implications on the non-farm activities' (Meagher and Yunusa, 2012).

Grazing as one of the most dominant economic activities has resulted in degradation of vegetation, land, and water over the years, which impacted negatively, the non-farming and farming economic and social opportunities along the riparian (Adefioye, 2013 and Blench, 2010).

Furthermore, due to the nomadic lifestyle and struggle for control of riparian resources in Nigeria, there have been incessant conflicts around the riparian area that is already becoming a norm due to limited grazing areas. Lives, property, and animals have been lost in these conflicts over the years, and little has been done by the local, State and

Federal authorities (Linus. *et al.*, 2014). This study assesses the effects of unregulated grazing activities on the socio-economic livelihoods of people living along the riparian of River Benue in Adamawa state, Nigeria.

Materials and Methods:-

The study was conducted in the riparian area along the River Benue from Lamurde and the areas to the River Gongola tributaries, extending up to Fufore in the upstream in Adamawa State that lies on latitudes $7^{\circ}28'$ - $10^{\circ}56'$ north and Longitude $11^{\circ}30'$ - $13^{\circ}75'$ east. A cross-sectional descriptive survey was used and it adopted quantitative and qualitative approaches. Simple Random sampling and stratified samplings were used in identifying the categories of sample population along the riparian. Study sample size was derived from five selected categories based on the nature and structure of the communities. It comprised of (1), River basin development authority (65), (2), Adamawa state environmental management agency (55), (3) Community based organizations (36), (4), Non-governmental Organisations (12), and (5) Local community members (382). Thus; a representative sample of 232 respondents from the target population of 550 was attained. The study administered questionnaires to the respondents to achieve the objectives of the research which is to determine the social-economic effects of grazing along the riparian of River Benue in Adamawa state of Nigeria on its communities. To validate the effect of grazing on some of the plants of economic importance, two transects of 1000m with alternate plots of 50m*50m in the grazed and ungrazed land were made. Plants were identified, counted in each plot and a total number were recorded.

Data Analysis:-

Responses were presented using descriptive statistics such as frequencies, percentages, tables, and charts. A Pearson's correlation was used to determine the relationship between the unregulated grazing activities and the socio-economic livelihoods of people living along riparian of River Benue in Adamawa State of Nigeria. To assess the distribution of the plants in grazed and ungrazed land, total means of the particular plants of economic importance along the transects were determined (Table 1) to show the distribution along the riparian.

Results:-

The figure 1 below expresses the effects of grazing on the social functions of the communities along the riparian of the River Benue..

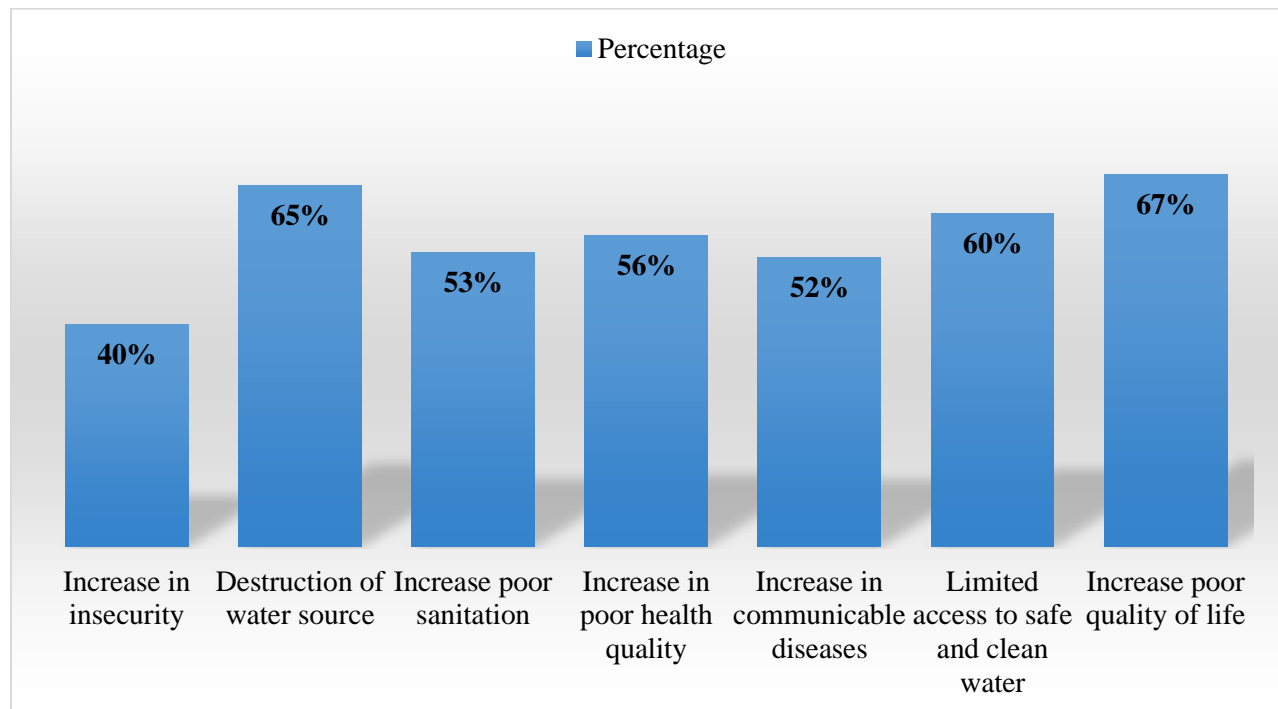


Figure 1:-The Social effects of grazing on the community along the riparian

A line graph was used to demonstrate the variation in the social consequences of grazing amidst the communities (Figure 2), and it showed the lower section of the riparian having the more severe weight of the effects compared to the upper section. Demsa is mostly affected with 17.8 percent of asperity of all the challenges, followed by Lamurde area at 15.8 percent crabbiness and Numan areas with 15 percent tartness to the prevalence respectively. In the upper section, Yola South is most affected by 15 percent sourness of the challenges, Fufore 13.4 percent astringency of the effect on community and Girei with 12.7 percent experiences of challenges bitterness to the actuality of effects and Yola North with 9.9 percent less experiences of challenges severity.

Social effects of grazing amidst the communities

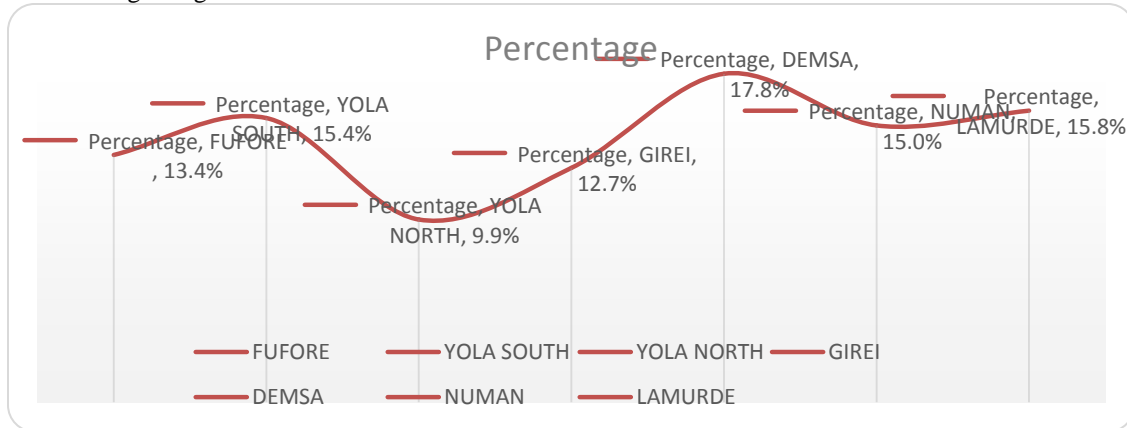


Figure 2:-Percentage differences in social effects of grazing amidst the communities

The economic effects of grazing on community livelihood along the riparian of River Benue

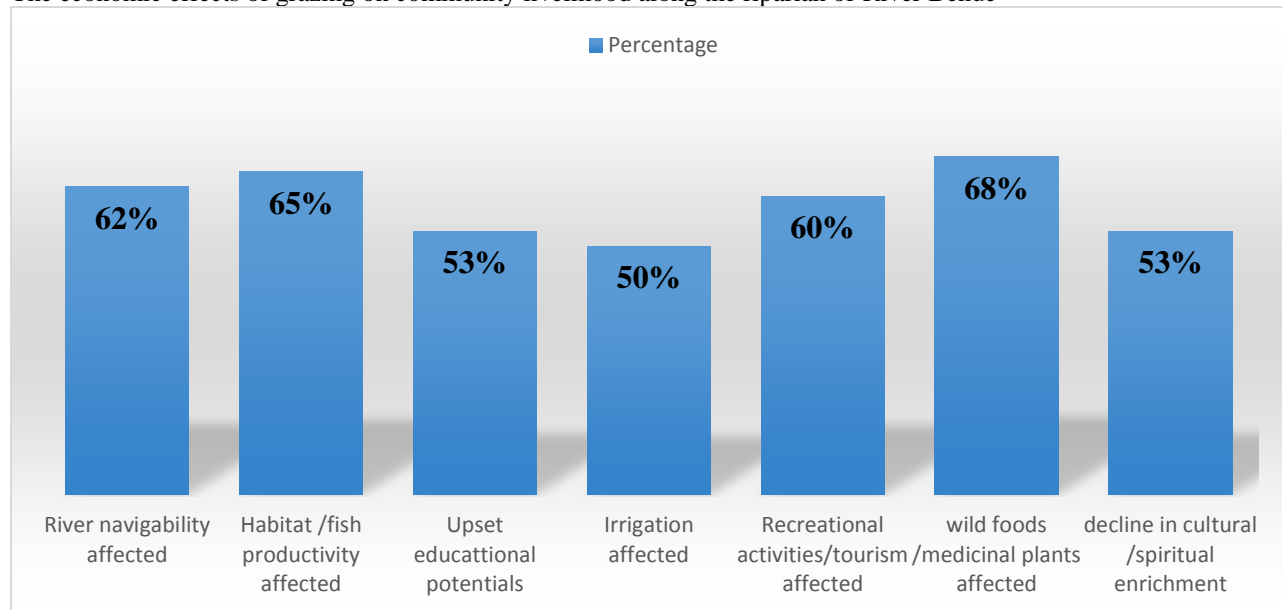


Figure 3:-Economic effects of grazing on communities along the riparian area

Figure 3 above indicates that grazing has an economic backlash on the communities along the riparian area. Most common and severe of the effects include; decrease in wild foods (e.g., *Hack berry*, *Anacardium occidentale*) and medicinal plants (68%), destruction of habitat and Fishery productivity (65%) and decrease in the navigability of riparian water for transportation and other functions (62%). Other effects such as disruption of recreational activities, the decline in irrigation destruction of spiritual and cultural enrichment of the riparian vegetation were also mentioned.

Differences in the economic effects of grazing amidst the communities along the riparian

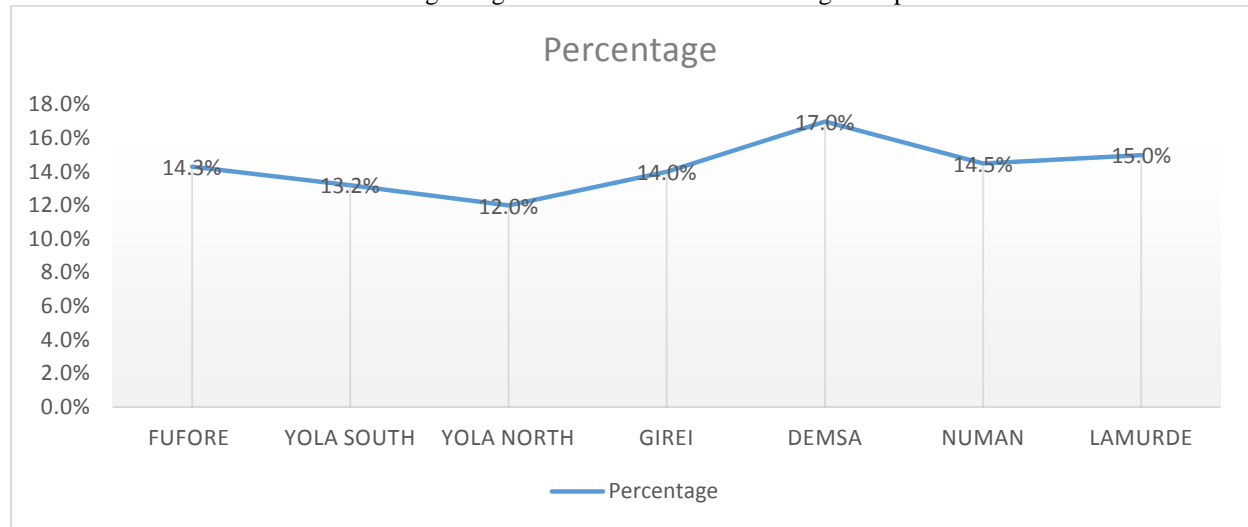


Figure 4:-Percentage differences in the economic effects of grazing amidst the communities

Figure 4 findings indicate that there is a great difference in the economic consequences of grazing in the communities along river Benue. Communities in the lower section of the riparian are more affected than those in the upper section. Demsa is most affected with 17 percent astringency; followed by Lamurde 15 percent asperity and Numan 14.5 percent bitter experience. In the upper section of the riparian, Girei is most affected with 14 percent severity, while Yola North 12 percent sourness, Yola South 13.2 percent asperity and Fufore within the range of 14.3 percent of the challenges astringency respectively.

A relationship between grazing and socio-economic livelihoods of the communities was determined using Pearson Correlation ($r=0.852^*$, $p<0.05$) (Table 2) and it showed that grazing has a negative implication on the sustainability of socio-economic activities among the communities along riparian of river Benue. This indicates that, as grazing increases in the riparian, there is more deterioration of the socio-economic activities and livelihoods of the communities along the riparian area.

Table 2:-Pearson correlation analysis of socio-economic effects of grazing on the communities’ livelihoods

		Social economic effects of grazing	People's livelihood	Overall
Social economic effects of grazing	Pearson Correlation	1	.852*	
	Sig. (2-tailed)		.000	
	N	230	230	
Deterioration in People's livelihood	Pearson Correlation	.852*	1	
	Sig. (2-tailed)	.000		
	N	230	230	

Discussion:-

The study found that the social effects commonly experienced by the respondents included; the prevalence of insecurity increased risks of contracting communicable diseases and destruction of water source for drinking. Others effects such as the reduced potential for recreational, fishing, swimming and boating in the area as found in Linus, *et al.*, 2014 were also mentioned. This has contributed to declining in eco-tourism activities, destruction of medicinal plants and the decline in navigability of the river which has affected transport business and practices of herbal medicine.

Intensive grazing in riparian is not only on the plant community resources, but it creates conflicts between the communities and herdsmen which generate huge social implications (Meagher and Yunusa, 2012; Linus. *et al.*, 2014). The effect is more disastrous in Demsa which has the highest percentage, followed by Numan and Lamurde

respectively. Categorically, settlements are rural in these communities with most of their social livelihood activities relying heavily on the riparian resources along the river.

The most common economic effects on the livelihood of the communities included among others; destruction of fish habitat and a decrease in fish productivity and wild life which is another source of income and protein for the community. Using Pearson correlation, the results indicated a high effect on the livelihoods ($r=0.852$) at ($\alpha=0.05$) hence need to check the situation if poverty levels are to reduce.

In addition, livestock grazing affects the riparian environment by changing and reducing vegetation or by the actual elimination of riparian areas by channel aggradation or lowering of the water table through plant degradation (Macleod. *et al.*, 2014). This is experienced in Benue as vegetation degradation has occurred immensely and contributed to declining in fish catch and reduced food supply. Resultant increases in stream temperature; decline in wild fruits along the stream, a decrease of debris cover through plants degradation has also been experienced. This is in agreement with McIntosh. *et al.*, (2013) and Armour. *et al.*, (2011), that found out that stream vegetation degradation has long been recognized as a major watershed-fisheries problem and general ecological services. The elimination of stream bank vegetation due to acute livestock grazing is a serious negative development to all vegetative dependent riparian components. In the grazed site of the riparian, stream vegetation was degraded because livestock congregates along streams for shade, succulent riparian vegetation, and drinking water.

Some economic plant species that have been affected along the riparian include; *hackberry* and *cashew apple*, produced naturally by cashew tree (*Anacardium occidentale*), Nigerian leafy vegetables such as *Wild Lettuce* locally known as (Efo Yarin –Yoruba) and *Crassocephalum rubens* locally known as the (Yoruban bologi Ebolo), *Crassocephalum rubens* (the Yoruban bologi Ebolo), *Crassocephalum crepidiodes*, *Vernonia amygdalina*, . These have reduced both in diversity and distribution in the grazed land as shown in table 1 below. This has economically affected the livelihood of the communities as they were harvested and sold for food, medicine, ornamental purpose and therefore income, medicinal and the nutritional value has been compromised.

Table 1:-Plants distribution of the most dominant species in the study sites

Species Name	Life form	Frequency in Grazed Riparian	Frequencies in ungrazed
Virtex Doliana	Tree	10	40
Bataytics sperman	Tree	11	35
Eucalyptus spp	Tree	20	46
Ziziplus spinadinsti	Tree	9	45
Balanites aegyptiaca	Tree	10	30
Acacia ivarensis	Tree	10	26
Acacia senegalensis	Tree	16	35
Termarindus indica	Tree	13	27
Tricalysia negerica	Shrub	10	30
Tarupin	Shrub	16	42
Tricalysia wrahaniana	Shrub	12	40
Tricalysia abanensus	Shrub	10	26
Sabicea langinosa	Shrub	16	35
Rytizynia aryantea	Shrub	21	48
Allophysus nigericus	Shrub	30	56
Prunus Africana	Shrub	31	50
Sansevera liberica	Shrub	14	28
Acacia nilotica	Shrub	10	35
Mimosa pudica	Shrub	10	29
Carculinta moschola	Shrub	7	28
Solanum nigeum	Shrub	9	30
Lecnurus sibiri	Shrub	11	52
Annoria spp	Shrub	9	26
Grater sahel	Shrub	25	54
Asptenium comutumaistan	Shrub	21	32

Indigofera lotisepola	Shrub	23	49
Alectra virgata herna	Shrub	19	28
Chlorophytum dalzieri	Grass	11	30
Aeschynarnene neglecta	Grass	13	33
Hepper	Grass	12	34
Labiates spp	Grass	20	44
Tridax combretum	Grass	37	60
Pacunium spp	Grass	27	62
Sorghum Vulgare	Grass	30	66
Panicum maximum	Grass	9	28
Floating grass	Grass	11	40
Tuft Damaliligel	Grass	17	29
Strychirus nuxvorica	Grass	20	46
Gynandopsis synandra	Grass	24	54
Nymphoea lotus	Grass	30	56
Pristia stratiotes	Grass	9	27
Commelina Beughalensis	Grass	40	64
Ipomoea spp	Grass	15	37
Hyparrhenia spp	Grass	30	54
Anogneissus spp	Grass	31	50
Ipomea aquatic	Grass	13	46
Maginfera indica	Grass	20	57
Walitenbergiara mosissima	Grass	18	37
Thulin sibsppra mosissima	Grass	13	54
Batulia termulcaulis	Grass	31	50
Helich Comer canines	Grass	25	46
Stiches pseudohamritusa	Grass	16	45
Nymphaelotus haolatus	Grass	14	40
Satibia molesta	Grass	16	28
Hibiscus sineoculeotus	Grass	10	24
Indigefera hutchinsoniana	Herb	13	26
Raphia mambillensis	Shrub	25	46
Azolia African	Grass	27	46
Commelina benghalensis	Forbs	16	38
Cyperus spp	Forbs	14	42
Leersia hexandra	Grass	13	38
Water hyacinuth	Grass	10	33
Raphia sudanica	Tree	23	56
Phonixdactylifera	Tree	11	33
Xeromphis nilotica	Shrub	22	46
Khaya senegalensis	Tree	9	41
Adansonia digitata	Tree	11	32
Azadiracta indica	Tree	20	46
Asperula canferta	Forbs	16	35
Boerhavia dominii	Forbs	15	36
Salsola tragus	Shrub	13	3
HackBerry	Shrub	13	38
Anacardium occidentale	Tree	9	30
Leonurus sibiricus	Shrub	11	27
Lactuca salinga	Shrub	12	32
Parkia spp	Tree	7	40
Hevea biasilliensis	Tree	9	41
Crassocephalum rubens	Shrub	12	28

Vernonia amygdaline	Tree	14	38
Moringa oleifera	Tree	20	45
Celtis Africana	Grass	15	46
Themeda triandra	Grass	10	43
Cynodon dactylon	Grass	9	50
Prunus Africa	Grass	9	50
Larissa spinarum	Shrub	8	32
Angylocorlyx oligophyllus	Grass	20	47
Aristida mutabilis	Grass	16	49
Chlorophytum dalziere	Grass	20	30
Rucinus cominunis	Grass	15	31
Imperata cylinderic	Grass	24	32
Chytrantasmusmacrobotrys	Grass	15	29
Denhous cilliaris	Grass	16	3
Euphorbiaceae	Tree	18	5
Mumosaceae	Tree	20	10
Sterculiaceae	Tree	03	54
Carissa spinarum	Grass	01	50
1.Celtis Africana	Grass	04	51
Senecio abyssinia	Grass	06	52
		1534	3763

Conclusion:-

Livestock grazing has affected the riparian environment immensely in different ways and this has been attributed to lack of adoptability and utilization of modern grazing management strategies in Adamawa State. The sustainability of the riparian areas is a serious environmental concern due to the presence of the local open and unregulated traditional grazing method. Improper grazing along the riparian has damaged the riparian vegetation which inversely has damaged other vital components of the system. The degraded plant community has reduced the potential for recreational, fishing, business and nutritional values in the area and also created conflicts among herdsmen and the communities. Therefore, there is need to empower public in understanding that, having a healthy riparian ecology is a strong mitigation measure against climate change impingement. Government at Federal, State, Community leaders and Community Base Organisations should revegetate the riparian with reasonable plant species of riparian character to help prevent or minimize the negative effects of livestock grazing in riparian as well as provide reasonable land for the establishment of ranches to control unregulated open grazing.

References:-

1. Adefioye S.A. (2013). Analysis of land Use/Land cover pattern along the River Benue channel in Adamawa State, Nigeria: Academic Journal of interdisciplinary studies, 2(5) MSCER-CEMAS.
2. Armour, C.L., Duff, D.A., & Elmore, W. (2011). The Effect of Livestock Grazing on Riparian and Stream Ecosystems. *Journal of Fisheries*, 16(1); 7-11.
3. Aremu, O.T., Onadeko, S.A., & Inah, E.I. (2010). Impact of Grazing on Forage Quantity and Quality for Ungulates of Kainji Lake National Park Nigeria. *Journal of Applied Sciences*, (1)-1800-1804. Blench, R. (2010), The transformation of conflicts between the Pastoralists and cultivators in Nigeria DFID.
4. Blench, R. (2010), The transformation of conflicts between the Pastoralists and cultivators in Nigeria DFID.
5. Bradford, M., & Ernest, S. (2013). Current usage of symbiosis and associated terminology. *International Journal of Biology*, 5(1): 1-32. doi: 10.5539/ijb.v5n1p32.
6. Capper, J.L. (2013). Should we reject animal source foods to save the planet? A review of the sustainability of global livestock production. *South African Journal of Animal Science*, 43(3), 233-246.
7. Charles, K. (2010). A Negotiated Framework for Rehabilitation of Riparian Zones in Nairobi City: Available from <http://isocarpnet/data/case-studies/1780.Pdf>.
8. Dossely, M., Vidon, P., Garwick, N.P., Allen, G.J., Dural, T.P., & Lawrence, R. (2010). The role of Riparian Vegetation in protecting and improving chemical water quality in stream, *Journal of America water Resources Association*, 40, 260.

9. FAO(2009).The state of food and Agricultural Livestock in the Balance: Food and Agricultural organization of united Nation, Publication.
10. Gunderson, D.R.(1968).Flood plain use related to stream morphology and fish populations. *J.l.d.J. Manage.*32(2),507-514.
11. Herrero, M., Grace, D., Nsuki, J., Johnson, N., Enahoro, D., Silvestri, S. and Rufino, M.C. (2013). The role of livestock in developing countries. *International Journal of Animal Bioscience*, 7:3-18.
12. HoganC.(2013)BenueRiver,Retrievedon29th,December,2016;from <http://www.eoearth.org/view/article/228342>.
13. International Fund for Agricultural Development (IFAD) (2013). *Smallholders, food security, and the environment*, IFAD publishers, Rome.
14. Jansen,A.,&Robertson,A.I.(2012).Grazing, ecological condition and biodiversity in riparian river redgum forests in south-eastern Australia ‘, *Proceedings of the Royal SocietyofVictoria*,117(1),85–95.
15. Lange, G., Barnes, J. and Motinga, D. (2011). Cattle numbers, biomass, production and land degradation in the commercial farming sector of Namibia. *Development Solutions Africa*, 15(4), 555.
16. Linus B. G., Amos, S. O., Michael, E. T., & Ensenga, G.M. (2014). Fishing Communities and Fishing as livelihoods in Adamawa state. Direct Research. *Journal of agriculture and food sciences*, 2 (11); 154 -204.
17. Macleod, N.D., Ash, A.J., & McIvor, J.G. (2014). An economic assessment of the impact of grazing land condition on livestock performance in tropical woodlands. *Rangel Journal*, 26(1), 49-71.
18. Meagher,F.,&Yunusa,K.(2012).Ifthe drumming change, the dance also changes deagrarianisaion and rural non-farm employment in the Nigerian Savanna African studies center, Leiden.
19. Meissner, H., Scholtz, M., & Palmer, A. (2013). Sustainability of the South African livestock sector towards 2050. Part I: worth and impact of the sector. *South African Journal of Animal Science*, 43(3), 282-297.
20. Nyariki, D.M., Mwang’ombe, A.W., & Thompson, D.M. (2009). Land-use change and livestock production challenges in an integrated system: The Masai-Mara ecosystem, Kenya. *Journal of Human Ecology*, 26(3), 163-173.
21. Olaotswe, E.K., Witness ,M.,& Barbra A.H.(2013).Grazing management system and their effects on savanna eco system dynamics: *A Review journal of ecology and the natural Environmental*,5(16);3-64.
22. Onouha F.C.(2008).Saving Africa Shrinking lakes through inter- basin water transfer reflections on the proposal Lake Chad replenishment project. *Nigeria journal of international Affairs*,34(2);34-45.
23. OyinloyeM.,&Kufoniyi,A.(2011).Analysisoflanduse,landcoverandUrbanExpansion inAkure,Nigeria.*JournalofinnovativeResearchinEngineeringandscience*,2(4).
24. Sarr, D., Knapp, R.A., Owens, J., Balsler, T., & Dudley, T. (2009). Ecosystem recovery from livestock grazing in the southern Sierra Nevada. Aldo Leopold Wilderness. Res. Insti., Missoula, MT.
25. Scholtz, M.M., Van Ryssen, J.B.J., Meissner, H.H., & Laker, M.C. (2013). A South African perspective on livestock production in relation to greenhouse gases and water usage. *South African Journal of Animal Science*, 43(3), 1-9.
26. Zhou,S.(2012).Effectsofwildernesstraininggiantpandas?Grazingandartificial harvestingonclonepopulationbiomassofumbrellabamboo.*ChineseJournalof AppliedandEnvironmentalBiology*.18(1):1-18.
27. Zoheir,A.(2011).Livestockgrazingandriparianareas:ALiteratureReview.Grazingand PastureTechnologyProgram.