

DEVELOPMENT OF RESERVOIR FISHERIES FOR SUSTAINABLE FISH PRODUCTION AND FOOD SECURITY IN NIGERIA

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ABSTRACT

The paper appraised the reservoirs constructed for various purposes in Nigeria and prescribes cultured based fisheries for these water bodies to enhance their productivity in order to create employment, provide alternative source of income and food security to the rural people. In addition to discussing the concept of reservoir fisheries, its importance and pitfalls and prerequisites for its development, the paper provides a policy outline intended to promote reservoir fisheries in Nigeria.

INTRODUCTION

Inland fisheries resources support the livelihoods of millions of people in Nigeria mainly around the Lake Chad and Kainji-Jebba reservoirs, and along the main rivers of Niger, Benue, Anambra, Cross, Sokoto, Ogun, and Kwa Iboe. Fisheries resources as a form of natural capital and a source of wealth can be utilized both directly (e.g., through employment) and indirectly (e.g., wealth generated and extracted is reinvested in the economy) to contribute to economic development and poverty reduction. Besides being a source of direct employment it can also provide a safety net during drought or crop failures. The inland water resources of Nigeria has in the past thirty year increased tremendously as a result of construction of large, medium to small reservoirs purposely for hydro-electric power generation, irrigation and urban water supply thus increasing potential for fisheries development for food security and poverty alleviation. In spite of the apparent importance of fisheries and other freshwater aquatic resources for large numbers of people in Nigeria, the sector has not been recognized and so there are little or no policies at national, state and local government levels to establish effective management systems for sustainable exploitation and conservation of these resources. Fish production from natural inland and marine has been declining even though in Nigeria it has never meet the demand which is augmented by importation of frozen fish from developed world. Nigerians consumes an estimated 1.3 million MT of fish annually with a per capita consumption of 7.512 kg meanwhile national production from both capture fisheries and aquaculture stands at 450,000 MT. Over 800,000 MT of fish is imported to meet the annual demand (AIFP, 2004). Recently aquaculture has been looked upon to bridge this gap between supply and demand for fish. However since aquaculture like any other business is geared towards profit, farmers tend to farm species that are more lucrative like catfish (*Clarias* and *Heterobranchus*) but out of the reach of the poor.

Nigeria has presently about a thousand medium and large reservoirs constructed for other purpose except fisheries. Most of these reservoirs are found in the rural areas especially those built for irrigation purpose. It is instructive therefore if these small and medium reservoirs are managed using culture-based stocking of fish into them they will contribute to rural food security, provide employment and reduce rural-urban migration and may even provide fishmeal for the growing aquaculture industry in the country.

The present work seeks to highlight the concept and provide policy guidelines that can be considered by policy makers when attempting to develop sustainable culture-based fisheries in Nigeria using the numerous reservoirs in the country. In addition to discussing the concept of reservoir fisheries, its importance and pitfalls and prerequisites for its development, the paper provides a policy outline intended to promote reservoir fisheries in Nigeria.

Background information

Culture-based fisheries (CBF) are a form of extensive aquaculture that is conducted in small water bodies usually less than 100 hectares (FAO 1999). On the other hand CBF are capture fisheries which are mostly or entirely maintained by the regular stocking of seed fish. CBF rely entirely on the natural productivity of the water body for growth, and on artificial stocking for recruitment. CBF is practiced in both man-made and natural water bodies, the former usually built for other purpose like irrigation, water supply and so on but due to their size and point of damming lacks adequate natural recruitment

of suitable species, while in the latter to produce economic species. The stocked fishes depend solely on the natural productivity of the water bodies and are harvest at predetermined period or when the water recedes. The owner of the fishery of water body which can be the community, individuals that are interested and have formed themselves into cooperative or investor are responsible for procurement of seed to be stocked, care and protection of the water against poaching and usually pay license fee to the dam authority.

CBF is different from stock enhancement which is practiced to increase the productivity of water body especially large ones that are more or less open access fishery.

Most developing countries in Asia, some in South America like Cuba and Brazil as well as Burkina Faso in Africa have recognized culture-based fisheries as an effective way of increasing the supply of fish as food in the rural areas (Valbo-Jørgensen and Thompson (2007), De Silva *et al.*, 2006 & de Graaf (2003).

CBF apart from food security, CBF also provide additional income to rural farmers that are primary beneficiary of reservoirs built for irrigation, it further ensures effective use of the impounded water. CBF being a communal activity engenders cooperation and harmony, and unlike conventional aquaculture, it is less resource intensive and requires little technical skill.

There is no federal law dealing with stocking and enhancement of reservoir. The inland Fisheries Decree of 1992 makes no reference to stocking of water body or enhancement. It is important that the process of reviewing the present inland fisheries law and developing a comprehensive law that will take aquaculture and culture-based reservoir fisheries in to consideration.

Factors that can enhance success of culture-based fisheries

Some factors has been enumerated by de Silva *et al* (2006), de Graaf (2003) and Nguyen, *et al.*, (2001) which can be classified into biotic and socio-economic factors. Biotic factor include species choice, water retention period of the reservoir, depth and surface area, presences of submerged tree stumps and obstacles, productivity of the water body, activities and catchment characteristics of the water body and presence of carnivorous species and piscivorous birds. Socio-economic factors include community willingness, strength of community organizations, multiple use of water bodies and most important the institutional setting. A participatory management requires two basic institutional conditions: A decentralisation of government structures and institutional decision-making processes. If all rules on management are decided in the state or national capitals, then participatory management will be again doomed to fail. A fisheries legislation that allows the handing over of the resources to communities is required.

Guidelines for legal framework

Most reservoirs in Nigeria are own by the federal government especially those created for irrigation under the river basin development authorities and while those created for hydroelectric power generation has in a way ceded to the littoral states. The development of the fisheries of reservoirs under the River Basin Development Authority should be vested with Federal Department of Fisheries while those reservoirs constructed by the State should be vested with the State department of Fisheries. It is these Department of Fisheries that will in turn take active steps for ensuring stocking of these water bodies and multiply the production level of fish in the reservoirs and either lease it to fishermen who has been organized into cooperatives, community or in case there are no fishermen community around the water body, private investors. However in the case of private investor the DoF will not be responsible for stocking and enhancing the productivity of the reservoir. The DoF and the River Basin Authority will both ensure that fishing activity do not jeopardize the primary purpose of the reservoir which is irrigation and water supply.

The fishing rights of all federally built water bodies which are under the River Basin Authority and by extension Water Resources Department should be transferred to Federal Department of Fisheries with the aim of accessing them and leasing them for cultured based fisheries. The transfer of fishing rights will be subject to the following conditions.

(a) The safety of Irrigation infrastructure of the reservoir should in no way be jeopardized as a result of fishing activity. The field level Fishery Officers will cooperate with their counterparts in the Water Resources Department to maintain safety standard.

(b) Steps should be taken to provide basic infrastructure in the existing irrigation project to facilitate fishing

(c) Stumps will be cleared or partly cleared to facilitate the netting operation in the reservoir.

(d) The Fisheries Department will take steps to ensure that favourable species is stocked and at the right density for the fishermen to realize profit from their investment

(e) A Co-ordination Committee at the local level may be required to ensure proper management and prevent conflict of interest among the reservoir community. Such a committee will include Project officer in-charge of the concerned Irrigation Project, Field Officer of the Federal Department of Fisheries or the State Fisheries officer, Leader of the fishermen and other stakeholders to ensure proper management and afford conflict.

CONCLUSION

Culture-based fisheries as demonstrated in Sri Lanka and other South East Asia countries is a veritable tool for deriving maximum benefit from man-made water bodies in Nigeria. In Nigeria the Nile Tilapia (*Oreochromis niloticus*) is a suitable species for culture-based fisheries as it can breed on its own and so requires no hatchery as the small one can be use to restocking after harvesting. It is hoped that government can start with pilot schemes which serve as learning ground for the department of fisheries and water resources practitioners at state and National levels.

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Utilization of the shell

The shell of oyster is rich in calcium and has a wide variety of uses. Shells have been used as a control material, cheap bio-filtration substrate in high-tech fish and prawn culture, recirculation systems for water purification, polished shells are used in art work and by the fashion industry. In the pharmaceutical industry, oyster shells are used in the production of vaccines and anti-cancer based drugs. A bed and ground shells are used as abrasives by manufacturers and polish for metal work. In the food production industry, the processed shells are incorporated into the feeds as a rich source of mineral element - Calcium. The shells contain high level of Calcium Carbonate (CaCO₃) and could be used for the treatment of acid sulphate soils.

Production Estimates and Marketing

Annual 1997 reported that 2000 kg ha⁻¹ of oyster mean could be harvested annually from oyster farms. Shell-on oysters cost ₦ 20 kg, the fresh oyster mean cost ₦ 420 kg, and shells only cost ₦ 10 kg (Adebo and Akinola, 2007). Hence from 1 ha farm, gross revenue of ₦ 2,000,000 could be realized annually. If the oyster mean size is 100 g, the gross revenue of ₦ 2,000,000 could be realized annually. The gross revenue of ₦ 2,000,000 is the gross revenue of the farm. The gross revenue of the farm is the gross revenue of the farm. The gross revenue of the farm is the gross revenue of the farm.

Culture Practices

There is no specific culture practice for oyster. It has rapid growth and high survival. It is able to tolerate high salinity and low oxygen. It is able to tolerate high salinity and low oxygen. It is able to tolerate high salinity and low oxygen.