

NIGERIAN FISHERIES AT A TIME OF ECONOMIC PARADIGM SHIFT.

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ABSTRACT

Opportunities for private sector investment in aquaculture in Nigeria are appraised in light of the global paradigm shift towards privatization of commercial production. Review of the current status of the fisheries sector shows that the bulk of fish production in Nigeria comes from the artisanal sector. Since local fish production is grossly inadequate, Nigeria imports about 49.5% of our fish needs. There is evidence that yields from the capture fisheries have been stagnating for some years now, and are unlikely to rise much further. The burden of bridging the supply-demand gap rests on aquaculture. Opportunities for private sector investment in aquaculture in Nigeria are presented. These opportunities include development of such culture systems as earthen ponds, cage fish culture, culture based fisheries in floodplains, recirculating tanks, fish hatcheries and recreational fisheries. Generally, the paper advocates government disengagement from activities that can be best done by the private sector. A more aggressive government intervention is advised for provision of loan facilities, technical assistance to farmers, protection of natural water bodies, and carefully targeted research and extension services.

INTRODUCTION

At independence in 1960, though tribes and tongues differed, there was consensus on at least one strategic objective: the rapid development of Nigeria into a pride of the black race. The problem then, apparently, was that we were confronted with conflicting paradigms of development. There were two competing alien models: capitalism and socialism. There was also an indigenous model that was largely communalist, some form of pragmatic socialism, to borrow the words of a former regional premier.

The path the country subsequently followed was a strange variant of capitalism in which the Government retained a stranglehold on national trade and industry. In return, the people perceived Government as some extraterrestrial force divinely ordained to provide everything, from cheap cooking kerosene to free drugs in hospitals. Government was to be blamed whenever anything went wrong, be it rise in cost of garri or rain failure for the planting season.

Three or four decades ago it would have been unthinkable having the words deregulation and Nigeria on the same sentence. Today we not only find deregulation, we also find privatization, we also find commercialization. It is like, after decades of postponing the day of reckoning, we are finally coming to terms with an aphorism which states that the more you regulate, the less you get. Now my choice of title for this keynote address is reasonably justified: Nigerian fisheries at a time of economic paradigm shift.

Historical Perspective

In Nigeria, as in much of Africa, freshwater and coastal fisheries traditionally provide an important source of food and livelihood for many millions of people. In the last few decades human populations have been growing at a high rate, and so have the demand for fish. There have been profound demographic shifts and changing food habits, with more and more people moving to urban areas and acquiring enlightened appetites for protein foods. The fisheries resources themselves are being

degraded by unsustainable fishing practices and environmental pollution. Thus, available records in the last few decades show a marked decline in the per capita availability of fish. In many countries of Africa, the average diet contained less protein in the 1990s than in the 1970s (Dugan, 2003). It is only in Africa that this dramatic decline has occurred. Current supply-demand projections to the year 2020 show that the gap between supply and demand will continue to grow, even if current harvests of wild caught fish can be maintained and aquaculture continues to progress at the current rate (Ye, 1999).

There would have been little need to worry if other sources of protein supply were steady, or if Nigerian population was not growing at an alarming 2.8% (PRB, 2003) or if fish production itself was not threatened by environmental constraints. Virtually all our traditional protein sources are under severe pressure: protein supplies from wildlife is under severe hunting pressure, production of cattle and other ruminants is faced with the problem of diseases and dwindling pasture lands, while poultry production is highly constrained by high cost of production inputs. Our aquatic protein resources are also threatened by environmental degradation, notably, river siltation inland, oil pollution in the Niger delta region, and over-fishing in many fisheries.

The strategic imperative of developing culture fisheries to supplement the capture fisheries has been recognized by national planners in Nigeria.

CURRENT STATUS OF THE FISHERY INDUSTRY IN NIGERIA

The fishery industry in Nigeria can be broadly classified into two main categories, namely, industrial or commercial fishing and artisanal fishing.

a) Industrial or commercial fishing:

This is mainly marine and capital

From the first fish ponds in Pan yam (Jos), Agodi (Ibadan) and Umuna (Okigwe) over four decades ago, aquaculture has come a long way in Nigeria. Similarly, on Federal Government request, an FAO expert Dr. T.V.R. Pillay and his Nigerian counterpart Mr. S.A. Wokoma, in 1963 completed investigations on the possibility of reclaiming vast areas of mangrove swamps of the Niger delta into brackish-water fish farms. This FAO project was interrupted by the Nigerian civil war in 1967.

Though aquaculture production in Africa generally is still insignificant at the global level and accounts for only about 0.9 per cent (407,571 tonnes) of the total global aquaculture production (FAO, 2003), there is evidence of some sustained growth in aquaculture in such African countries as Ivory Coast, Egypt, Ghana, Malawi, Nigeria and Zambia (Jamu and Ayinla, 2003). For instance, production increased from 60,000 tonnes in 1990 to 340,000 tonnes in Egypt and from 7,000 tonnes in 1990 to over 20,000 tonnes in 1998 in Nigeria (FAO, 1999). However this progress is highly modest, almost insignificant, when compared to the domestic demand for fish.

The high domestic demand for fish coupled with growing export market for fish, the stagnation of inland capture fisheries and changing macro-economic environment in most of sub-Saharan Africa (Jamu and Ayinla, 2003) implies that investment in aquaculture can be profitable in Nigeria.

intensive. It is made up of coastal trawling, shrimping, distant-water trawlings etc. The sector is generally believed to be dominated by foreign trawlers on charter to Nigerian companies. Table 1 is a comparison of sectoral contributions to fish production in Nigeria. The output of the industrial

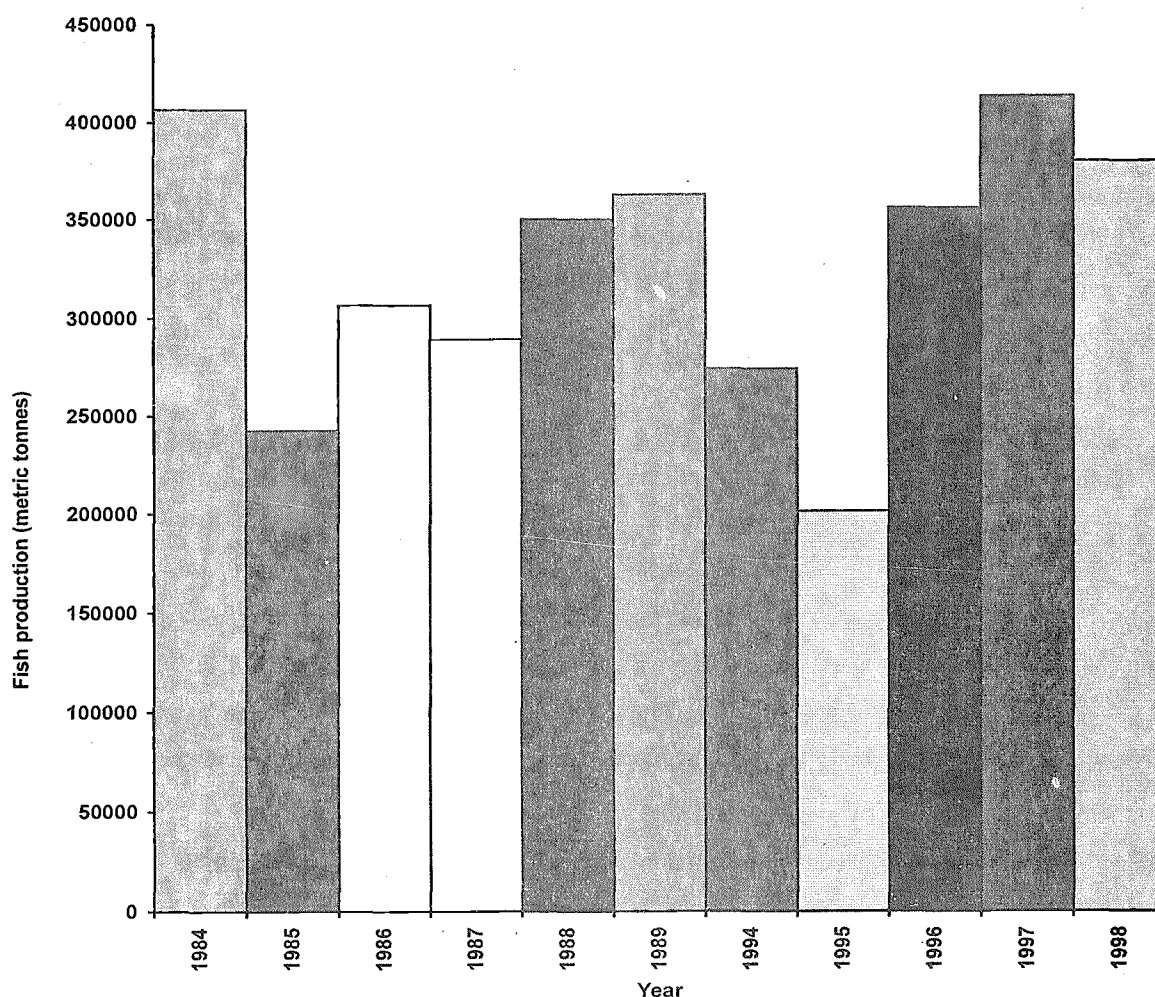


Fig. 1: Nigeria fish production (1984 1998)

Source: Fed. Dept. Fisheries, Fisheries statistics of Nigeria

TABLE 1 NIGERIA FISH PRODUCTION BY SECTORS

Metric tonnes

Sector	1994	1995	1996	1997**	1998*
ARTISANAL					
Coastal & Brackish water					
Inland Rivers & Lakes	124,117	142,279	138,274	175,126	157,534
Fish Farm: (Aquaculture)	110,476	26,642	170,926	185,096	172,591
INDUSTRIAL:					
COMMERCIAL TRAWLERS	18,104	20,753	19,490	25,265	20,458
Fish					
Shrimps					
Eel					
DISTANT (IMPORT 8)	21,707	1,473	15,425	15,326	17,314
	7,872	9,024	9,551	10,807	10,870
	718	823	2,268	1,570	1,291
	241,133	265,882	403,273	382,442	373,044
Total	515,127	466,876	759,207	795,632	753,102

Source: Federal Ministry of Agriculture

Notes: *Provisional

**Revised

sector is comparatively low. Based on the 1998 production records, the industrial sub-sector contributed 29,475 tonnes (or 3.9%) of the total fish output of 753,102 tonnes.

b) Artisanal fishing

This sub-sector is largely labour intensive and often of low productivity. Four categories of artisanal fishing include coastal canoe fishery, brackishwater canoe fishery, freshwater fishing and aquaculture. By far the bulk of Nigeria's fish production is contributed by this sector. According to the 1998 records, this sector accounted for 350,580 tonnes (46.6%) of the total fish output.

Excluding imported fish, this sub-sector accounts for about 92.2% of the total fish produced in the country.

The contribution from fish farming is still low, about 2.7% of total fish output. The number of fish farmers in the country is still low and most of them are subsistence farmers. So many reasons have been put forward for the poor adoption of aquaculture by small-scale farmers, but the fundamental cause is now widely recognized to be the failure of effectively integrating aquaculture into the farm economy (Harrison *et al* 1994; Brummet and Williams, 2000).

STAGNATING CAPTURE FISHERIES

With demand for fish increasing as a result of a fast increasing human population, it would have been wonderful if there was a corresponding increase in the capture fisheries. This has not been the case. The records (1984-1998) tend to suggest that, if anything, the output is stagnating (fig. 1). This observation is further reinforced by the records of fishing crafts and fishermen (Table 2). Between 1994 and 1997 the numbers of inshore trawlers, artisanal canoes (powered and non-powered) and

fishermen remained relatively stable, suggesting that the fishing sector is probably approaching a saturation point in terms of productivity and number of fishermen it can accommodate.

The supply-demand deficit will continue to widen in the future if current rate of human population is maintained. If present per caput fish consumption is to be maintained, or increased, then we must attack on two fronts:

TABLE 2 ESTIMATED NUMBER OF FISHING CRAFTS AND FISHERMEN

Year	Inshore trawlers		Artisanal canoes Fishermen			
	Fishing	Shrimping	Powered	Non-powered	full-time	part-time
1993	77	156	n.a	n.a	n.a	n.a
1994	74	230	16,037	61,036	264,577	193,198
1995	69	235	16,039	61,028	264,723	185,278
1996	57	196	16,039	61,028	264,446	193,107
1997	40	266	16,045	60,991	264,506	193,134

Source: Federal Ministry of Agriculture

a) We must enhance the sustainability of existing capture fisheries through sound management practices that will check over-fishing, protect major water sheds to check river siltation, protect coastal fisheries from oil pollution and

reduce other forms of environmental degradation;

b) We must expand the scope of both subsistence and commercial fish farming to achieve a spectacular increase in aquaculture output.

OPPORTUNITIES FOR PRIVATE SECTOR INVESTMENT IN AQUACULTURE IN NIGERIA

Overview

The demand for fish in Nigeria at present is about 756,000 tonnes out of which about 373,044 tonnes (49.5%) is imported. Based on projected population levels of 150.3 million in 2010 and 203.4 million in 2025 (PRB, 2003), the demand for fish in Nigeria will rise to about 960,040 tonnes in 2010 and about 1,297,000 tonnes in 2025, if we are to maintain a per caput consumption of 6.38 kg fish. What are the possible sources of fish to bridge the supply-demand gap? The output of inland capture fisheries is unlikely to rise further as few under-exploited systems remain and the catches have been leveling off in recent years, as already described. Although cheap marine fish is available for import, this situation may not continue for long because many major marine resources are over-exploited. Moreover no one can guarantee the availability of foreign exchange for such imports in the future. Thus the burden of bridging the gap lies with aquaculture.

With a long coastline bordering the Atlantic ocean and an extensive network of river systems inland, Nigeria has remarkable potentials for development of aquaculture. In the Niger delta area alone, Scott

(1966) estimated that there are about 729,000 hectares of saline mangrove swamp suitable for development of commercial fish farming. In addition, there are hundreds of hectares of flood plains, freshwater swamps and estuaries suitable for culture-based enhancement fisheries (Table 3). A more recent study (Kapetsky, 1995), using geographical information system (GIS) to identify areal expanses suitable for warm water fish farming in ponds in Africa, showed that Nigeria is one of the most promising countries for aquaculture. Of the 40 countries studied in Africa, Nigeria was the 3rd best in terms of available land for subsistence fish farming. With regard to potentials for commercial fish farming, Nigeria was classed as 2nd best after Zaire (fig. 2). Nigeria has over 800,000 km² suitable for subsistence fish farming and over 400,000 km² ideal for commercial fish farming. Furthermore, Nigeria falls within the highest category of aquaculture productivity where two good crops of fish per year is possible.

Private sector investment is therefore feasible in commercial fish farming enterprises, which include the following:

TABLE 3: CLASSIFICATION OF THE NIGER DELTA AREA BY SCOTT (1966).

Zone	Area (km ₂)
Dry land (may be undated during the floods)	5,248
Freshwater swamp	3,571
<i>Saline swamp</i>	4,989
Rivers	671
Saline creeks	988
Estuaries	681

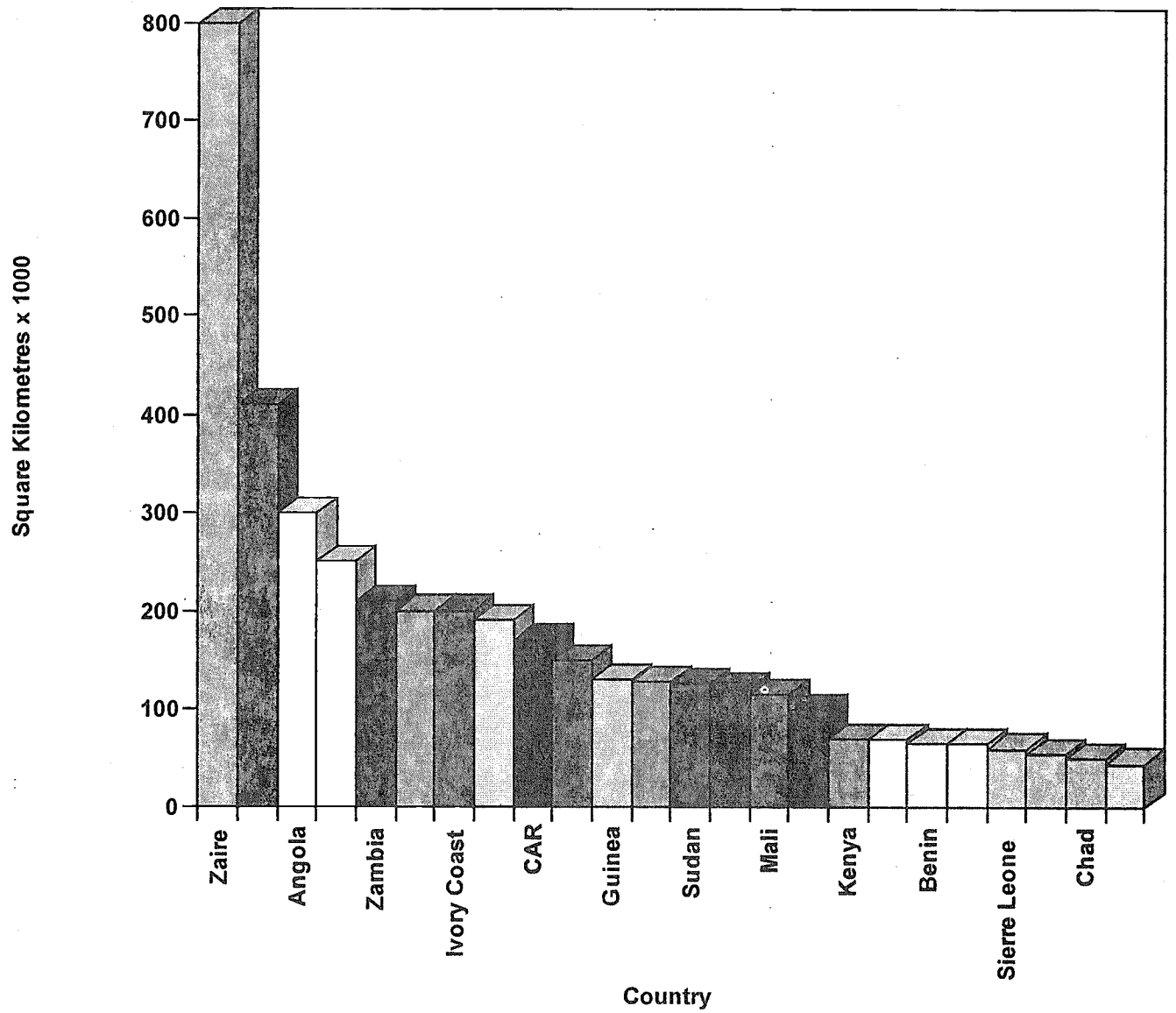


Fig. 2: Potential as land area by country commercial fish farming
(Adopted from Kapetsky, 1995)

- a) Fish production using conventional production systems like earthen ponds;
- b) Fish production using more intensive and sophisticated systems like cages and recirculating concrete tanks;
- c) Establishment of hatcheries for production of high quality fish fingerlings.
- d) Investment in integrated culture systems such as fish-pig, fish-duck and fish-rice (rizipisciculture);
- e) Production of ornamental fish species for private aquaria and public places such as hotels;
- f) Development of recreational parks where sport-fishing is the main attraction.
- g) Production of fish feeds;
- h) Mass production of pre-fabricated culture systems such as cages and fiberglass tanks;
- i) Consultancy services especially on site selection and fish farm construction.

Earthen Ponds

At present, earthen ponds are the dominant production system in Nigeria. They are relatively cheap to construct and several hectares of land can be easily converted to fish ponds. Size of individual ponds could range from about 200m² to over 1.0 hectare. Commercial scale earthen pond complexes can be over 100 hectares. The major constraint to their construction is in site selection. Earthen ponds are only possible on claying soils with good water retention capabilities. In addition they need a perennial water source. When cited on gently sloping ground, water supply and drainage can be achieved by gravity thus making running costs of such ponds to be low.

These ponds are suitable for both subsistence level and commercial aquaculture. Fish yields from them depend on the production intensity and efficiency. An average yield of 1,450 kg/ha/yr has been computed for such ponds under subsistence level conditions (Kapetsky, 1995). Under commercial scale management involving intensive feeding, yields of 2,500-10,000 kg/ha/yr are

possible.

Fish culture in cages

Cage culture of freshwater, brackishwater and marine fish species has attained a high commercial scope in many developed countries, especially in Europe. Fish production in cages is more suited for the commercial investor because it is capital-intensive as a result of the high cost of cage construction, total dependence of formulated feeds and high cost of procuring fish fingerlings for stocking the cages. Cages may be constructed with twofold sieve cloth or wire netting. Galvanized and welded-netting are best suited for brackishwater (Bard *et al*, 1976).

Technical partnerships between Nigerian investors and foreign technical experts will be ideal. Commercial viability of cage culture in Nigeria can be enormously enhanced if attention is focused on export-oriented production. Cage culture is not yet popular in Nigeria but preliminary trials show that cage culture can contribute to rural incomes and fish production. When artificial feeds are used, yields of 20-30 kg of fish can be realized per m³ of cage (Bard *et al*, 1976). Experience in Asia shows that small cages can provide rapid returns on investment in situations where there is no access to land for pond construction (Hambrey *et al*, 2001).

Culture based fisheries in floodplains

A lot of opportunities exist in Nigeria for development of aquaculture in floodplains, lagoons and lakes. Management of this kind of culture involves stocking, protection and supplemental feeding of fish in enclosures, temporary pools, channels etc. Enclosures are necessary for effective control of fish in this culture category. Such enclosures may be made with a bamboo fence, or plastic wire netting, or reinforced polyethylene sieve-sheets, or galvanized/welded wire and are usually located in shallow bays of 1-2m deep.

Fish yields are generally low per unit land area but

when large areas of flood plains are managed this way, aggregate production can be enormous. Fish yields from floodplain fish culture general fall in the range 300-1,700 kg/ha/yr (Dey and Prein, 2002; Chikafumbwa *et al*, 1998).

Recirculating Tank System

With steady population growth and consequent steady decline in per caput arable land, there is no alternative to intensivism in our approach to agricultural production. Intensive aquaculture in recirculating fiberglass or concrete tanks is a worthwhile commercial investment. Such recirculating systems can be cited in relatively small space where fish stocked at very high densities are sustained by complete feeds, aeration and water treatment.

Both capital and running costs of recirculating systems are high. Under good management conditions, the high capital outlay is more than compensated by the high production intensities. Ideally, recirculating culture systems should be cited near urban areas where they will enjoy infrastructural facilities like electricity and good roads, as well as have access to the urban and semi-urban fish markets. In Nigeria there are a few intensive recirculating systems stocked with African catfish (*Clarias gariepinus*) and carp (*Cyprinus carpio*). Yields from such systems can exceed 50 kg fish/m³/year.

CONCLUSION

Those who still argue in favour of continued direct participation of government in agricultural production, be it maize or fish, are already historically too late. The global paradigm shift towards greater privatization of commercial production looks irreversible. The shift we are witnessing now is much more than a tactical shift; it is a strategic imperative. Nigerians are still savouring the magic of the privatization of the

Fish Hatcheries

The most crucial input for fish production is fish fingerling. For commercial fish production to be viable, there must be steady supply of fish fingerling with good culture characteristics. Stocking one hectare of earthen fish ponds, for instance, needs more than 20,000 fingerlings. Higher stocking densities are needed for more intensive culture systems like recirculating tanks and cages.

Culturable fishes with high demand for fingerlings in Nigeria include the African catfish (*C. gariepinus*), *Heterobranchus* sp, the common carp (*Cyprinus carpio*) and the tilapias such as *Oreochromis niloticus*.

Sport Fisheries

Apart from production of highly prized aquarium fishes for homes and public places like hotels, there are opportunities in Nigeria for development of sport or recreational fisheries. Large stretches of rivers can be rented and developed for sport fishing. The interest in sport fishing is not consumption of the fish but the excitement of trying to hook a fish in a highly serene environment. It is one of the most relaxing of sports. When developed on a large scale it has a potential to generate employment and boost tourism. With the high prevalence of blood pressure related health disorders in Nigeria, there is definitely a large market for sport fishing recreational parks in Nigeria.

communication sector. In less than two years of operation, over 2 million lines were for sale and tens of thousands of employment opportunities were created. The short termist fears of privatizing the petroleum-refining sector are understandable. But every cloud has a silver lining. Those short term fears should not cloud the long term prospects of efficiency of production, elimination of corruption in the system, and the inevitable stabilization of

prices in the future.

We are advocating this same seriousness in private investment in aquaculture, not only to meet domestic demands but also as a means of earning foreign exchange. If government can disengage from activities that can be best done by the private sector, the government will concentrate better on improving general infrastructural facilities that are not the responsibility of the private sector. Specifically, government can do the following to encourage more private sector participation in aquaculture.

- Compared to most agricultural production systems, aquaculture is capital intensive and takes a long preparatory and establishment phase. Government needs to re-invigorate its agricultural loans facilities to potential fish farmers. These loans will achieve optimum results when given only to potential fish farmers with pre-requisite technical competence.
- Offering technical assistance to potential investors in such critical tasks as site selection, pond construction, export promotion etc. is very necessary. For instance, site selection is the most crucial step in establishment of large fishpond complexes, especially earthen ponds. The results of most GIS surveys on potential aquaculture sites are indicative rather than definitive. Government can embark on more detailed, higher resolution studies at national or sub-national levels so that ideal culture sites can

be rapidly identified for potential commercial fish farmers.

- Sustainable aquaculture production will not be possible if our natural water bodies continue to be subjected to the present levels of degradation. The more the watersheds of our rivers and streams are abused with irresponsible construction works, the smaller these water bodies will get. Many of our streams have disappeared. Many others are a mere shadow of what they used to be. Government needs to be more aggressive in enforcing environmental laws. This same level of concern should go to biosafety. Some of the genetically enhanced fish species produced in our hatcheries, and introduced into fishponds, may actually escape into our rivers. We need to know the environmental impact of these aquaculture escapees.
- Government fisheries stations can concentrate more on carefully targeted research and extension services. For instance we need to identify and design ways to overcome technical, economic and social constraints to aquaculture development in Nigeria. If farmers are to integrate aquaculture into the farm economy, various government fisheries establishments have a leading role to play in the introduction of simple, more readily adopted and more adaptable approaches to aquaculture based on a comprehensive understanding of the peculiarities of our rural economy.

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