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INTEGRATING CULTURAL, ECONOMIC AND ENVIRONMENTAL REQUIREMENTS FOR FISH PRODUCTION IN BORNO STATE

BY

AMINU RAJI AND BENARD A. OMOYENI
FEDERAL COLLEGE OF FRESHWATER FISHERIES
TECHNOLOGY, BAGA P.M.B 1060, MAIDUGURI
BORNO STATE

ABSTRACT

The study examines the integration of cultural, economic and environmental requirements for fish production in Borno State, a reconnaissance survey was conducted transferring some selected Local Government Areas. 60 questionnaires were administered in the six Local Governments representing Southern Borno State with Biu and Shani, central Borno with Konduga & Jere and Northern Borno with Gubia and Kukawa respectively.

There is no cultural constraint to fish production but about 63% prefers to invest in other farming activities than in fish farming, 33% are not a wear believe that fish can be cultured apart from getting it from the wild. As much as 35% have the impression that fish farming ventures can be handled by government only. The economies for fish production is high especially in parts of Northern Borno, but the Local market potentials throughout the state is great.

The State posses suitable soil for ponds apart from few locations at the central and Northern Borno that are made of sandy soil. There exist numerous perennial and seasonal rivers, streams, lake, pool and flood plains adequate fish culture especially in Southern Borno. The mean annual rainfall can result in some storage in ponds. In areas where annual precipitation is less than 550mm, there exist a number of few flow boreholes with potentials for fish production. The temperature regime is that which will support growth and survival of fish even during they hottest months of the year (March, April and May). With the understanding and manipulation of these requirements, fish production in the State can be greatly enhanced.

INTRODUCTION

Borno state has a great potential for fish production both from the capture and culture fisheries, regrettably the potential for the later has not been developed, this can be attributed to the enormous fisheries resources of the State Inland water particulary the Lake Chad whose fisheries although entirely artisanal is one of the most productive in Africa having produced an estimated 1.7 million metric tonnes of fish between 1960 and 1988, having annual sustainable yield in the 1980's estimated at between 100,000 - 180,000 tons under normal condition (Durand 1980).

It is a fact of life that Borno Station is the largest producer of fish from inland river and lakes in Nigeria providing a significant part of the National Inland fisheries 61% (Aminu and Omoiyeni, 2000). However, the Lake Chad fisheries has experienced a classical 'Borno and bust' scenaio. Production increased from 15,000t (1960) up to 220,000t (1974) and has now dropped to 52,000t (Neiland and Ladu, 1997). This

shows that artisanal fisheries production from Lake Chad have been fluctuating to the extend that it has decline in recent years. Obviously, the Lake Chad Fishery is an integral part of the World's Inland fisheries which has been estimated to be on their maximum level of exploitation (FAO, 1995). Furthermore, welcome and Bartley (1997) have indicated that caught from inland fisheries are in decline due to deteriorating quality of the aquatic environment and poor management.

With the growing concern that the fisheries of N.E Nigeria have been increasingly over exploited, there is the need to look inward and redirect fisheries enhancement programmes leading to increased fish production. One of the ways to enhance fish production is by shifting attention to fish culture practices, considering the fact that aquaculture is an industry in its early development stages in Africa. This is more so in Nigeria especially in the N. E region where Borno State lies. Fish production from aquaculture in Borno State is

at its infant stage. There is general lack of awareness of aquaculture as a rational way to enhance fish production. Those that are even interested in fish farming are constrained by some environmental, economic and culture considerations. For there to be a change in the feelings towards fish farming in the State, there is the need for an understanding of the interaction and interrelationship between the cultural, economic and environmental factors as it affects fish production from culture fisheries.

This paper therefore presents the opportunities and constraints to fish production with a view to integrate the cultural, economic and environmental requirements to enhance fish production in Borno State.

METHODOLOGY

Firstly, a literature review was carried out to examine the cultural, economic and environmental characteristics of Borno State.

Secondly, a reconnaissance / exploratory survey of the State was carried out.

Third, 60 questionnaires with face to face interview were used to retrieve information at the Six Local Government Areas selected to represent the entire State. Biu and Shani for Southern Borno, Konduga and Jere for central Borno, Gubio and Kukawa for Northern Borno.

RESULT AND DISCUSSION

GENERAL CLIMATIC FEATURE OF BORNO STATE

Borno State is situated between Lat $10^{\circ}15'N$ and $13^{\circ}40'N$ and Long $11^{\circ}30'E$ and $14^{\circ}45'E$. The climate is of semi-arid and arid type with wide seasonal and diurnal temperature ranges. A long dry season is followed by a single wet season. Practically all rainfalls in a three to four months period from June to September. From November to May it remains very dry. The amount of rainfall recorded in different observation points in the State is highly variable. For example the mean annual rainfall of Bama, Biu Damboa, Gwoza, Maiduguri and Baga for 59 years up to 1974 was 698mm, 951mm, 869mm, 647mm and 300mm respectively (Antoni 1978). In essence, Borno State falls into the Sudano-Sahelian vegetation classified under the tropical continental climate with rainfall of 250 - 1000mm.

The temperature regime of the State is relatively more constant than that of rainfall pattern. The hottest months of the year are March, April and May with mean monthly temperature of $29.5^{\circ}C$, $32.8^{\circ}C$ and $34.5^{\circ}C$ respectively.

ENVIRONMENTAL CONSIDERATION

Generally, most of the environmental requirements of fish farming could be attributed to water, temperature and soil. These factors play critical roles in determining the possibilities of fish farming activities, this is more so in the Sudano-Sahelian eco-climatic zone.

A. WATER

Water is the greatest limiting factor in Aquaculture. The starting point for conceptualizing aquaculture activities is water availability. In areas where pond had

to be constructed, the source of water to the fishpond must be guaranteed. This shows that water is such an important factor that cannot be compromised.

Most aquaculture initiatives have been frustrated by unavailability / inadequacy of water in the Arid Zone, because permanent surface water in streams and rivers is not a common occurrence in the Arid Zone. Where surface water is found, it is intensively utilized for human and animal drink, in water irrigation and fishing. Ironically, Borno State possesses abundant water resources which can be categorized into:

- (i) Seasonal rivers, pools and flood plains
- (ii) Small perennial rivers, reservoirs and lakes
- (iii) Major rivers
- (iv) Major Lake

The southern part of the State is blessed with many perennial rivers, streams and reservoirs (dam), the central with seasonal rivers, stream and few perennial reservoir (e.g) lake Alau and the Northern part with Lake Chad and its flood plains however they exist from Local government areas (Gubio, Kaga, Magumeri and Ngazai) that do not possess surface water in form of stream/rivers/lake apart from reservoir arising from the free flowing borehole as observed in Ngazai local government area.

Interestingly rainfall runoff constitutes one of the sources of water for fish culture especially when the rainfall runoff can be stored for aquaculture. Much as the annual rainfall for the State had been established to be low, there is still the possibility of storing the rainfall for aquaculture. FAO (1987) developed a relationship between mean annual precipitation and rainfall runoff to assess water storage potential for irrigation in Africa. This relationship indicates that a mean annual rainfall as low as 500mm would result in some storage in ponds (Kapetsky 1994) though radical draw down can occur during the driest months, due to evaporation losses.

In Zambia, fish farms are found in districts that have ranges of prevalent rainfalls of from 700mm to more than 1400mm, commercial fish farmers in Zambia are able to maintain water throughout the year in low rainfall areas (e.g 700mm) by sitting reservoirs so, that they have large catchment areas. Most parts of Borno State have annual rainfall between 800-900mm, an amount that can adequately be stored for fish production.

Similarly, rainfall runoff can be stored for aquaculture if the technique of water harvesting is utilized for water conservation as it had been done in some countries like Israel as far as 4,000 years back in the Nagev desert to support a population of 50,000 (Davioes, 1967).

According to Iqbal (1977) a very good water harvest method could yield 1,000 litres per square meter in a 200mm rainfall zone. Numerous methods exist to harvest water, they include using water repellent such as silicone, paraffin, sodium salts to treat the soil to reduce infiltration which enhance channeling runoff generated into storage tanks using fibre glass, plastic and metal sheets or concretes to also build channels for water (Medina, 1976) However, Olokor and Erinne (1995) suggested simple cost effective and easily adaptable

methods which include.

1. Constructing reservoirs / ponds below a catchment and linking it with a dug out channel. Being the lowest part of a catchment a lot of water is capable of being harvested with little rain.
2. In places where no slopes wrist embankment of ponds should be constructed in such a way that a large part of the surface area slopes down into the pond
3. The water holding capacity of the soils should be enhanced by using clay soil to form a hard in penetrable surface or by using concrete tanks.

In addition to the water resources of the State, there exists a number of free flowing borehole reservoirs dug initially for water storage for animal and human drinking. This source of water has great potential for fish production for it supplies water throughout the year. What is experienced now is wasted water resources not adequately utilized. There is the need to intensify studies on the utilization of this resource for fish production.

(b) TEMPERATURE

The temperature regime of the State throughout the year is suitable for fish production. Since there is a linear relationship between temperature and fish survival and growth, the mean monthly temperature observed will support fish growth and survival both during the coldest and hottest months, although fish performance during the coldest months may be slowed down due to decrease in surface water temperature with monthly mean recorded as 19°C, 18°C and 18.2°C in the months of December, January and February respectively. However, during the hottest months of the year, April - June, the mean surface water Temperature were recorded as 26.4°C, 28.1°C and 27°C respectively. This shows that optimum performance can be expected during the hottest months for fish species like *Oreochromis niloticus* and *Clarias gariepinus* whose optimal thermal range shown by Coche and Muir is (27 - 30°C) and (25 - 27°C) respectively.

This suggests that temperature does not act as constraint to fish production in the State much as it influences the bio-chemical composition of the aquatic medium and fish performance. There is however the need to state that the rate of evaporation could be very high during the hottest months. Since evaporation is a function of solar energy, air temperature, relative humidity and wind, there exists a relationship between the ambient temperature and evaporation. Some parts of Borno State (Central and Northern Borno) lies in the region that normally experience the highest temperature thereby increasing the evaporation rates leading to desiccation of pond water. The Sahel zone temperature can be as high as 41°C even with minimum diurnal temperature as low as 18°C at the peak of the harmattan wind which is very dry the high evaporation rate can be suppressed. This can be done by the following methods proposed by Olokor and Erinne (1999) for easy adoption in the arid Zone.

1. Using floating woven grass rafts or raft made from dried guinea corn stems. This placed on the water

surface could be fixed by a stake. If 0.25 Ha of a pond of 0.5 Ha is covered by this method, 40% of evaporation can be checked. This means that in the absence of seepage, a pond water will experience a longer culture period. The effectiveness of this method is easily seen in concrete ponds.

CULTURAL CONSIDERATION

The cultural environment of any production activities is equally an important factor that is to be taken into consideration, for it goes a long way in determining the success or otherwise of the production activity, there exist a relationship between the culture of a people and their politics, consumer preference, resources allocation and the influence of the traditional authority on the people.

Borno State has an age long tradition that is deeply rooted in traditional jurisprudence. The traditional authority in most cases determine who gets what. For instance, fishing on the flood plain of Lake Chad is under the jurisdiction of the village head (Bulama), however, much as this so, the traditional authority does not constitute constraints to fish production activities rather it tends to ensure the rational utilization of the fish resources. In the same vein, the allocation of land for fish farming falls under authority of the traditional institution.

Culturally, there is no taboo attached to fish production but the fact remains that there is a general lack of awareness of aquaculture. The people of the state are predominantly livestock and crop farmers. This is confirmed in table 1 showing 63% preference to invest in other farming activities than in fish farming. As much as 33% are not aware / believe that fish can be cultured apart from getting it from the wild (table 2). Not only that 35% have the impression that investment in fish farming should be handled by government only (Table 3) for investment in fish farming is seen as that which requires heavy capital outlay.

Ironically, the people of the state attach very high value to fish products. Fish is a culturally and nutritionally important source of food among the diet of the people especially the Marghis in the southern part. Notwithstanding that Borno State is the largest producer of cattle and people tend to prefer fish to meat.

ECONOMIC CONSIDERATION

The economics for fish production in the state is high especially in parts of central and Northern Borno. The capital outlay for pond construction could be high at these parts of the state as a result of the nature of the soil and the cost of water transportation (pipes, pumps etc) and even water conservation. Consideration is also to be given to the availability of fish farm inputs like the fingerling fish feed and even the technical aspect.

However, since economics for subsistence and commercial farming were derived by combining inputs and local market demand with equal weight. It can be asserted that the local market demand will match the input, infact outweigh it. There exists a great local

market potential throughout the state. Although the actual fish consumption is difficult to estimate, however, because of the limited statistics available, the population density can be used as surrogate to get the comprehensive economic data that could be used to indicate potential market for aquaculture products in the State. Also based on the field observation on consumption pattern, the demand for fish in the State is far greater than its supply.

To corroborate this, Moen (1983) stated that fish is one of the most important food available in Nigeria with the consumption rate estimated at 22.5 million metric tons annually. Similarly Eyo (1992) indicated that the level of domestic fish production can hardly meet 20% of the demand.

From all indication, there exist a steady market for aquaculture product making investment in fish farming a profitable venture since fish and fishery products will continue to play a fundamental social and economic role in the state. Fish for human consumption will remain the most important source of animal protein for many. Therefore, investment in aquaculture no doubt promises a great return for the investors.

CULTURE FISHERIES ENHANCEMENT IN BORNO STATE.

Having examined the environmental, cultural and economic factors as they affect aquaculture practices in Borno State, its obvious that despite the fact that the State lie within the semi-arid and arid zone, it hold a great potential for fish production through aquaculture by harnessing the environmental, culture and economic opportunities. Notwithstanding, there exists a high level of ignorance and a path for investment in fish farming obviously due to the fear of the climate, attitude of the people and the economics of fish production in the state. Ironically, there is little or no constraint to fish farming in the state, the environment can be manipulated when the need arises, the culture of the people poses no threat to fish farming and there is a great local market potential for fish and fishery products.

Getting the potential investors in to frame of mind and attitude to go into fish farming business becomes desirable. Presently, the intensity of fish farming and the level of fish husbandry is generally low in the state as observed in the arid zone by Eyo (1999). It is to be stated that the current level of commitment to aquacultural practice both by the public and the private sector should be increased.

Possibilities exist for extensive and intensive culture in the numerous seasonal; and perennial rivers, streams, flood plain reservoirs and Lake. Since there is also the great potential for aquaculture technology, aquaculture ventures would be very successful if the environmental,

culture and economic requirements earlier discussed are integrated to enhance fish production in the state.

CONCLUSION AND RECOMMENDATION

There exist a great potential for fish farming in Borno State that is yet to be exploited. In spite of its location within the Sudano-Sahellian eco-climatic zone,, possibilities exist for fish production through aquaculture if the environmental, culture and economic factors of production are integrated. This can be done by harnessing the opportunities of these factors and manipulating the requirements for increased fish production through aquaculture. In the light of the above, the foregoing recommendations are considered relevant.

1. That the attention should shift from the near total dependence on capture fisheries for fish production to culture fisheries enhancement in Borno State.
2. That the appropriate authorities should be creating the awareness on the possibilities of fish farming in the state despite the seeming constraints.
3. That the prospective and potential investors in fish farming should be liaising with the relevant organizations or experts for technical information and assistance.

Table 1: AGRICULTURE ACTIVITIES PREFERENCE OF THE PEOPLE OF BORNO STATE

AGRICULTURAL ACTIVITY	NUMBER	PERCENTAGE
Livestock	24	40
Crop Production	14	23
Fish Farming	22	37
TOTAL	60	100

Source: field Survey, September, 2001

Table 2: AWARENESS ON FISH CULTURE PRACTICES

AWARENESS	NUMBER	PERCENTAGE
Aware	46	67
Not Aware	14	33
TOTAL	60	100

Source: Field Survey, Spent 2001

Table 3: CONSIDERING FISH FARMING VENTURE AS THAT WHICH CAN BE HANDLED BY GOVERNMENT ONLY.

RESPONSE	NUMBER	PERCENTAGE
Yes	21	35
No	39	65
TOTAL	60	100

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