# NIGERIA

**NATIONAL AQUACULTURE STRATEGY**

**Prepared by:**

**Federal Ministry of Agriculture and Rural Development**

## TABLE OF CONTENT

## NIGERIA NATIONAL AQUACULTURE STRATEGY


| | | Page |
|---|---|---|
| 1.0. | Introduction | 5 |
| 1.1. | Justification | 7 |
| 2.0. | Policy Base for the Elaboration of the National Aquaculture Strategy (NAS) | 7 |
| 2.1. | Policy Definition | 7 |
| 2.2. | Policy Objectives | 7 |
| 3.0. | Information Base for Elaboration of NAS | 8 |
| 3.1. | National Aquaculture Programme Thrust | 8 |
| | 3.1.1. Key issues Prevalent in Nigerian Aquaculture | 8 |
| | 3.1.2. Constraints to Aquaculture Development | 9 |
| | 3.1.3. Programme Design | 9 |
| | 3.1.4. Funding Arrangement | 10 |
| | 3.1.5. Identification of High Potential Aquaculture Zones | 10 |
| 3.2. | Definition of Types of Aquaculture | 13 |
| 3.3. | Aquaculture Outreach and Extension | 13 |
| | 3.3.1. Review of Aquaculture Extension Services | 13 |
| | 3.3.2. Appropriate Framework for Aquaculture Outreach/Extension | 14 |
| 4.0 | Elements of Strategic Framework and Roles of the Public and Private Sectors | 15 |
| 4.1. | Suitable Production Systems | 15 |
| 4.2. | Availability and Access to Inputs | 15 |
| | 4.2.1. Feeds | 15 |
| | 4.2.2. Seed | 16 |
| | 4.2.3. Capital | 17 |
| 4.3. | Research | 18 |
| 4.4. | Outreach/Extension | 18 |
| 4.5. | Education and Training | 19 |
| 4.6. | Fish Producer Quality Assurance and Control | 20 |
| 4.7. | Marketing and Value Addition | 21 |
| 4.8. | Producer Organizations | 21 |
| 4.9. | Regulations | 21 |
| 4.10. | Monitoring, Evaluation and Control | 22 |

## Acronyms

| | |
|---|---|
| ADP | Agriculture Development Programme |
| AIFP | Aquaculture and Inland Fisheries Project of Food Security Progamme I |
| BOD | Biological Oxygen Demand |
| CCRF | Code of Conduct for Responsible Fisheries |
| EIA | Environmental Impact Assessment |
| FAO | Food and Agriculture Organization |
| FDF | Federal Department of Fisheries |
| FFA | Fish for All Summit |
| FISON | Fisheries Society of Nigeria |
| GDP | Gross Domestic Product |
| GIS | Geographic Information System |
| GMAO | Genetically Modified Aquatic Organisims |
| Ha | Hectare – 10,000 m2 |
| IFC | International Financial Corporation (of the World Bank) |
| Kg | Kilogrammes |
| MDG | Millennium Development Goals |
| MT | Metric Tonnes |
| NAFDAC | National Agency for Food, Drug and Administration and Control |
| NARP | National Agriculture Research Programme |
| NAS | National Aquaculture Strategy |
| NEPAD | New Economic Programme for African Development |
| NIFFR | Nigerian Institute for Freshwater Fisheries Research |
| NIOMR | Nigerian Institute for Oceanography and Marine Research |
| PCFAD | Presidential Committee on Fisheries and Aquaculture Development |
| PEP | Private Extension Practitioners |
| ppt | Parts per thousand |
| REFILS | Research Extension Farmers Input Linkage System |
| SON | Standards Organization of Nigeria |
| SPAT | Small Plot Adoption Technique |
| T&V | Training and Visit System of Extension |
| UAES | Unified Agricultural Extension Services |
| VEA | Village Extension Agent |
| Yr | Year |

# Executive Summary

The development of National Aquaculture Strategies has proven useful in 15 African countries for defining roles and responsibilities of Government and Private Sector. Well-documented strategies have been useful in obtaining loans and funding for projects. This National Aquaculture Strategy for Nigeria is a living document to be subjected to regular review and updating.

The FAO's financial and technical support served to evaluate and edit the National Aquaculture Strategy which was drafted by a team of three national consultants in April 2008. Two meetings were held in Abuja and Lagos to bring participants together to critique the original draft. All revisions and suggestions have been incorporated into the original NAS, producing final copy which was approved by the Government. This NAS will be implemented by an FAO Technical Cooperation Project (TCP) which has been approved and tagged "Sustainable Aquaculture Systems for Nigeria".

We wish to thank the FAO for providing the funding and the technical assistance for the preparation of the document and wish also to thank NIOMR for its participation and support during the preparation process leading to the production of the Strategy document.

# NIGERIA NATIONAL AQUACULTURE STRATEGY

Development of National Aquaculture Strategies have proven useful in 15 African countries for defining roles and responsibilities of Government and Private Sector. Well-documented strategies have been useful in obtaining loans and funding for projects. This National Aquaculture Strategy for Nigeria is a living document to be subjected to regular review and updating.

## 1.0 Introduction

Nigerians are large fish consumers with a total consumption at more than 1.36 million MT. With fish imports making up about three fifths (740,000 MT) of the fish supply. Although the contribution of fisheries to the Gross Domestic Product is only 3-4%, it occupies a very significant position in the primary sector providing employment for over a million people (FDF, 2007) and contributing about 50% of the animal protein intake of the population, particularly the resource poor (IFC. 2003). Furthermore, fisheries in the Nigerian economy show that there is already a demand / supply deficit of over 60% (Table 1). There is in addition, steady decline in capture fisheries sources, due to normal global trends which are aggravated by specific local disturbances in Nigerian coastal and offshore waters. This scenario has led to a shift in focus to inland water resources especially aquaculture, which efforts have yielded encouraging results in the past few years. Nigeria moved rapidly from a production level of 25,720 m.tons in 2000 to 56,355 m.tons in 2005 to 85,087 million tons (FDF, 2007). This upward trend is expected to continue and there is a subsisting Government directive on the fisheries administration to among other things; "Review the existing National fisheries Policy and formulate strategies and plans for sustainable fisheries management and development in the country." However, out of the sub- Sectoral sources, aquaculture has the greatest and fastest potential for growth (Table 2).

| **Table 1: Nigerian Fisheries Production- 2007** | |
|---|---|
| Total Fish Demand | 2.66 ml tonnes |
| Domestic Fish Production | 700,739 tonnes |
| Supply Deficit | 1.956 ml tonnes |
| Per Caput Consumption | 7.5 kg |
| Quantity Imported | 1.012 ml tonnes |
| Value of Fish imports | $US984. 8 million |
| Local Revenue Generated | N88.58 million |
| Forex Earned | N74.5 million |

| | |
|---|---|
| Contribution of Agriculture to GDP | 40% |
| Contribution of Fisheries to Agric GDP | 4.5% |
| Estimated Employment<br>a) Primary Sector<br>b) Secondary Sector | <br>8.5 million<br>18.0 million |

Nigeria Fisheries Data (FDF, 2008).

| **Table 2: Potentials of Aquaculture in Nigeria** | |
|---|---|
| Inland Water Surface Area | 14 mil hectares |
| Available land for Aquaculture | 1.7 mil hectares |
| Existing Pond Area under Water | 60,000 hectares |
| Total Fish Production from Aquaculture | 85,087 metric tons |
| Estimated Aquaculture Potential | 2.5 million metric tonnes |
| Average Pond Production Rate<br>Subsistence Ponds 500 – 800 kg/ha/yr<br>Homestead Ponds 1000 -1500 kg/ha/yr<br>Commercial Farms 5000 -20000 kg/ha/yr | |
| Recirculation Systems | 300-400 kg/m3/production cycle of 4-6 months |
| Total Fingerling Supply | 55.8 million |
| Commonly Cultured Fish Species | Tilapia, (O. niloticus) Clarias, Heterobranchus and Carp, “Heteroclarias” a hybrid of Clarias and Heterobranchus |

Nigeria Fisheries Data (2007).

### 1.1 Justification

According to FAO, elaborating and adopting innovative aquaculture strategies is now becoming a tool for accelerating the pace of revival, growth, and development of aquaculture, with examples in 15 African countries. Nigeria will also benefit from adopting same tool, for the following reasons:

a) The stage is set, with respect to current level of activity in the sector.
b) The environment is better, as it would meet social, economic and cultural aspirations.
c) Information / technology are available and more accessible.
d) There are copious lessons to draw from.

Further justification for a strategic framework would derive from the lopsided participatory arrangement in aquaculture development, between the public and private sectors of the economy. Over the years and perhaps up-to-date, the Public sector has assumed a domineering role in programme delivery, to the extent of making direct business investments in aquaculture production. The fall- out include inefficient deployment of resources, human and material; un-sustained funding; and least accountability. The landscape is replete with collapsed infrastructure and 'scars' of failed investments. The essence of having a strategic framework at this time is to assign roles to stakeholders as appropriate and tie such roles to specific targets. Hopefully, it will facilitate correct / proper implementation of the National Aquaculture Programme and guide the development of the sub- sector towards achieving the goal of the entire fisheries sector. The strategy will respond specifically to the relevant provisions of the MDGs, the outcome of the NEPAD - FFA Summit and the recommendations of the PCFAD (2005).

## 2.0 Policy Base for the Elaboration of the National Aquaculture Strategy (NAS).

### 2.1 Policy Definition:

The Nigerian National Fisheries Policy is to achieve increased domestic fish production from all sources on a sustainable and renewable basis to the level of self – sufficiency and fish export in the medium to long term.

### 2.2 **Policy Objectives** :

2.2.1 To massively accelerate fisheries and aquaculture production through private sector led investment in collaboration with the public sector and by all operators in the fisheries sub-sector.
2.2.2 To improve the socio- economic life in fishing communities by facilitating access to fishing inputs, equipment, facilities and credit.
2.2.3 To pursue a deliberate policy of annual import reduction by 25% of fish and fishery products over a period of 5 years.
2.2.4 To develop and implement a national fish disease diagnosis, control and prevention network.

2.2.5 To support and strengthen fisheries related organisations for optimal contribution to fisheries research and development.
2.2.6 To achieve an effective national safety and quality assurance system that can protect consumers' health and enhance foreign exchange earnings through export of fish and fishery products.
2.2.7 To emphasize value addition in fish processing.
2.2.8 To develop efficient local and international marketing of fish and fishery products.

# 3.0 Information Base for Elaboration of NAS

## 3.1 National Aquaculture Programme Thrust

Aquaculture practice in Nigeria began with non - commercial farms, characterized by very low material and labour inputs and usually associated with other forms of agricultural production. Output was low and was taken up mostly in home consumption and to a lesser extent, farm - gate disposal. To some extent and over the years, average yield increased and many more farms opened up. Gradually, improved output led to commercialization, characterized by high capital investment, intense material and labour inputs and aggressive marketing. The enterprises are market driven and profit oriented. Up to date, about 2,600 fish farms are inventoried (ref. Inventory of Fish Farms in Nigeria, AIFP, 2004) in mixed categories (Inventory of Fish Farms. 2004). Government still plays a prominent role in aquaculture development but there is need to address the appropriateness of Government interventions.

The latest approach was the elaboration of a comprehensive programme of development of fisheries and aquaculture. Its aquaculture component identified the key issues, prevalent in the sub- sector and the constraints to its development. It sets targets for a 5 - year period, proposed a programme for its achievement and a funding arrangement.

3.1.1. Key Issues Prevalent In Nigerian Aquaculture:

a) Fish Fingerling Hatcheries

b) Fish Feed Production

c) Integrated Fish Farming: Rice, poultry, pigs, crops

d) Ornamental Fish Farming

e) Shrimp Farming

f) Brood stock Production

g) Live Fish Transport and Handling

h) Fish Farm Supplies

i) Fish Processing

j) Marketing and Quality Assurance for Local Consumption and Export

k) Divestment of Government Fish Farms

l) Credit for aquaculture farms

m) Extension and Outreach (Farmer Support, Aquaculture Technology Transfer Centres -6)

3.1.2 Constraints to aquaculture development:-

a) High investment costs.
b) Inadequate supply and high cost of fish fingerlings.
c) Undeveloped potential for local sources of feeds.
d) Difficult access to credit and insurance cover for fish farming enterprises.
e) Shortage of competent and experienced technical manpower. Lack of accreditation of consultants for Technical Support
f) Inadequate Marketing and Distribution Network
g) Inadequate facilities for genetic improvement, disease identification and control.
h) Inadequate research extension back-up to aquaculture and fish farming development.
i) Environmental degradation of suitable sites for aquaculture
j) Inadequate baseline data for planning, research and industrialization.
k) Underutilization of certain State and Federal water bodies for aquaculture.

3.1.3 Programme Design:-

a) Aquaculture data management.

b) Fish hatchery establishment/management and feed production

c) Fish Feed Production.

d) Fish Meal Production.

e) Table Fish Production.

f) Aquaculture Skill Development and Technology (capacity building).

g) Aquaculture Financing.

h) Aquaculture Insurance.

i) Fish Health Care Services.

j) Aquaculture Marketing, Post Harvest Technology, Processing and Handling.

k) Value Addition and Export Promotion of Aquaculture Products.

l) Research and Extension Activities.

m) Shrimp Culture.

n) Promotion of other Aquaculture System- Cage, .Pen and Mariculture

o) Quality Control and Certification.

p) Environmental Impact Assessment.

There is a current focus on shrimp culture, a re-awakening arising from private sector initiatives to tackle existing constraints to its development. The major setback to shrimp culture in Nigeria has been a combination of factors relating to search for suitable culture species; lack of production technology and environmental concerns. These factors seem to have been addressed in the recent proposal by a private sector conglomerate of 18 farmers with a total holding of up to 2,200 ha. The proposal is to culture shrimps in lined ponds (dug-out or built-up); in inland areas and inland waters, to which sea water will be introduced to achieve very low salinity (<2ppt).The technology is tested, described as " bio-flow closed system" with no water release. The specie is *Penaeus monodon* (marine tiger shrimp) which is a key component of Nigeria's local shell fish resources. With this development, it is safe to include Shrimp culture and marketing in the programme design.

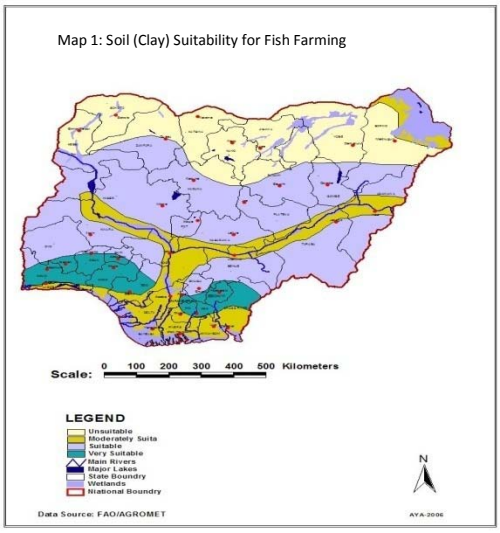
3.1.4 Funding Arrangement:-

a) Development Aspects: Through budgetary allocations from the three tiers of Government (Federal, State and Local), grants in aid from Donor Agencies and credit lines from International Financing Institutions.
b) Commercial Aspects: Through bank loans, mutual funds and other facilities.
c) Small –Holder Production Aspects: Through credit lines by local development banks i.e. NACRDB; micro – finance facilities and revolving loan schemes of local NGOs and cooperative associations.

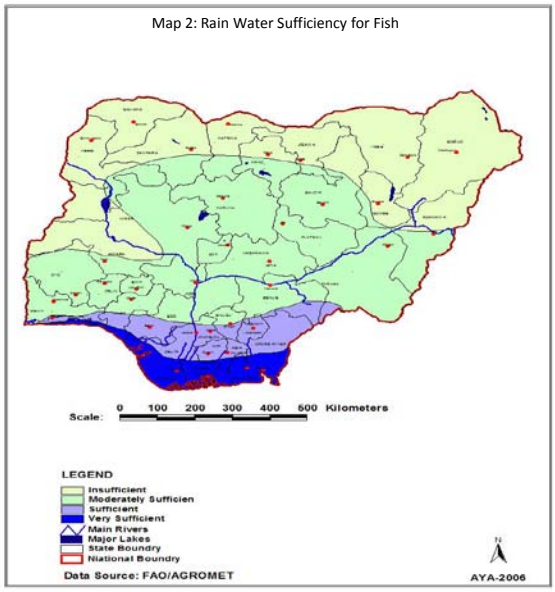
3.1.5. Identification of High Potential Aquaculture Zones

a) Bio physical Potential for Aquaculture

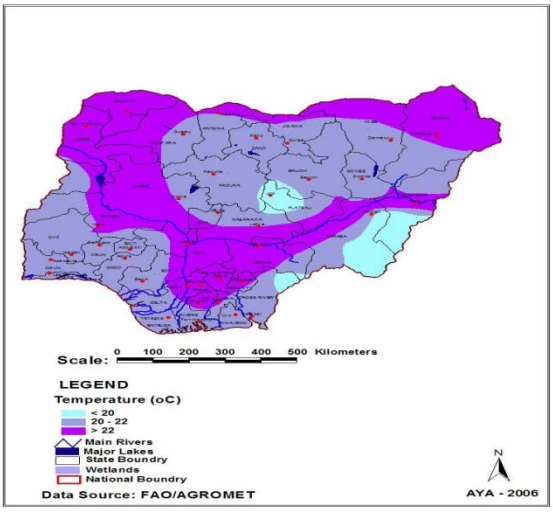
Bio physical elements determine the feasibility of aquaculture project in any environment. Data on Soil, water availability and temperature are among the important biophysical elements were used to determine areas of highest potential for aquaculture production for Nigeria. Suitable soil for aquaculture covers 77 percent of the Nigeria's area as shown in Map 1. It is noted that concrete or plastic tank culture of fish is growing in popularity and can be done anywhere there is water.



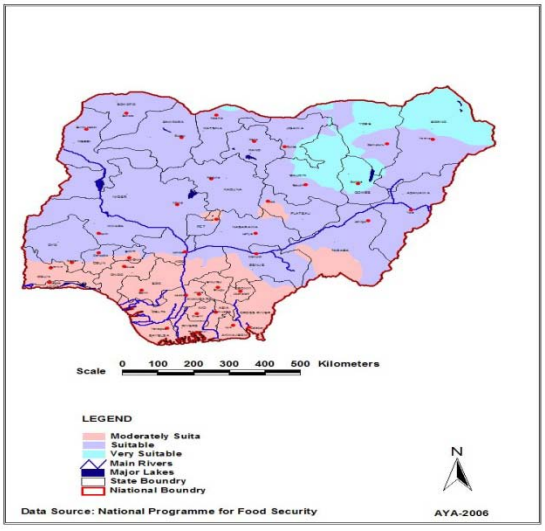
Map 2: Rain Water Sufficiency for Fish




Nigeria's area, 112,085 square kilometres has very sufficient water for fish farming and about 75 percent or 696,314 square kilometres have moderately sufficient water which might require additional effort to maintain water level 98 percent of the Nigeria's area falls within the very suitable and suitable areas for water temperature (Map 2 and 3). Map 4 shows that water pH was found to be the most limiting environmental factors; areas that fall within the very suitable and suitable are about 5.0 percent respectively. (Abdullah, A. Y. 2007)



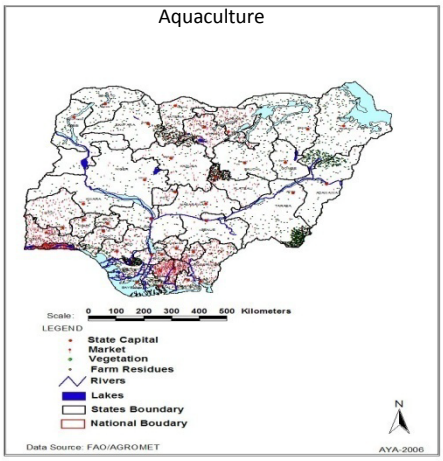

Map 4: pH (Wat




b) Socio economic Potentials for Aquaculture

Areas of highest economic potential determine viability of aquaculture enterprise. Readily availability of markets for aquaculture products was determine using population density as surrogate data as shown in Map 5 showed that only about 30 percent of land area has more than 200 individuals per square kilometre which translates into 30 percent of suitable area for good market.

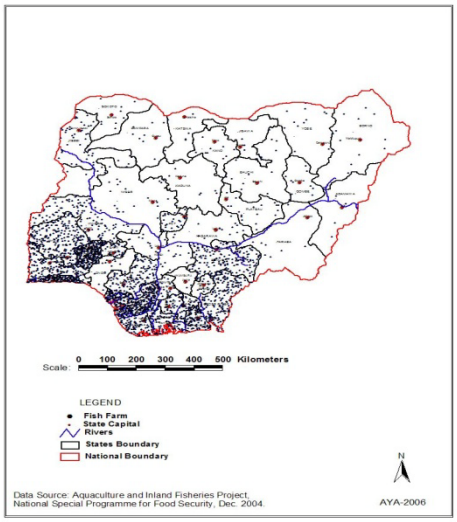
Map 5 Economic Potential for Aquaculture

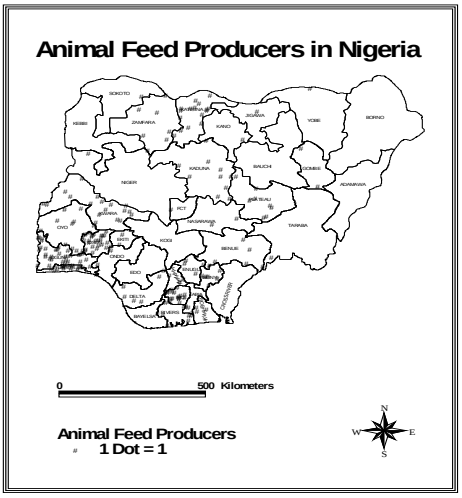



Readily availability and cheap aquaculture of inputs also contribute to investment viability. According to the World Bank (1991), numerous aquaculture ventures in Africa failed because they were not integrated into the rural and agricultural economy surrounding them. The need to develop semi-intensive fish feeding strategies that emphasize the use of simple feed ingredients and agro-industrial by-products available was recognised by Tacon et al. (1987). Map 5 showed that there is virtually no part of Nigeria that does not have some farm residues that could be used either as feed or fertiliser in fish farming. More than 50 percent of the area is of suitable category. Therefore, Nigeria has all it takes towards meeting her fish needs through aquaculture production.

Map 6 is a graphic representation of aquaculture projects across Nigeria. The distribution pattern is almost in conformity with areas having highest potential and a relationship between the optimal areas and the concentration of fish farms. Location of aquaculture projects is further corroborated with the location of animal feed producers (map 7) who mainly produce fish feed until farms took the lead in fish feed production and the importation of high quality fish feeds into Nigeria.

Map 6: Fish Farms Distribution




## 3.2 Definition of Types of Aquaculture

There are many types of enclosures and farm designs used to grow fish in Nigeria. These include earthen ponds, earthen tanks lined with plastics, wooden tanks lined with plastics, net cages in lakes or oceans, rectangular raceway tanks, circular or rectangular fibre glass tanks, concrete tanks. Using these enclosure systems, the following culture systems are practised and have potential for development in Nigeria:

3.2.1 Earthen pond without or with aeration
3.2.2 Shrimp Culture (Marine and Freshwater Shrimp)
3.2.3 Oyster Culture
3.2.4 Cage and pen fish farming
3.2.5 Flow through systems
3.2.6 Intensive water recirculatory system
3.2.7 Culture-based lake/reservoir stocking
3.2.8 Integrated fish farming: Rice, poultry, pigs, etc.
3.2.9 Monosex tilapia culture
3.2.10 Ornamental Fish Culture
3.2.11 Polyculture of Systems

## 3.3 **Aquaculture Outreach and Extension**

### 3.3.1 Review of Aquaculture Extension Services

The extension needs of the aquaculture industry are quite enormous in light of the uniqueness and peculiarities of this sub-sector of Agriculture which is aqua based Aquaculture Extension became incorporated in the Unified Agricultural Extension services (UAES) in 1988. Prior to that aquaculture extension was operated on a parallel system to the UAE system. Fisheries/Aquaculture extension is generally identified as a late comer in the UAE system, since it was not originally in the mandate of the ADPs. Technology delivery methods employed by the ADPs are Training and Visit (T&V) delivery systems, Small Plot adoption Techniques, and the use of mass media. Technology transfer is achieved by collaborating between the ADPs and fisheries Research Institutes and Universities.

Aquaculture extension is low in most ADPs, reflecting the bias towards crops. This results in the generally low percentage adoption of fisheries/Aquaculture technologies in the state. This low level of achievement in aquaculture technologies adoption is attributed to the following:

a) The adoption of Small Plot Adoption Technology (SPAT) technique is difficult in fisheries. The cost of aquaculture input are high, one aquaculture SPAT is said to be equitable to ten of crops.
b) Village Extension Agent (VEAs) preference for dissemination of technologies on other components this is so because such components (crop & livestock) produce faster impact than fisheries.
c) Inadequate inputs such as fish seeds, fish feeds, water quality assessment kits, and pumping machines for effective performance.

d) Most VEAs have shallow technical base in aquaculture and therefore lack the necessary basic skill needed to convey aquaculture message to users.
e) There is little or no incentive and motivation to compensate extension workers for the addition hazards involved in aquaculture extension.

At the inception of the National Agriculture Research Programme {NARP} in 1991, an extension Programme, Research Extension-Farmers –Input Linkage System {REFILS} was introduced. The research institutes were to work through the State Agriculture Development Projects {ADPs} for the execution of the REFILS project. REFILS program for aquaculture involve:

a) Diagnostic survey that serves as a bottom-up approach to research projects execution.
b) On Farm adaptive research for field testing and demonstration of research findings, it is a practical approach to technology dissemination.
c) Monthly technology review meetings for the transfer of fisheries technology to ADP's extension officers.
d) Publications for dissemination information of aquaculture in simple non-technical languages.
e) Workshops for extension officers, practising and prospective fish farmers and fisherfolks.

Less than 30% of the existing universities and colleges of agriculture offer aquaculture as a major course granted, aquaculture has been a late entrant into most institutions of learning but a number of Zoology Department offer fisheries mainly with hydrobiology. Little attention is given to aquaculture extension in the curriculum, where available. It is offered as a minor/elective course in the general agriculture curriculum.

### 3.3.2. Appropriate Framework for Aquaculture Outreach/Extension

a) Establish national and international aquaculture information networks which are accessible at local hubs.
b) Establish accreditation programme through the Fisheries Society of Nigeria (FISON) an apex professional organization, with a long history.
c) Need for demand-driven and community-based research that is responsive to the needs of farmers, therefore it should be linked to on-farm result rather than publication record.
d) Formation of cluster groups for easy access to aquaculture technologies for up-to-date information.
e) Seek partners as necessary to meet information shortfalls that cannot be met with public resources.
f) Encouragement of group formation for purpose of rationalizing marketing and purchase of input as well as increasing out reach –farmers contact.
g) Encourage commercial investors to provide outreach support to smaller operators.
h) Creation of discussing channels amongst different aquaculture stakeholders.
i) Larger investor need to pay for technical assistance on a contract basis negotiated with the institution providing assistance.

j) Constant evaluation of outreach efficacy and prompt advice as to outreach needs.
k) Commercial producers should assess their opportunities in serving as information providers {e.g. production of brochures, manuals e.t.c}.
l) Need to restructure the aquaculture curriculum in our institutions {where aquaculture is offered). Aquaculture extension should be a mandatory course to ease the delivery of fisheries technologies by the would-be future of aquaculture experts hence achieving the ultimate increase in fish production in Nigeria.

## 4.0 Elements of Strategic Framework and Roles of the Public and Private Sectors

The Fisheries administration in Nigeria has produced a development programme through a process of wide consultation with industry stakeholders. This has been summarized in section III above. Therefore, the question of "what to do" has been answered and we are about to address "how to do it". A strategic framework provides the "how". The under-listed elements of the strategic framework apply to all aspects of the development programme, while the public and private sectors are the *dramatis personae* to deliver the programme. The tactical assignment of what to do, to who does what provide how it will be done. The cycle is completed by providing a means of monitoring the process with a view to keeping in track and updating, as may be necessary.

The roles and responsibilities of the public and private sectors are to be defined according to the following elements:

### 4.1 Suitable Production Systems

4.1.1 Government should:

a) Identify general production technologies appropriate to relevant aquaculture zones;

b) Inform investors in regard to these technologies; and,

c) Concentrated its outreach activities in these zones.

d) Implement Environmental Regulations

4.1.2 Private sector should:

a) Be aware of the Government strategy regarding different production systems within aquaculture zones and the need to respect environmental regulations.

### 4.2 Availability and Access to Inputs

4.2.1 **Feeds:**

i) Government should:

a) Promote large scale investment in fish feed production

b) stimulate domestic feed industries by utilizing locally available ingredients ( cereals, lantern fish and fresh water clupeids) as basic feed ingredients; encourage research on local alternatives for fish meal.

c) Address under-utilisation of existing feed mills by providing incentives for them to incorporate locally sourced fish meal.

d) make information on feed and feed materials, especially local source and prices, regularly available to producers through all means of information transmission;

e) within its means, ensure feed quality through inspections and a programme in place for feed standards and certification for both local and imported feeds;

f) promote the adoption of appropriate feed manufacturing guidelines such as the FAO Technical Guidelines for Good Aquaculture Feed Manufacturing Practice; and,

g) facilitate rapid clearance of imported fish feeds from the ports,

ii) Private Sectors:

Feed millers should:

a) produce and market feedstuffs that conform to the need of the industry;

b) provide a uniform quality products at a fair price;

c) find mechanisms to facilitate access to high quality feed throughout the sub-sector;

d) make proximate analyses available to clients;

e) As appropriate, assist outreach programme in promoting good feeding practices/fish management; and monitor results.

iii) Fish Feed Producer organisations should:

a) serve as a forum for information sharing among stakeholders;

b) lobby for collective bargaining and appropriate public sector intervention; and,

c) Link with research organisations.

### 4.2.2 Seed:

i) Government should ensure:

a) Development of high quality brood stock of selected culture species corresponding to the identified production systems;

b) Provision of guidelines for the production of good quality fish seed through such measures as seed certification;

c) Encouragement of commercial farmers and hatchery operators to facilitate access to quality seed.

ii) Fish Seed Producers should:

a) Produce and distribute quality seed at affordable prices;

b) As appropriate, assist outreach programme in promoting good management practices favouring improved yields and monitor results.

iii) Fish Seed Producer organisations should:

a) Serve as a forum for information sharing among stakeholders;

b) Lobby for collective bargaining and appropriate public sector intervention; and,

c) Link with research organizations for update in technology information.

4.2.3 **Capital:**

i) Government should:

a) Provide information to lending and insurance agencies on the profitability of aquaculture;

b) Advise farmers on where and how to access funding from specialized institutions through capacity building for good record keeping and development of bankable business plans,

c) Interact with these funding institutions to negotiate reasonable interest rates for aquaculture development as appropriate.

ii) Private sector:

a) Lending and insurance institutions should avail themselves of technicalities of aquaculture production and investment profile.;

b) Lending institutions should consider reasonable interest rates for aquaculture enterprises when and where applicable;

c) Small investors should ensure that they have appropriate business and financial management skills before requesting external financial support; and,

d) NGOs should work with non commercial producers to develop financing options;

Collect information on other funding mechanisms and make it available to farmers;

e) Sensitise farmers on the savings and solidarity funds for use in aquaculture development;

Examine the possibility of creating an aquaculture guarantee fund;

f) Examine the possibility of providing temporary direct assistance to aquaculture producer organisations.

g) NGOs such as Fisheries Society of Nigeria (FISON) should facilitate linkage between producers and financial institution for easy access of credit.

### 4.3 Research

**i) Government should**:

a) Support applied and farmer-participatory research directed at small and medium scale commercial farmers

b) Support research in value-addition and storage for fish and aquaculture products,

c) Support research for genetic improvements of brood stock of cultured species,

d) Develop methods whereby farmers can have access to Government research facilities and scientists on agreeable terms.

e) Develop framework to coordinate project in research institutes and universities.

f) Ensure capacity building to meet skill gaps in the research institutes.

g) Should improve budgetary allocation to research and develop mechanism that could sustain such

h) Disseminate research results, as appropriate

**ii) Private sector should**:

a) Fund research according to their needs;

b) Assess and evaluate research results and inputting into research agendas.

### 4.4 Outreach/Extension

**i) Government should**:

a) Provide quality technical assistance through an efficient aquaculture outreach program;

b) Encourage establishment of certified private extension practitioners (PEP) to reach out to marginal areas.

c) Seek partners as necessary to meet information shortfalls that cannot be met with public resources, such as technical support information being published by input suppliers for dissemination to farmers;

d) Establish national and international aquaculture information networks which are accessible at local hubs;

e) Play a co-ordinating role in the outreach programme;

f) Put emphasis on participatory approaches when providing services to farmers;

g) Encourage group formation for purposes of rationalising marketing and purchase of inputs, as well as increasing outreach-farmer contact;

h) encourage commercial investors to provide outreach support to smaller operators;

i) Facilitate the creation of discussion channels amongst different aquaculture stakeholders;

**ii) Private sector should**:

a) Create mechanism like farm cluster formation such as cooperatives for facilitating and generating their extension needs.

b) Assist and reinforce public sector outreach programmes, particularly with regard to outreach contributions by feed and/or seed suppliers;

c) Commercial producers should pay for technical assistance evaluate outreach efficacy.

d) Commercial producers should assess their opportunities in serving as information providers.

c) Provide feedback to public sector on production data and other relevant information;

## 4.5 Education and Training

**i) Government should:**

a) Arrange and/or conduct on demand at regular intervals, short courses for in-service training and human resource enhancement through recognized government or private institutions;

b) establish a continuing training plan for its staff and assist in linking candidates with local, regional or international agencies providing training, education and/or financial assistance, including distance learning options;

d) Provide information on career development in aquaculture; and,

Introduce longer term, professional training in aquaculture sciences to universities

.

**ii) Private sector should:**

a) Facilitate training opportunities on their commercial farms;

b) Ensure regular recruitment and training of those technicians necessary for the development of a commercial aquaculture sector;

c) Feedback to the public sector regarding the efficacy of training; materials/ curricula, advising on training needs as necessary.

d) Professional Association such as FISON should intensify training of industry operators through short courses, seminars, public lectures, etc

## 4.6 Fish Product Quality Assurance and Control

**i) Government should:**

a) Develop standards and code of practice for fish and fisheries products in line with internationally accepted practice.

b) Develop the human and material capacities to enforce the standards as through Standard Organizations of Nigeria (SON), National Agency for Food, Drug and Administration and Control (NAFDAC) and fisheries institutions (NIOMR, NIFFR and FDF).

c) Establish fish disease diagnosis, control and prevention centres and in partnership with producers organise regular trainings in quality assurance and fish disease control.
d) Control the use of alien and genetically modified aquatic organisms (GMAO) according to Inland Fisheries Act No 108, Par. 8 Section 1 of 1992.
e) Monitor activities on-farm as permitted by the Fish Quality Assurance Regulation, 1995 Paragraph 12.
f) Collect and publish reliable and up to date statistics.

**ii) Private Sector should:**

a) Comply with stipulated codes and standards of practice.
b) Have standard quality management team to manage and control fish diseases using only approved therapeutic agents.
c) Have self regulatory, self control mechanisms to ensure quality of seeds, feeds and products.

## 4.7 Marketing and Value Addition

**i) Government should**:

a) make information on fish retail prices, conservation and processing available to producers and consumers through, for example, newspapers, newsletters, rural radio or other media; protect local producers against unfair foreign competition (imports) provided that protective measures used fit within the international trade conventions/ agreements;

b) Provide basic marketing infrastructure, such as roads and communication channels; assist producer s in promoting aquaculture products (in order to stimulate demand) through agricultural fairs and other such opportunities;
c) Encourage and enable commercial producers to develop market channels which can be accessed by smaller producers; and,
d) Prepare, publish and regularly monitor guidelines on the implementation of quality standards of aquatic products to protect the public health as well as improve acceptability of aquaculture products.
e) Research institutes should disseminate information on value addition to producers especially in the areas of processing and packaging.

**ii) Private sector should:**
a) Commercial producers should provide uniform quality products according to market requirements; and, look for mechanisms to provide market guarantees for smaller producers (e.g., satellite production systems).
b) Embrace value addition in processing and packaging

## 4.8 Producer organisations

**i) Government should**:
a) promote and facilitate the formation of producer organisations with legal status as appropriate by, for example, advertising their advantages in collective bargaining , streamlining administrative the registration process, etc.; and,
b) Advise interested farmers, feed and seed producers on where and how to get assistance in group formation and function.

**ii) Private sector should**:
a) Organize themselves in professional organizations to defend their mutual interests, facilitate access to inputs and markets, etc.
b) Should play a catalytic role in establishing producer organisations, NGO's, etc; and,

## 4.9 Regulations

**i) Government should**:
b) Establish clear and secure user rights to land and water favourable to aquaculture investment;
c) Establish requirements for commercial large scale aquaculture which will specify farmers' rights and obligations;
d) Waive such permits for non commercial aquaculture as long as Government regulatory thresholds are not exceeded;
e) Regulate the movement of aquatic organisms between watersheds and the provision of discharge and outfall standards (e.g., Biological Oxygen Demand-BOD limits or alien species to receiving water bodies, etc.);
f) Regulate the use of alien and genetically modified aquatic organisms;
g) Apply and enforce appropriate international codes to which Government subscribes (e.g., Code of Conduct for Responsible Fisheries – CCRF);

h) Collect and publish reliable and up to-date statistics;
i) Apply criteria for requiring environmental impact assessment studies as provided in the Environmental Impact Act No. 86 of 1992.
j) Regulate seed and feeds in commercial production;
k) Define a regulation on quality control of aquaculture products.

**ii) Private sector should**:
a) be aware of and conform with relevant regulations;
b) Self regulate to ensure good farm management practices with the goal of sustainable resource use;
c) Self regulate to ensure a safe-to consume product is provided to all consumers; and, provide complete and correct data for monitoring by the public sector.

### 4.10 Monitoring, Evaluation and Control,

**i) Government should:**

a) Control the movement of aquatic organisms between watersheds and the provision of discharge and outfall standards (e.g., Biological Oxygen Demand- BOD limits and alien species to receiving water bodies, etc.);

c) Control the use of alien and genetically modified aquatic organisms (Inland Fisheries Act No 108, Par. 8 Section 1 of 1992).

d) Enforce the regulation on quality control of aquaculture products (Fish Quality Assurance Regulations 1995, Par. 16).

e) Ensure commercial aquaculture farmers obtain permits which specify the rights and obligations;

f) Apply and enforce appropriate international codes to which Government subscribes (e.g., Code of Conduct for Responsible Fisheries – CCRF);

g) Harmonise data and information collection system for the purpose of publishing reliable and up to date data and information;

h) Monitor the conduct of EIAs as stipulated in EIA Act No 86 of 1992.

i) Control seed and feed quality in commercial production.

j) Develop Geographic Information System (GIS) tools to plan, monitor and control development of the subsector.

ii) **Private sector should:**

a) Comply with the regulations for establishing commercial aquaculture farms;

b) Comply with stipulated regulations in respect of seed, feed, live and finish products

c) Regularly provide reliable and up-to-date statistics;

d) Have self-regulatory, self-control mechanisms to ensure seed quality, the quality of commercial feeds and the quality of aquaculture products.

STEERING COMMITTEE:-

| Membership: | |
|---|---|
| Federal Department of Fisheries | 2nos |
| Fisheries Research Institutes | 2nos |
| Universities | 1nos |
| Fish Producers | 2nos |
| Feed Producers | 1 nos |
| Fish Input Suppliers | 1nos |
| Fisheries Professional Organisations | 1nos |
| Fisheries Service Providers | 1nos |
| Export Promotion Council | 1nos |
| **TOTAL** | **12nos** |

**Reference:**

Abdullah, A. Y. (2007). Evaluation of land Based Fresh Water Fish Farming Potentials in Nigeria: An Approach through the use of Geographic Information System (G.I.S.) A Thesis For Ph.D. Zoology (Fisheries), Department Of Biological Sciences, Faculty Of Science University Of Abuja, Nigeria.

Tacon, A.G.J., G. Macioci and Vinatea. (1987). National agricultural feed survey (NAFS) for aquaculture planning and development in Latin America and the Caribbean. 1. *Guidelines (GCP/RLA/075/ITA). Field Document 1/E*. Brasilla Brazil, Rome. 11p.