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FISHERIES DEVELOPMENT IN NIGERIA WITH SPECIAL REFERENCE TO CROSS RIVER STATE.

BY

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ABSTRACT:

The paper appraises fisheries development in Nigeria with specific reference to Cross River State and the problems militating against increased fish production. The potential for developing the industry to supplement the low level of animal protein consumption in Nigeria is discussed as well as the import of a vibrant fishery industry in contributing to employment and international trade. The need to legislate on fisheries activities while enforcing the existing laws for sustainable exploitation of the fisheries resources is elaborated. Similarly, the need to maximize the proceeds from Nigeria's Exclusive Economic Zone (EEZ) by protecting the operations of this economic sector and other unauthorized fishing practices is elucidated. In view of the present situation where most of the country's water bodies have been over-fished, more attention and emphasis should be placed on aquaculture development. The paper also proffers recommendations to boost fish production in capture and culture fisheries.

INTRODUCTION:

The existence of enormous water bodies offers great potentials for the development of the fishing industry in Nigeria. Nigeria has maritime area of 46,300km^2, an Exclusive Economic Zone (EEZ) area of 210,900km^2 and 12.5million hectares of inland waters. Despite this endowment, the current fish production level of less than 400,000metric tons a year is short of its requirements in order to meet its needs, Nigeria requires at least 1.5million metric tones of fish in a year. At present, about 50% deficit in supply of fish requirement is met through importation. This importation translates into huge avoidable drain of Nigeria's scarce foreign exchange. This could be avoided if the available water bodies in each of the 36 States of the country are properly managed for increased fish production.

Cross River State as an integral part of Nigeria is connected with the neighbouring waters of South Western Republic of Cameroon and situated in a river estuary of 1500km. Holzlohner (1999) reported that Cross River has the biggest estuary mangrove system in West African Coast and it is probably the most untouched in the world. The state is therefore blessed with enormous marine, brackish and freshwater bodies capable of holding and sustaining abundance of fin and shellfish resources. In spite of her being a coastal state with abundance of fisheries potential, fish landings are low due to poor management of fisheries resources of the state. As an insight, Cross River State, thirty-three years after its creation has no legal instrument for controlling haphazard exploitation of her fisheries resources. It is disheartening to note that, despite the shortfall in fish supply, post harvest losses have increased to about 40% due to spoilage a situation which has resulted from poor handling, poor preservation and limited processing. Poultry production (eggs and meat), which hitherto supplemented the imbalance between animal protein supply and consumption, has declined. It has therefore become imperative to address the problems of fisheries development.

The aim of this study is to examine the problems and prospects of the fishery industry in Nigeria with special reference to Cross River State and make appropriate recommendations.

The fisheries of Cross River State like most other fisheries can be broadly divided into two groups: Marine and inland capture fisheries and Aquaculture.

Background Information:

As an insight, fisheries development began in 1914 in Nigeria when the first Fisheries Office was established as a component of the Agricultural Office of the colonial administration. In 1945, a Fisheries Officer was appointed and charged with the responsibilities of exploratory fishing fishery survey and experimental fish culture. The establishment of Panyam fish farm in 1951 marked the beginning of fishpond culture in the inland area while an experimental fish farm was established in Onikan, Lagos about the same period. From 1954 onwards, fisheries service operated under the Ministry of economic Development in Lagos. It became a department in the Ministry of Agriculture and Rural Development in January 1970 following the advice of FAO. In 1976 three fisheries "Research Institutes; namely the Nigerian Institute for Oceanography and Marine research Lagos; Kainji Lake Research Institute and Lake Chad Research Institute were established. Fisheries attracted no attention during the ten year Development Plan (1945-54) period. The colonial British government ten-year development plan, focused on the cultivation of cocoa, rubber, oil palm, cotton and groundnuts. This situation became worse when regional governments of Northern, Eastern, and Western provinces were created.

Marine Fisheries:

Cross River State is a coastal state with the hinterland having an outlet to the sea through the mouth of the Cross River Fishing in the whole of Nigeria's territorial waters and the exclusive Economic zone (EEZ) is open to all Nigerian citizens. Marine fish catch comes from (a) the artisanal fishermen operating in the Ikang zone near the Cameroon border, (b) Fishermen fishing in the Oron Utan Brama area of Akwa Ibom State and (c) fishermen operating in the estuary and brackish waters of the Cross River system. Some of the fishermen in the Ikang zone settle in the Bakassi Local Government Area, but gendarmes are constantly molesting them. Moreover, recent diplomatic moves by the Government of Cross River State (Nigeria) and Cameroon are yet to bring about the expected peace at the border that could allow fishermen from both countries operate freely in the zone. In addition, the high cost of fishing inputs reduces the productivity of the marine fisheries of this zone. Antia *et al.* (1993), numbered 59,714 sea fishermen using 17,706 canoes, and gill nets of various meshes (ranging from 63.5mm-66.7mm) for fishing bonga and shad, while using nets greater than 152.4mm for large fish and shark. Gillnets were used mainly for demersal fish and as encircling net for coastal pelagic fish, bonga *(Ethmalosa fimbriata)* and shad. The marine fisheries of Cross River State remains almost entirely at the small scale (subsistence and artisanal) level and are carried out mainly by fishermen from Calabar and Odukpani LGAs. Some fishermen from Akwa Ibom State also land their catches in Calabar, which include the demersal catfishes *(Chrysichthys, Arius)*, sole *(Cynoglossus spp.)*, croakers *(Pseudotolihus spp.)*, shinyhose *(Polydactylas)* snappers *(Lutjanus spp)* and the coastal pelagic bonga and shad.

In 1988, the only industrial (trawling) fishing company operating in Calabar was Eyib's Nutritional Food enterprises Ltd. This company had management problems. The staffs were inadequate and not dedicated. There was a dire need of spare parts. Consequently, company could not break even. Industrial fisheries contribution to the states fish output is at present negligible.

Inland Fisheries.

Cross River State despite the fact that 40km of the southern part of it is boarded by the Cross-River estuary, is also a hinterland state. The most important river is the Cross River, which flows into the Cross River estuary having an approximate area of 580km2. It is subject to seasonal flooding which occurs between July and October. The effective flood plain area is estimated at 2,500km and this lies in the middle course of the river. Other rivers, which are Kwa River, the Calabar River and Aya/Afi River, offer another considerable scope for inland fisheries development. The fishes of these rivers include catfishes, *(Chrysitchys spp.). Tilapia, Mormyrid spp.. Heterotis spp., Citharinus sp, etc.* The ever-present swamps, lakes, natural ponds, and brackish water are suitable for the culture of different cultivable fish species. Over the years, Cross River State Government has tried to introduce modern methods of fish farming to the public through extension services.

Aquaculture Developments.

There had been some awareness of the art of aquaculture in the state in the last 10years. Eyo *et al.* (1994) estimated that the number of practicing fish farmers had increased from 20 to 1,000 in 1994. This had dropped in recent times. There are about 200-recorded fishponds owned by the State Government, private farmers, Educational Institutions and Communities in the State. The Nigeria Association of Fish-farmers and Aquacultirsts (NAFFA) in the State have just been revived and is now a fertile forum for sharing the new ideas in aquaculture among farmers and researchers.

Most of these farmers however have a common problem, which is, the dearth of fish fingerlings. A large number of them depend on the supply of fingerlings from UNICAL Fishfarm hatchery, which is the only functional hatchery in the State, and this cannot meet the demand. Cross River State Government in collaboration with DFRRI in 1989-91 started the construction of two fish hatcheries in Bekwarra and Ibonda in Odukpani Local Government Area. At the two sites, the hatchery houses, ponds, troughs

and equipment were provided. These hatcheries have not been completed and put to use due to lack of funds. Considering the hectarage of fish farms and reservoir of water bodies in the state requirement is 20million fingerlings a year. Presently, because of the inadequacy of fingerlings supply, farmer's travel to Jos, Port Harcourt, Owerri and other distant places to buy fingerlings. Fingerlings that are often stocked are *Oreochromis noliticus (Tilapia). Heterobranchus. Mugil sp* (Mullets).

There is no functional fish feed factory in the state. Farmers depend on their homemade fish feeds, or buy expensive pelleted fish feeds from Livestock Feeds in Aba, Abia State.

Fertilizer:

These are occasionally available but the process of buying a few bags from government agencies is sometimes arduous as such the average farmer is forced to buy at the expensive market prices.

Labour:

Labour is always available in both urban and rural parts of Cross River State. The cost however varies from place to place. For example, while it may be N400 per day for pond construction in Calabar, in Obubra, a farmer may use his age grade to assist him and pay in kind by drinks or food. In summary, the main constraints to aquaculture development in the state include lack of capital, insufficient personnel trained in pond construction and hatchery management, inadequate data with respect to aquaculture, difficulties in the procurement of fish farm inputs and insufficient supply of fingerlings.

Fish Processing/Preservation.

Fish processing in Cross River State as in other parts of the world is an old tradition. It is not only a measure of conservation but also contributes to satisfy the tastes of consumers. Processing of fish here is seen as preparation of fish for preservation. The most commonly practiced methods of preservation and processing are smoking, salting, and cold storage.

Preservation of fish is necessary because it is impracticable to market live fish over a long period of time. Fish spoilage sets in, shortly after the death of a fish. As the fish caught are exposed to high ambient temperature which may range from 30°-35°c, spoilage is rapid, deterioration due to action of bacteria and autolytic enzymes in the fish sets in. Within 12-18 hours of capture, the fish would become unacceptable.

If fish is landed in a spoilt state, no method of preservation will improve its quality. In Cross River State, the major fish preservation method is by hot smoking.

Marketing and Distribution:

There are two major markets (a) consumer market (b) industrial market. Fish in CRS is mainly caught and landed by artisanal fishermen and is marketed in the form of fresh fish i.e wet, chilled or frozen, dried fish i.e. smoked fish, mangalla etc. The marketing process of agricultural outputs such as fish is continually changing in its organization and functional combinations. The marketing of the outputs is the series of events that take place as the product moves to its consumer's destination. The structures of the activities that come under the organization constitute merely the skeleton; while human action provides the nerves and muscles.

Local Markets System

The primary concern of fisherman is to land good catch and keep it in good condition for market. It is then sold to consumers or middlemen after working all night. The delay in landing of fish may lead to spoilage. If spoilage sets in, such fish is normally dried or frozen by marketing managers before being sold to the consumer. Some consumers prefer some of the rancid or putrefied fish, which is known as "bad" fish, as a special delicacy. So in the market, some consumers are seen struggling for such fish.

State Laws, Edicts Regulations/Local Government By-Laws.

It is matter of great concern that Cross River State has no state law regulating the exploitation of the Fisheries resources in the State. Since the creation of Cross River State, the fishermen have nothing to guide them in their fishing activities.

Some Local Government councils e.g. Ikom and Akpabuyo have by-laws that are mainly for revenue generation, these include paying canoe license and daily market ticket payment. They are not concerned with the fisheries resources management, exploitation, and conservation. A draft bill had been prepared by the State Fisheries Department in October 1999 and hopefully the Cross River State House of assembly will pass the Bill. The proposed law takes into consideration mesh sizes of fishing nets, fishing seasons, obnoxious fishing methods etc.

Sponsorship of Catch.

The usual practice in the maritime or coastal areas is that the fishermen are said to be employed by some shylock money lenders or by fish mongers benefactor who provide him with either cash or fishing inputs in kind on tenure and conditions that are favourable to the lender. The entire catch for the fishing season would be sold at a uniform market price until their entire loan plus possible interest on the loan is paid. Fish for his daily meal is under rigid check by the sole benefactor. In such a situation, the general practice by the Fisherman is to play a hide and seek game with his master. He seeks a temporary market source where the briskly sells off much of his

catch at below current price index before delivering the remainder to the investor. These illegal sales may be at sea or creeks. Sometimes the fishermen or mongers buy second hand clothes, kerosene, soaps etc for the fishermen who in return secure their catch for their masters. In some instances, the effort of the fisherman is under paid for, by the fish traders.

Cross River State Government Policy on Fishery Development.

The Cross River State Policy on Fishery Development and programmes executed to realize the policy, is based on the identified problems in the fisheries sub-sector. The main government Policy on Fishery Development is centered on increase in fish production in the State. The objectives vary from one plan period to another. The objectives of this sector can be summarized as follows:

Funding:

Every year, funds are allocated to various fishery projects but the funds are not released. It is only the present administration that has taken up the Fisheries Projects in terms of allocation of funds and release. According to the Ministry of Finance, a total sum of N5m is expected to be released in two instalments N3.5m first quarter and N1.5m second quarter of year 2000.

Cross River State Agricultural Loans.

The amended edict of 1984 on Agricultural loans law included fisheries in the scheme in Cross River State Agriculture Loans Board (CRSALB). The Director of Fisheries is a member of the board. According to the amended edict the conditions for loan are the same in all the agricultural sub-sector. All these loans are highly dependent on the availability of the applicant security and funds released by government.

Individual loans were put at a maximum of ₦50,000 while the group maximum is N100,000. Fisheries loans granted are in the area of pond culture alone. The artisanal fisherfolk are excluded despite the fact that they produce over 80% of fish landings. The loans are categorized into three smallholder-revolving loans of ₦1,000 to ₦10,000 with the acceptance of a third part. The medium term loans of ₦10,000 - ₦15,000 with acceptance of customary rights of occupancy while the long term loans of any amount up to a ₦100,000 requires certificate of occupancy. The security on these loans has to be 100% because the board is not a financial institution. The board gets her money from government grants, commercial, development and merchant banks in line with the current interest rates.

The loans when taken are meant to be paid within 3 years. The snag in the granting of fisheries loans is in the low-level awareness of the farmers, the non-availability of fund, the security requirement of the applicant and the bureaucracy. Consequently, for 16 years existence of the cross River State Agricultural Loans Board, no fish farmer till date has benefited from this provision.

Staff Training / Development.

The fisheries development department being one of the departments in the Ministry of agriculture has not been benefiting from State Government Manpower development pursuits because the State Government on her own has done very little in this direction. The Federal government through the IFAD/AFDP Project carried out a greater percentage of the training over ten years ago. The project provided training on human resources development under the central project co-ordinating office at Abuja.

PROBLEMS OF FISHERIES DEVELOPMENT.

These problems are categorized under the following headings namely:

(a) Problems associated with fish production
(b) Problems of preservation and processing
(c) Problems of marketing and distribution
(d) Problems of Institutional responsibilities
(e) Environmental problems, and
(f) Human factor problems

Problems Associated with Fish production.

Fish production in Nigeria comes from three main sources; namely artisanal (Marine and inland), industrial and aquaculture. According to Gaffar (1999), the artisanal fishing operation is tedious and characterised by low individual productivity. These artisanal fisher folks usually operate within a few nautical miles in the non-trawling zone of the Atlantic coast. Most of them operate more along the creeks, rivers, lagoons, peninsula and natural and artificial (man made) lakes. Some of the fishermen use motorised canoes, which has extended their range of operation and has enhanced their production. At the moment, this sector accounts for 80% of the total fish production.

Capital/Funding:

Cross River State alone in 1987 contributed 40% of Nigeria domestic (marine) fish production. Since then the total annual fish production had declined. Indeed, actual data from Federal Office of statistic show that in 1987, the annual growth rate of fisheries was 1.20, but in 1988 it dropped to - 30 (Federal Office of Statistics, and office of planning estimates). The decline was due to the introduction of Structural Adjustment programme (SAP) where government divested herself from agricultural production leaving it in the hands of the private sector. The depreciation of the Naira, inflation, the decline in purchasing power and the rise in the cost of fishing input and other basic needs were all contributory factors to the decline in production. One of the identified constraints

to increase artisanal fish landing is the high cost of fishing inputs such as outboard engines, nets, hooks, etc. Although fishermen are capable of landing substantial quantities of fish daily, they lack the requisite capital for acquiring the major input. Fishing input requirement for fishermen in major rivers like the Cross River, Niger, and Benue; ranged from N84,000.00 to N145,671.00 (Ita, 1999). The problem of funding also extends to aquaculture (fish farming). It is interesting to note that it cost as much as N1.5 million to establish one hectare of fish farm in Calabar North Local Government Area of Cross River State. This amount consist of cost for land acquisition and development, pond construction, water facilities, fish-farm equipment, fish feed ingredients, procurement of fingerlings, liming, provision of fertilizer and the cost of manpower (see Table 1). This amount could be tripled if concrete ponds are to be constructed. Fish farming is therefore capital intensive.

Table 1: Estimate for establishing a one (i) hectare fish farm call North L.G.A. Cross River State.

A. CAPITAL cost

1. Land Development

Item		Qty	Unit Cost	Total cost (N)
1.	Land Clearing	1½ha	7man-days/N200/day	2,000
2.	Felling and stumping of trees	1½ha	4 man-days/N400/day	2,400
3.	Parking and burning	1½ha	3man-days/N200/day	900
				5,400
2.	**Pond Construction**			
1.	Excavation of ponds	1ha	N160/2m2	800,000
2.	Building of embankment	1080m3	N100/2m2	54,000
3.	Supervision			30,000
				884,000
3.	Water Facilities			
1.	Pvc pipes (10cm diam)	40	400	16,000
2.	Pvc T. Joint (10cm diam)	10	100	1,000
3.	Pvc elbow Joint (10cm diam)	10	100	2,000
4.	Pvc pipes gum	2tins	500	1,000
5.	Cement	3 bags	500	5,500
6.	Sand	1 trip	2,000	2,000
7.	Installation (workmanship)		10,000	10,000
8.	Transport		5,000	5,000
				36,500
4.	**Fish Farm Equipment**			
1.	Harvesting net	1	30,000	30,000
2.	Wheel Barrow	2	4,000	8,000
3.	Head pans	22	500	11,000
4.	Shovels	2	1,500	3,000
5.	Matches	2	800	1,600
6.	Hand Grinder	1	4,000	4,000
7.	Weighing balance		15,000	15,000
8.	Transport			3,000
				75,600

Source: Cross River State Department of Fisheries, Calabar.

B. Recurrent Cost (Operation and Maintenance Cost)

1. Fish feed ingredients

Item		Qty.	Unit Cost	Total cost (N)
	Groundnut	2bags	5,000	10,000
	Rice bran	5bags	1,000	5,000
	Maize	2 bags	3,500	7,000
	Crayfish waste	2 bags	4,000	8,000
	Fish offals		5,000	5,000
	Transport		5,000	5,000
				40,000
2.	**Fish seed**			
	Heterobranchus fingerlings	15,000	N20	300,000
	Tilapia fingerlings	5,000	N10	50,000
	Transport			5,000
				355,000
3.	**Liming**			
	Agriculture lime	2 tons	5,000	10,000
	Transport		5,000	5,000
				15,000
4.	**Organic fertilizer**			
	Poultry manure	3 tons	900	2,700
	Transport			2,000
				4,700
	Manpower cost			
	Day watchman	1	3,000	36,000
	Night watchman	1	3,000	36,000
	Pond attendant	1	3,000	36,000
	Fisheries expert	1	3,000	36,000
	Allowance			**144,000**

Grand total recurrent cost (BN) = N556,700

Overall grand total A + B = N991,500 + N556,700 = 1,548,200

Source: Cross River State Department of Fisheries, Calabar (2000).

Fishing Laws/Regulations:

Lack of enforcement of Federal Fishing Laws and lack of relevant State Legislation to regulate and control fisheries activities is another problem affecting fishing industry in Cross River State in particular and Nigeria in general. The Sea Fisheries (fishing) regulations of 1972, bans all fishing trawlers within 2 nautical miles from the coast or in waters shallower than 20m depth (FAO, 1986) with the aim of eliminating competition between the artisanal and industrial fisheries. Trawler operators do not respect this regulation. Lowenbergy and Kunzel (1991) reported on a study of the commercial trawl fishing within the Cross River estuary in 1986. This illegal exploitation of the artisanal fishing grounds by trawlers in the absence of adequate enforcement is responsible for the destruction of artisanal fishing gears (IFAD, 1988). The use of 76mm minimum cod-end mesh size as stipulated by law is not adhered to. This use of wrong net results in the capture and death of much juvenile fish. Lowenbergand and Kunzel (1991) also observed from their investigations that most trawl nets used in Nigeria are with 44mm cod-end-

mesh size. IFAD (1988) attributed the suddent drop in the artisanal landings in Nigeria in the early 1980's partly to these artisanal and industrial fisheries shifting from demersal to pelagic fishery (for bonga and sardine) where there is no competition. It is however the responsibility of the federal Fisheries to enforce these regulations in order to ameliorate social crises that results from collapse of fisheries leading to unemployment, lack of fish and the need to import all our fishery requirements. It is unfortunate that, since the creation of South Eastern State in 1967 until now, there is no law regulating the exploitation of fisheries resources in the state. It is just recently that a bill was sponsored by the fisheries department and forwarded to the state house of assembly. This situation brings to focus the next problem of institutional responsibilities.

Institutional Responsibilities.

The various Insitutions concerned with fisheries management issues in Cross River State include:-

- The State Fisheries Department (SFD) in the Ministry of Agriculture; .
- Federal Department of Fisheries (FDF);
- Cross River Agricultural Development programme (CRBDA);
- Cross River Basin Development authority (CRADP);
- The University of Calabar, and
- The college of Agriculture.

The administration, management and planning of fisheries in the Cross River State are the primary responsibility of the State Fisheries Department (SFD). The SFD initiates programmes, sometimes in collaboration with other agencies such as CRADP, NACB etc. Since the inception of Cross River State, lack of fisheries data is a major constraint to fisheries development because planning, research and proper management depend largely on availability of fisheries statistical data. Lack of statistical data results in haphazard exploitation of fisheries resources, poor planning and a decline in fish production. Along with its array of programmes, the CRBDA had been involved in fisheries development projects. Their involvement in the construction of dams for irrigation provided large bodies of water for fish farming. Previously, it used to maintain a fleet of medium sized trawlers - the popular "croakers" series. It also had many aquaculture sites, but due to Federal Government policy of divesting in direct production, the level of activities in fisheries is negligible. Consequently, this institution is unable to contribute effectively to the development of the fisheries sub-sector.

Environmental Problems:

The importance of aquaculture development in the state cannot be over stressed. It is necessary to supplement the fish yields from natural waters, provide alternative employment to would-be fishermen thereby reducing pressure on natural fish stocks or to occupy the fishermen during their off-fishing period. Aquaculture may be an element in our rural development and poverty alleviations schemes. Despite the little awareness that was created sometimes ago with respect to fishponds, out of 1000 fishponds in the state, only 200 are now functional. Part of the problem encountered by fish farmers was high seepage of water. Accurate estimation of permeability is therefore an important factors in the choice of pond site. It is an important requirement in ground water development. Along with porosity and specific yield, permeability is used to assess the performance of an aquifer. Edet (1993) determined the permeability of some localities. From this study, Edet developed hydrogeological maps of Cross River. These maps are invaluable for a meaningful evaluation of ground water resources of the whole state. Acquisition of such data is quite expensive and the lack of funds for such detailed field studies remains major set back to the development of underground water resources in the state. Consequently, the sustainable development of fishponds has been constrained.

Increased Pollution Levels.

Petroleum product spillage and pollution of the coastal areas is becoming a threat to the mangrove vegetation. Table 2 shows the oil spill record of ELF petroleum Nigeria Limited and SHELL petroleum D.C. In the Niger Delta between 1995 to year 2000.

Table 2: Oil Spill Record in Niger Delta between 1995-2000.

Year	NO OF OIL SPILL	
	1	2
1995	23	300
1996	16	250
1997	19	260
1998	12	260
1999	16	320
2000	5	NA

Source: 1. Oil spill prevention and combating by ELF petroleum Nig. Ltd.(2000).

2. SPDC & The Environment in the Niger Delta or Performances Review (2000).

Althought much work has not been done in this area, only specific investigations on the crabs in the Cross Rivers estuary are available. Ewa (1988, 94) worked on the influence of simulated crude oil spills on the mangrove swamps of Bonny Estuary on crabs., Three days after the spill, the bigger crabs disappeared. Thus increased pollution level in the Cross River State is a problem of fishery industry.

Water Hyacinth.

According to Daddy, et. al., (1999) water hyacinth *Eichhornia crassipes* is a native of Brazil in South America and has spread to many aquatic systems in Africa. Akinyemiju (1987) reported first appearance in Nigeria The exact extent of its spread is still being investigated, Apart from its economic cost on water transportation, water hyacinth upsurge in Cross River has disrupted fishery activities, because they make net casting and line laying very difficult. However further research carried out during this study shows the economic viability of water Hyacinth.

Human factor problem.

Human factor problem include high rate of pilferage and proaching. Madueke (1989) reported that it is common practice for some fishing vessels to illegally sell their catches to large canoes at sea. The proceeds of such sales accurue to unscrupulous crew at the expense and detriment of the fishing company. This practice had rendered some fishing company operation unprofitable and unbearable thereby showing the growth of fish production. In addition to pilferage, Eyo *et al.* (1994) reported of poaching the fishponds. This practice also is partly responsible for poor harvest on fish farms. The consequence is that, fish farmers are frustrated and discouraged because they cannot break even. Accordingly, such fish farmer considers fish farming unprofitable.

Another human factor problem is mismanagement. It is widely experienced by fish farm proprietors unfortunately; most fisheries technocrats have no expertise in business management. The practice therefore is to restrict the fishery expert to the field while the ignorant administrator manages the project. It is also true that attempts made at placing the technocrats in managerial position had resulted to mismanagement and total collapse of the enterprise. It is author's view that business management should be incorporated in the curriculum of fisheries studies of our tertiary institutions.

Ita, (1999) observed that if a minimum of 1,000 private fish farmers, each managing about five hectares of fish farm could be mobilised in each state including Abuja, a total production of a over 450,000m.t. of fish a year could be achieved. The answer to increased fish production therefore lies in intensified fish farming.

Recommendations and Conclusion.

It is against this background that the following recommendations are proffered so that the fishery industry would attain substantial growth.

1. Governments at the three tiers should perform their supportive, regulatory, stimulatory and supervisory roles in fisheries development.
2. All the various institutions concerned with fisheries industry such as Federal and State department of fisheries, ADPs River Basin Authorities, National Institute for Freshwater fisheries Research, Oceanography and marine research etc should be adequately funded to enable them discharge their

responsibilities towards fisheries development.

3. The Central Bank Agricultural Credit Guarantee Scheme should be revisited and reviewed to give more attention to fisheries sub-sector of agriculture.
4. Community and agriculture Banks, State Agricultural Loans Boards etc should consider and make available funds with one unit interest rate and long term repayment plan to the fish-farmers.
5. Fisherfolks, fish farmers, fish processors and fish distributors should constitute themselves into viable cooperatives in order to obtain micro-credits from these banking institutions.
6. The Fisheries Society of Nigeria (FISON), Federal and State Governments should create further awareness in aquaculture.
7. The Legislative Houses at Federal and the State levels should enact laws with heavier and stricter penalties so as to discourage the use of obnoxious methods (chemicals, explosive) for harvesting fish and illegal industrial fishing and shrimping with trawlers, control of aquatic pollution and degradation for suitable exploitation of fisheries resources. Governments at all tiers should enforce all existing fishery laws.
8. The Federal Government should equip and utilise the Nigerian Navy to police her Exclusive Economic Zone (EEZ) thereby protecting this economic sector and unauthorised fishing and fishing practices.
9. The research Institutions should liase with the fish farmers and fisherfolks in research designs and utilisation of such findings so that those research findings will be made accessible and relevant to the industry. It is interesting to note that more basic researches are done than applied researches in fisheries development. From literature on this subject, it has been discovered that most of the research findings do not have direct relevance to fisheries development. They are more of academic interest than practical value.
10. Fisheries manpower training should include management in their curriculum. This will enable fishery technocrats manage fish farm enterprises successfully.
11. Efforts should be made to establish Fish Canning Industry or preferably pounch food-manufacturing plant at the export Processing Zone (EEZ) to reduce post harvest losses due to spoilage during the short season and to promote export for revenue generation.

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COMPARISON OF EXTRUDED AND NON-EXTRUDED SOYBEAN MEALS IN THE DIET OF GENETICALL Y IMPROVED MUDFISH *HETEROBRANCHUS LONGIFILIS* JUVENILES.

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ABSTRACT

Raw soybeans were subjected to three different processing methods viz Parboiling. Toasting and Extrusion with an Intra Pro Extruder. The processed soybean meals were thereafter incorporated at equal levels into the diets of genetically improved mudfish *Heterobranchus longifilis* juveniles. The fish were fed the experimental diets in triplicates at 5% of their body weight for eight weeks. The growth performance and food utilization indices namely mean weight gain (MWG), Food Conversion Ratio (FCR), Specific Growth Rate (SGR%) and Protein Efficiency Ratio (PER) were monitored bi-weekly. The result shows that fish fed the control fishmeal diets were highest in growth performance, which was significantly different (P::::0.05) from others. Among the fish fed the test diets, those fed toasted soybean had higher MWG, SGR, FCR and PER than juveniles fed the parboiled soybean diet. The juveniles fed the extruded soybean diet recorded the least growth performance. The implication of these results in diet formulation is discussed.

INTRODUCTION

Feed cost account for about 60 percent of the total cost in fish farming (Olomola 1990). The effect of lack of good quality feed for economic production of fish in Nigeria are slow growth, low survival, diseases and poor harvest (Eyo, 2001). Falaye (1992) has agitated for the replacement of the highly expensive fishmeal with very rich protein sources of plant origins to replace higher proportion of fish diets for fish, which will invariably reduce the cost of feed production.

Soybeans *(Glycine max)* is popularly grown everywhere in the tropics and contain high nutritional values among other plant proteins. The crude protein range between 47-50 percent, NFE 40 percent and lipids 15-20 percent (Dabrowska and Wojno, 1977). It is equally high in essential amino acids, essential fatty acids, vitamins and minerals.

Raw soybean, contain antinutritional substances, mainly trypsin inhibitors (Robinson, 1984, Lovell, 1990, Olli and Krogdahl, 1994). The effects of the inhibitors include impairing the activities of growth hormonal factors and the enlargement of the pancreases (Rachis, 1974) Viola *et al.*, (1983), Wee and Shu, (1989), Eyo, (1999), have reported that ~xposition of raw soybean to heat inactivate the actions of the trypsin inhibitors