E3 Journal of Environmental Research and Management Vol. 3(7). pp. 0129-0131, August, 2012
Available online http://www.e3journals.org
ISSN 2141-7466 © E3 Journals 2012

Full Length Research Paper

Land use and environmental sustainability in the Zaha Mafa catchment basin in Gwoza local government area, Borno state, Nigeria

Allumma, M.I, And Tada, M.J

Dept of pre-ND Studies, Ramat Polytechnic, PMB 1070, Maiduguri, Borno state. Nigeria.

Accepted 14 August, 2012

Studies conducted between 1993-1997 have determined the environmental sustainability and land use of Zaha Mafa in Gwoza local government area, Borno State. The study revealed that the Zaha Mafa catchments basin has a potential irrigable land of 22,500 hectares, with, only 604 hectares intensively utilized by various economic groups for crop cultivation and grazing by February 2006, when the area was inspected last. This write-up stresses the need for effective research on land use through necessary guidelines and inputs. The catchments basin is a unique geomorphic feature with peculiar area attributes and land forms that constitute integral part of human environment and occupy an important place in the development process. The development strategies of Borno State Agricultural development programmers as contained in the aim and objectives of the state policy have not been extended to this area The land use in the catchment basin is largely traditional, less capital and government incentives which does not encourage sustainable resource and proper environmental use. Data used were obtained from field survey and maps. Interview schedules were carried out in 10 village units selected purposively along the Zaha Mafa basin. A sample of 600 respondents was interviewed from the sampled villages and 45 groups were interviewed orally on socio-economic activities and environmental issues. Data obtained were analyzed using simple descriptive statistics and table. It is recommended that the development of resources in this basin should be conceived, planned and executed accordingly. This will go a long way in maintaining and sustaining it to an indefinite future, taking into cognizance, renewable and non-renewable resources.

Key words: Land use, Zaha-Mafa, Sustainability, Marshes, Catchment basin

INTRODUCTION

Socio-economic activities are some of man's human activities carried out in an environment in man's attempt to survive on the earth's surface through his productive capabilities. This productive process however relies heavily on environmental resource base. In an attempt to satisfy man's basic needs on the available environmental resources humans are likely to cause physical changes and alterations on the environment which may be dramatic so that the resultant consequences are difficult to identify let alone remedy. Ayuba, (2004), observed that human activities already have pushed many plants and animals species (biodiversity) into extinction in many places. He said, no one knows the exert number, but it is widely agreed that the rate of extinction will accelerate as population growth and development put more pressure on the prime habitats of other species.

In many developing countries, like Nigeria, there is heavy reliance on the environment's resource base Odihi, (1991). During the last four decades, the country has witnessed tremendous population growth due to improvement in health facilities (PRB, 2000). To meet the needs of the growing population there have been emphasis on short term gains and poor awareness of the structure and functioning of the ecosystem, particularly with regard to Fadama resources exploitation in the Sudano-sahelian zone where the land is generally fragile (Mortimore, 1991) thus putting the environment at risk.

*Corresponding authors: E-mail: allumma20@yahoo.com

However, in the recent years, there has registered a growing awareness of the need for better understanding the effects of man's activities on all facets of the global environment. This is reflected in a increasing concern for the planning and exploitation of global resources which, as Ayuba (2005) stressed, must not only stop at simply identifying and discussing environmental problems, but must also think critically about them as humans races towards an uncertain future.

Ayuba, (2004), views that, managing the environment in Northern Nigerian for example, requires integrating the short-term and long-term objectives by linking economic/budget of planning with the ecological aspect of natural systems. This aims at how best to use, harness and maintain environmental integrity in our ecosystems. Kola- wole, (1991) and Scones, (1991) the Zaha mafa catchments basin has potential irrigable fadama land of 22, 500 hectares FUA 1997 (Table I), these development strategies as contained in the aim and objectives in the Nations policy strategies for Fadama development has not been efficiently and effectively extended to the Zaha Mafa catchment as confirmed by FUA, (1997) in their report.

MATERIALS AND METHODS

Study area

Zaha Mafa catchment is located east of Gwoza local government, in the south eastern part of Borno state, it is located between $10^{o}45^{'}$ N and $11^{o}12'$N and longitude $13^{o}55'$E. The basin catchment covers an estimated surface area of 961 km^2 astride the Nigeria and Cameroon boundary. The Zaha Mafa river takes its source from the Cameroon and Manadara mountains east of Madagali hills draining Northwards into the Lake Chad via the Elbeid system.

The drainage systems of the Mandara mountains generally can be described as dendritic type. The rivers take their sources from the highlands and flow to the pediments. At the upper course, the rivers have narrow bottoms and steep gradients that form gorges (Ibrahim,1989). The middle course or pediments of the river valleys are broader and fairly flat floored, with their gradients gentle. Further away from the pediments, the river valleys become wider and shallower where flooding is also common during the rainy season (Ibrahim 1989).

The climate is the tropical savanna type with well marked wet and dry seasons. Rainfall is between 750-1000 mm per annum, received in about 180 rainy days in the months of May – October (Udo, 1970), temperature is moderate (270^{o}c 32^{0}c), due to the effect of the highlands. Relative humidity is over 85% in the rainy season but falls below 10% in the dry season. Potential evapo–transpiration is estimated at about 1880 mm (T.C international & Mai Associates, 1985).

The soils consist of raw mineral soils that are generally shallow and weakly developed. Down the catena, the soils are grayish and contain fragment of partially weathered rock, coarse grits and gravels and some areas covered with un-weathered rocks boulders and bed rocks on hilltops, slopes and pediments (Bawden et al, 1972). Alluvial soils are found on flood plains especially along river bank, where they are generally structureless and over – laying un-weathered basement complex rocks. At depth of about 7-8 meters, the soils overlay the coarse sand at Arboko and the crystalline bed rock at Chinene (Wardrop engineering,1993).

The vegetation types found are the wood land or scattered trees interspersed with Montane grassland found on uncultivated higher slopes and along river banks, and the savanna shrubs which are relics of the natural vegetation that has not been cleared over the years by man (Ibrahim, 1989).

Field investigation was carried out in January, 2003 in 10 village units along the catchment basin. Interviews schedules and oral interviews were conducted on 600 respondents. 10% of each village population was used as target population. Structured questionnaire was used for interviews schedules and oral interviews and were conducted at the upper, middle and lower parts of the basin catchment on socio economic activities and environmental issues. Both male and female from age 25 years and above were interviewed together. The distribution of sampled respondents was based on peoples availability for interview, 10-15 people formed a group for the oral interviewed and 45 groups were interviewed. General consensus views or ideas were adopted as their perception on various environmental issues.

RESULTS

Field observations reveals that the morphology of the basin is linear, narrow and elongated stretching over three distinct relief units. At about 1351 meters above sea level, the river flows over a fairly undulating plateau surface before dropping over a series of stepped scarps that form rapids, cataracts and water–falls located on a 600 meter scarp face. On the pediments (around Koghum and Barawa), there is a drop in stream channel gradient, thus resulting in deposition of materials on stream banks where springs and seepage points are common features.

Headword erosion of stream channels, meandering of streams effecting lateral and vertical erosion results in the creation of flood plains and other related features that form the basis for intensive irrigation or cultivation of food and cash crops in both dry and rainy seasons. Here the water table is 0-5 meters. At the downstream sector (at

Table I: Size of Farmlands

Size (Hectares)	Respondents	Percentage (%)
0.1 – 2.0	278	46.4
2.4 – 4.0	89	14.8
44.4 – 6.0	16	3.0
64 – 8.0	6	1.8
8.4 – 12 .0	6	1.0
Non participants	198	33
Total	600	100

Table II: Source of irrigation water

Responses	No. of responses	Percentages
Surface water spring, ponds, lake marshes etc	93	15.5
Underground water	299	49.8
Non-participants	208	34.7
Total	600	100

about 360 meters), further reduction in velocity leads to the deposition of fine materials that forms more alluvial plains, mud flats, flood plains, ponds etc around Jubrilli/Ajagajaga, Zambga, Kwadale Ashigashiya, Kirawa, Njiminini and Simdawale. These are difficult to plough using hoe, due to the sticky nature of the soils.

Table I shows that 46.4% of the respondent have between 0.1 – 2.0 hectares of farmland, 14.8% have 2.4 – 4.0 hectares, 30% have 4.4 – 6.0 hectares and only 10% have 8.4 – 12.0 hectares. This confirmed that the areas used for irrigation are largely small.

Table II shows that half of the farmers use ground water to irrigate their farmlands; and only 15.5% use surface water from spring, pond and marshes for irrigation.

DISCUSSION

The Zaha Mafa catchment basin is a fragmentary refugee environment of different ethnic groups whose cultural habits and economic way of life is fairly similar (Udo, 1970). Like most rural settlements in Nigeria the people inhabiting the area are agrarians. The land use in this area is dominated by farming and grazing; The largest parts of the land are located on highlands, pediments and plains that are used mainly for rainfed farming and grazing, crops cultivated on these landforms are low value crops (Millet, Sorghum, maize, legumes etc).

Table I shows the level of land usage for the purpose of irrigation to be relatively low, which is largely due to lack of government interference and lack of encouragement and financial assistance. The people are using simple traditional available system to raise water from the streams springs, ponds,rivers or lakes hand dug wells and dugout pits to irrigate their farmlands to cultivate both food and cash crops during dry and rainy season (Table II), these are however restricted to areas close to valley bottoms when surface water completely dries up during the dry season, cultivation close to valley bottoms often results into conflicts between crop cultivators and sedentary pastoralist who destroy field crops on farm lands en-route as they move their flocks to watering points. This leads to destruction of crops and consequently low production.

In the downstream sector, flooding of the marshy areas in the rainy season is one of the major constraints to the use for the mashes for rain fed cultivation of crops. Rice may be the only crop that can be planted in these areas which are subject to flooding, and except the right variety of rice planted at the right time, even this crop can be lost to floods. The flood water dries up almost as rapidly as it builds up at the inception of rainy season, and the water is driven to the semi-permanent water table (5-15 meters deep) making dry season farming impossible.

Studies carried out by T.C. international & Mai Associates (1985) and Wardrop Engineering (1993), suggest that the only alternative to overcome difficulty posed by environmental factors to increase agricultural production in the Zaha Mafa catchment, is to develop and harness the landforms of the Fadama areas to increase food production using sustainable means without the depreciating the natural capital stock. The dream of these organizations has not been realized. Cattles are reared extensively on the downstream sector by sedentary pastoralist who resides in Gakara near valley. Transhumant pastoralist who come from unknown origin or destination used to invade the Zaha Mafa catchment

basin occasionally especially during drought stricken years. They tend to be violent and fatal, threatening the peace and security of the people in the area. These situations have led to competition for resource use in the basin, thereby putting the environment at risk.

Already, the catchment basin is undergoing some degree of degradation as shown by biophysical indicators like the lowing of water table, the disappearance of some plant species like Mbamba and decreasing soil fertility, Ibrahim (1989), Policy interventions are needed to balance the needs of the various economic group in the shared use and maintenance of the ecological system.

RECOMMENDATIONS

Surface water can be conserved in the downstream sector by Brunding and impounding water for use in the dry season as was done in Kano region before dam constructions. The current drive by government towards sustainable use of Fadama for comprehensive sustainability of development programmes should be extended to the Zaha Mafa catchment basin through a appropriate and acceptable technology that are relevant for harnessing its potentials employing modern water management systems.

It is also recommended that, further studies should be carried out on the specific land forms at each terrain level or unit to ascertain the condition of the area now and compare with past recorded data's to see how best the resources can be properly use and conserve for sustainable development.

.

REFERENCES.

Awogbade MO (1992). Management and Sustainable use of Range Land. The case of Nigeria Paper presented at workshop on new

Ayuba HK (2004). Environmental problems and issues of concerns in Northern Nigeria. A paper presented at the Economic/budget literacy workshop in jewel suite, Gombe State on the 3rd and 5th October, 2004. organized by ANPEZ centre for environment and Development, an NGO based in PortHarcourt, Rivers State

Ayuba K (2005): Environmental Science: An introductory Text, Apani publications. A division of Apani Business and Research consult No. 27 Baga Ruwa, costain Kaduna.

Bawden MG, Carrol, DM, Tuley P (1972). The Land Resources of North east Nigeria, vol. 3. the land system, land resources study No. 9 (Land resources Division TGoi-worth Tower Suiton survey, England.

Directions in Africa Range Management Policy Matose, Bulawayo Zimbabwe 13 – 17 January, 1992.

Fadama, user's Association (FUA) 1997 Monitoring Report, BOSAPD

Ibrahim M (1989). Geomorphology of the Mandara Mountains North of Gwoza Town, Borno State. Unpublished B.Sc. Dissertation, Department of Geography, University of Maiduguri.

Kolawale A (1991). Economics and Management of the Fadama in Northern Nigeria part 3a Wetlands in dry lands the Agroecology of Savanna systems in Africa. Dry lands programmes II Ed London.

Odihi JO (1993). Fadama Resources Sustainability: Lessons from the Jere Rice Bowl experience in Borno State". A paper presented at the National Workshop on utilization and sustainability in Northern Nigeria. Dujima Hotel Maidugri, 15 – 17 February 1993.

Population reference Bureau (PRB) 1987. Human needs and nature's balance: Population, resources and the environment, Washington DC p.2.

Scoones I (1991). Overview Ecological, economic and social issues, Part I, wetlands in Dry Lands programme IIED, London.

T.C. International & Mai Associates (1985): Feasibility study and preliminary Design of Fadama Land Development Schemes in Borno State. An Appraisal Report to Chad Basin and Rural Development Authority, Nigeria. (pp. 2-4,22).

Udo, R.K. (1970): Geographical regions of Nigeria, Ibadan Heinemann (pp.198-201) Wandrop Engineering Inc. with Mai & Associates (1993). Study of Irrigation potential of Shallow Aquifers in Fadama Area of Borno and Yobe States. A report to Borno State Agricultural Development Programme and Yobe State Agricultural Development progrmame Nigeria (pp.62-66).