

REFERENCES

**PRELIMINARY INVESTIGATIONS OF NJUWA LAKE,
ADAMAWA STATE, FOR FISH PRODUCTION ENHANCEMENT
AND RESUSCITATION OF NJUWA ANNUAL
CULTURAL FISHING FESTIVAL.**

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ABSTRACT

Lake Njuwa located (N12°30' 0", E09° 01' 30", 147m above sea level), is a geological depression which formed a natural trough into which many seasonal streams flow in. The Lake has a historical and cultural heritage and has been a veritable source of livelihood to the people of Yola town on the South-western side, and Rugange village on the North-eastern side of the lake. The Lake is awashed by many Rivers and streams which flow into it. From the South Western side River Chouchi and Mayo Chudde; from the South Eastern side by numerous streams such as Mayel Lumo, Mayel Kalwa, Mandare streams and many other small streams (about five) drain into Njuwa Lake. However the major contributor to the Lake is a "neck" in the North Eastern side of the Lake (see map), which emanates from Benue River. When River Benue is full especially when Lagdo spill gates are open in September, the neck allows water from the back-flow of Benue to enter the Lake and with it comes the recruitment of the Lake's fish species diversity Preliminary investigation revealed that Njuwa Lake despite its numerous environmental problems which sometimes leads to its complete drying, has very ideal limnological parameters for fish production. Njuwa was reported to be 17.5km² (17500m²) before the construction of Lagdo dam on River Benue on the Nigeria-Cameroon boarder by the Cameroonian Authorities and the numerous irrigation projects around the Lake and River Benue. As at December 1981 however, aerial photos showed that it had shrunk to 3.5 km (3,500m²). As at November 2004, it has completely dried up. It was reported that cars could actually drive through on the dry bed of the Lake. The average depth of the Lake is around 0.5 metres and the water is very turbid. Farming around the Lake has triggered a higher level of deposit into the flood water which serves as silting material for the Lake. This is addition to farm chemicals run off from the rain fed and irrigated crop, increasing the nutrient supply to lake's water thereby leading to accelerated eutrophication with it adverse consequences. Fish species diversity is also very high from on site report. The following fish Species were available in the lake: *Lates sp.*, *Hydrocyanus sp.*, *Polypterus sp.* (lung fish), *Mormyridae (Hypearopisus sp)*, *Heterotis sp.*, *Clarias sp.*, *Gymnarcus sp.*, *Distichodus sp.*, *Tilapia sp.*, *Synodontis sp.*, *Melapterurus sp.* among others. Therefore the lake offers a unique potential for both artisanal fishing and fisheries tourism through the resuscitation of the cultural fishing festival despite the environmental degradation that it has suffered over the years. The water quality is good for fish production, it is near urban settlement of Yola with an adjacent fishing community, Rugange where fishing is the tradition of the community and the people were the same people who were the main participants in the traditional fishing festival in the past. The primary activity that needs to be undertaken is the consultation with the River basin Authority who are the sponsors of the irrigation project with a view to critically re-assess the original design of the Chouchi Irrigation Project

embarked upon by the then PTF. In view of the great prospects of the Njuwa Lake basin, if properly developed for its multidimensional benefits to the local economy in tourism job creation, food security, livelihood diversity and environmental improvement, the development of the lake basin on a holistic basis is highly recommended. The process should capture and involve the interest of all stakeholders around the Lake.

1.0 Introduction

Lake Njuwa located (N12°30' 0", E09° 01' 30", 147m above sea level), is a geological depression which formed a natural trough into which many seasonal streams flow in. The Lake has a historical and cultural heritage and has been a veritable source of livelihood to the people of Yola town located on the South-western side, and Rugange village on the North-eastern side of the lake. The Lake is in the heart of expansive Fadama (wetland) where dry season cultivation of "*Muskuwari*" (a dwarfish guinea corn with reddish heavy seed bunch) farming is being undertaken to supplement farmers' subsistence during dry season. However, the most spectacular event in respect of which Njuwa Lake is cherished and always remembered is the traditional annual Njuwa Fishing Festival which used to come up between March - April every year. The last was held in 2002. A traditional ruler called *Njubare* (a traditional title given by Adamawa Emirate Council), coordinates the traditional activities of the fishing festival annually, and is in-charge of the lake's administration.

2.0 Hydrobiology

Njuwa Lake is awashed by many Rivers and streams which flow into it. From the South Western side River Chouchi and Mayo Chudde; from the South Eastern side by numerous streams such as Mayel Lumo, Mayel Kalwa, Mandare streams and many other small streams (about five) drain into Njuwa Lake. However the major contributor to the Lake is a "neck" in the North Eastern side of the Lake (see annex map), which emanates from Benue River. When River Benue is full especially when Lagdo dam (in Cameroon) spill gates are open in September, the neck allows water from the back-flow of Benue to enter the Lake and with it comes the recruitment of the Lake's fish species diversity.

Preliminary investigation revealed that Njuwa Lake despite its numerous environmental problems which sometimes leads to its complete drying, has very ideal limnological parameters for fish production (Table 1).

Njuwa Lake is a very turbid lake from the large quantity of dissolved materials that are important nutrients for plant and animal growth. The lake has a very large draw-down area of about 2.5 km in length and a large shoreline with good indentation suitable as breeding ground for fish. There is a very small presence of water hyacinth and is generally shallow with an average depth of about 0.5m. A total length of 1.48km of the lake towards the 'neck' is allowed as a closed area (see map) for a period between November to May each year. North West area of lake is used for irrigated rice cultivation. Limnological parameters of this lake are expected to be even better during the rainy season when the lake will receive much water inflow from the feeding Streams and River Benue.

Fish species diversity is also very high from the on site report and observations. At the time of investigation (March 2006), no serious fishing activity was observed on the Lake, fish traps were however noticed along the Lake's shores of the no-fishing area. Discussion with the *Njubare* indicated that the following fish Species are available in the lake: *Lates sp.*, *Hydrocyanus sp.*, *Polypterus sp* (lung fish), *Mormyridae (Hypearopisus sp)*, *Heterotis sp*, *Clarias sp*, *Gynnuarcus sp*, *Distichodus sp*, *Tilapia sp*, *Synodontis sp*, *Melapterurus sp*. among others.

3.0 Environmental Problems

Njuwa was reported to be 17.5km² (17500m²) before the construction of Lagdo dam on River Benue on the Nigeria-Cameroon boarder by the Cameroonian Authorities and

the numerous irrigation projects around the Lake and River Benue. As at December 1981 however, aerial photos showed that it had shrunk to 3.5 km (3,500m²). As at November 2004, it has completely dried up (Field Report, 2004). It was reported that cars could actually drive through on the dry bed of the Lake.

The average depth of the Lake is around 0.5 metres and the water is very turbid. Farming around the Lake has triggered a higher level of deposit into the flood water which serves as silting material for the Lake. This is addition to farm chemicals run off from the rain fed and irrigated crops, increasing the nutrient supply to lake's water thereby leading to accelerated eutrophication with it adverse consequences. Physical alteration of the lake basin through civil construction work and irrigation alter the topography and hydrological system that support the ecosystem of the area. The lake basin has been a deposit of loamy clay soil that supports the cultivation of *Muskuwari* corn and vegetables which grows with the residual moisture left by the receding water in the Lake. Perhaps the one activity that had the most environmental impact is the Chouchi Irrigation Project.

Chouchi Irrigation Project was started in 1998 by the then Petroleum Trust fund (PTF). It was to irrigate the Fadama land between the twin towns of Yola and Jimeta (See Annex Map). The Project was earlier conceived by North Eastern State Ministry of natural Resources under a wider coverage "Benue Valley projects. The Project started with construction of flood control measures which blocked the major source of water into Lake Njuwa. It also includes the channelisation of contributing stream i.e. River Chouchi and Mayo Chudde into Irrigation reservoir; construction of road to Rugange from Yola water works. This road passed on an embankment constructed across River Benue 'Neck' which feeds Njuwa Lake with flood water and fish. This same inlet also serves as the outflow channel during the draw-down period. Four pipes of not more than 0.6m diameter were provided to carry water across the road into and out of the Lake. The Chouchi irrigation had since stopped. As at the time of this investigation, the pipes are blocked with silts and vegetation. The present position of the pipes are on a higher elevation than the channel bed, thus making it difficult for the Lake to be recharged through the pipes unless at high flood period. Furthermore, a wider channel was constructed as flood control measure, (see map) to discharge water out of the Lake. More water therefore goes out of the lake than flows in; the result is systematic reduction of the water volume and the gradual silting of the lake. This reached its peak when it completely dried up in 2002.

4.0 Productivity Enhancement Strategies

Njuwa Lake offers a unique potential for both artisanal fishing and fisheries tourism through the resuscitation of the cultural fishing festival despite the environmental degradation that it has suffered over the years. The water quality is good for fish production, it is near urban settlement of Yola with an adjacent fishing community, Rugange where fishing is the tradition of the community and it is the same people who were the main participants in the traditional fishing festival in the past.

The reduction in size and depth of the lake through low inflow of water as well as siltation due to irrigation activities and some infrastructural developments that imparted on the lake physiography, have greatly reduced its potential to sustain artisanal fish

production and the traditional fishing festival as it was in the past. However, all is not lost, some environmental mitigation could be implemented that will surely restore these potentials. This is more so because despite these environment degradation, the lake was able to maintain its fish species diversity though catch per unit effort is greatly reduced and at the time of this investigation, it is virtually free of aquatic weeds infestation especially water hyacinth although some traces were observed along a portion of a bank.

The primary activity that needs to be undertaken is the consultation with the River basin Authority who are the sponsors of the irrigation project with a view to critically re-assess the original design of the Chouchi Irrigation Project embarked upon by the then PTF. If the project will continue in the future, it will need to be addressed and redesigned such that a new project design will be holistic, taking cognisance of other uses to which the lake can be put, particularly its water retention capacity in order to sustain fish production, the annual cultural fishing festival and sustainable irrigation among others. These will then be followed by the under listed productivity enhancement activities of the lake in order to restore its full potential for both fishing, the annual fishing festival, irrigation and other uses.

5.0 Increasing Water inflow into the Lake

The excessive silting of the feeder channel has greatly reduced the volume of water inflow into the lake. This problem is further compounded by the construction of a dike over the neck connecting the Lake with the River Benue. Re-channelisation of tributaries feeding the lake for greater water inflow and the pipes that run through the dyke at the neck area will need to be replaced with a wide culvert/bridge of about four metres wide (same as the channel) that will allow enough water through into and out of the Lake even at low flood. This free passage through the culvert/bridge will allow fish movement in and out of the Lake. This is important because inflow of fish into the lake will improve the diversity and outflow will possibly conserve some of the species that use the lake as breeding ground during the flood and later move out into River Benue with the receding waters.

The two open channels (about 30 meters wide each) which drain water out of the lake will need to be blocked such that water outflow from the lake would be controllable rather than allowing fast and uncontrolled discharge out of the lake at the end of the flooding season.

6.0 Flood Control and Water Conservation

With the re-channelisation of the inflow channels, greater volume of water will therefore be expected into the Lake. The current depth of the silted lake might not contain this volume and this could lead to flooding of the farm land and possibly the Yola and Rugange settlements. The lake will therefore need to be dredge, at least to depth of one to two meters at the middle. This depth will contain the in-coming waters during the flood and will further reduce greatly the flow back of the water from the lake when river Benue recedes, thereby retaining it throughout the year. This will also allow for the stratification of the Lake temperature wise and the development of thermocline which is important for fish productivity and diversity especially considering the fact that the Lake is situated in a very hot environment with temperature exceeding 40°C for most times of the year. The dredging must be professionally undertaken to cater for other users of the water body by providing gentle slope into the lake at necessary locations and appropriate provision of berthing facilities for boats, modern pier construction, and delineation of the lake for different users.

Construction of flood protection bank as a means of protecting flood water from encroaching residential homes near the lake is also of importance as a precautionary

measure against environmental hazards especially when the Lagdo dam food gates are open.

7.0 Fish Species Conservation

Njuwa Lake has high fish species diversity as listed above. However these could not be sustained with the current situation of the Lake. Dredging and opening the feeder channels will bring about good and diverse environment for the growth of fish. This may however not guarantee sustainable fish production in the lake unless appropriate measures are put in place. For the first year of the dredging the entire lake needs to be closed to allow the fish recruitment and growth and detail study the fish biology of the Lake will have to be undertaken to identify and mark closed areas and seasons and migration pattern in and out of the lake. This is with the aim of identifying fish species indigenous to the lake and those using it as breeding ground so as not to disrupt their reproductive behaviour.

All farming activities will have to stop especially in the draw down area around the lake. This could be in the region of 50 meters from the lake shore in order to reduce siltation and chemical run off from the farms. And for the stability of the soil in this farming restricted area, orchard will need to be established along the shore.

8.0 Community Lake Management Approach

In order not to disrupt the livelihood of the farmers, farming restriction could be enforced only when the dredging is completed and the water is closed for fishing in the first year. Because of this a Community Lake Management Community (CLMC) will need to be established immediately. This will comprise the Fisherfolk, Farmers; Community Based Organisations (CBOs) with the representatives of Emirate council, State Government, River basin Authority. The CLMC will be involved and will participate in all the activities for the lake enhancement after which it will be responsible for the enforcement and management of the lake regulations.

9.0 Reactivation of the Njuwa Annual Fishing Festival

Development and upgrading of the annual fishing festival in Njuwa Lake will promote tourism and indeed the local economy. When compared to the Argungu flood plain area that produces the now popular annual Argungu Fishing Festival with its upcoming international status and importance, the Njuwa Lake has the advantages and potential to become an even more prominent fishing festival of international status and huge tourism potential. The following reasons support this postulation:-

- 9.1 Njuwa Lake with its observed diverse speciation is at least ten times larger than the Argungu fishing festival waters. There is therefore opportunity to modify the size of fishing on Njuwa Lake over a longer period and dimension to keep tourists and participants longer over a period of time than the Argungu festival.
- 9.2 Njuwa Lake is already urbanized, only a few hundred meters from the city. Its impact will be enhanced because of proximity to urbanization. This will also enhance development prospects by stakeholders who may wish to invest in tourism.
- 9.3 There is already a market for tourism and water recreation from the sizeable population of resident expatriates in Yola and Jimeta municipalities. Staffers of the emerging ABTI Universities with large American population and expatriates from other institutions like the construction companies like Julius Berger all have the potential to jump-start the tourism industry that will be generated from the multi-sectoral development of Njuwa Lake.

9.4 The strategic location of the lake at the centre of Adamawa Emirate particularly with the personal interest and involvement of the Lamido of Adamawa and his Council will facilitate multi-sectoral and timely development of the project. The Emirate Council can mobilize both national and international interests in the development of the project.

10.0 Other Potentials of Njuwa Lake for Multipurpose Uses

Njuwa Lake, like most other urban and peri-urban natural and man-made lakes are only optimally utilized when they are allowed and managed for multipurpose uses. Already, the lake has a traditional fishing festival use and recently irrigation purpose. A potential co-management method can be established towards optimal utilization of the lake. Some of the potential uses are highlighted as follows:

10.1 **Irrigation Purposes:** Njuwa lake basin is very expansive with hundreds of hectares of agricultural land which are only partially utilized particularly after the recession of the flood. Recent experience by individual rice farmers' initiatives introducing irrigation by pumping water from the lake has confirmed that large, productive year-round farming of various crops can be undertaken in the lake basin. This can create thousands of employment in the peri-urban and urban sectors of the local economy. It will promote economic growth and create enormous wealth within the local community. This will open up the local economy as most of the resultant boom in agricultural production may end up in neighbouring states. Food Security in the local economy will be enhanced as a result of easy and expectedly cheaper access to agricultural products.

10.2 **Fulbe Cultural Festival:** Adamawa Emirate is a Fulbe (Fulani) Emirate with a wide influence on Fulani community across Nigeria and Cameroon. Lamido has been the recognised leader of this vast international community whose tradition is tied around the rearing of cattle and other livestock. Cattle rearing need good watering points especially those around urban centres that will allow the women to sell milk for their household needs. Njuwa Lake provides veritable source of water to such suitable sites for both water and fresh grass on the draw down area. Many cattle were noticed grazing in this area at the time of investigation. Fulanis are known for their varied cultural festivals and this could be incorporated into the fishing festival for added glamour and international appeal.

11.0 Conclusion

In view of the great prospects of the Njuwa Lake basin, if properly developed for its multidimensional benefits to the local economy in tourism job creation, food security, livelihood diversity and environmental improvement, the development of the lake basin on a holistic basis is highly recommended. The process should capture and involve the interest of all stakeholders around the Lake.

12.0 REFERENCES

- 12.1 Lake Njuwa Rehabilitation and Resuscitation, Yola Development Trust Fund. Letter written to The Hon. Commissioner for Environment, Ministry of Environment Adamawa State. 26th July, 2005.
- 12.2 Environmental Analysis of Problems Affecting Njuwa Lake. Department of Environmental Degradation Control and Information management (E.D.C.I.M.) Ministry of Environment, Adamawa State. August, 2005.

Table 1: Water Analysis of Njuwa Lake

Parameters	Readings	Remarks
Temperature	27.6	Within ideal level for tropical lakes
Alkalinity	84mg/l	Very ideal for fish production
Hardness	50mg/l	The buffering capacity of this lake is within limit for fish production
Ph	7	Natural and suitable for life sustenance.
Free CO ₂	2.5mg/l	Dissolved carbon dioxide is ideal for freshwater
Chloride	12mg/l	The level is right for the survival of fish; it shows that there is low level of chlorinated waste.
Transparency	6cm	A bit turbid but alright for shallow waters

ANNEX I: NJUWA LAKE SATTELITE PICTURE

