African Aquaculture: A Regional Summary with Emphasis on Sub-Saharan Africa

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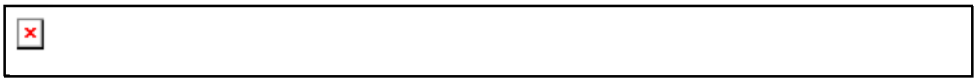
ABSTRACT: The African Region consists of 48 countries and five island nations, most of which are practising some form of aquaculture, often at a very low level. Over half the countries report producing less than 100 mt annually. The largest producer is Nigeria (17 700 mt) followed by Madagascar (5 100 mt) and Zambia (4 700 mt). The 1997 combined aquaculture production of the region was 40 300 mt. Aquaculture is estimated to be 95 percent small scale, with fish ponds integrated into the mosaic of agricultural activities. Mean yield is approximated as 500 kg/ha/yr, although the range is wide, from less than a hundred to more than 10 000 kg/ha/yr. A typical scenario would be a 300 m2 pond producing 15 kg a year relying on family labour and on-farm inputs. There is little reporting of production from the region's many reservoirs, although these are often exploited by nearby populations. Commercial finfish culture is fresh or brackish water, with Nigeria, Côte d'Ivoire, Zimbabwe, Kenya and South Africa being important producers. Commercial tilapia farms report pond yields of 10 to 15 mt/ha/yr, while Clarias yields can exceed 20 mt/ha/yr. Marine shrimp culture is concentrated in Madagascar, although a few farms are found in Seychelles, Mozambique and Kenya. Mussels, oysters, abalone and seaweed are also marine cultures in some countries.

Fish consumption has been decreasing as supply decreases relative to a growing population: from 9 kg per capita in 1990 to 6 kg per person at present. The attributes of Sub-Saharan Africa include under-utilized water and land resources, available and inexpensive labour, high demand for fish and a climate that favours a year-round growing period. However, optimal use of these resources has frequently been curtailed by poor infrastructure and lack of production inputs. The potential for expansion is nevertheless considerable, but requires several enabling factors that include: a positive perception of

aquaculture, sound policies at the national level, strong public institutions, availability of nutrient inputs, conducive investment policies to attract increased private-sector participation, and access to credit for commercial-scale enterprises.

KEY WORDS: Africa, Sub-Saharan Africa, Aquaculture, Development, Fish Farming



Executive summary

African aquaculture has come a long way since it was first introduced over 50 years ago. However, aquaculture development in Africa has followed a long and bumpy road. Initial high interest in the innovation of farming fish rapidly dwindled during the 1960s as over-expectations were not met and many enterprises were abandoned. Yet a positive perception of aquaculture's potential role remained, as witnessed by the fact that delegates to the first meeting of the FAO Committee for Inland Fisheries of Africa (CIFA/R1, 1973) identified aquaculture as a priority area, stressing the need to further its development across the region. To this end, in July 1975, the Food and Agriculture Organization of the United Nations (FAO) organized the First [Africa] Regional Workshop on Aquaculture (ADCP/REP/75/1). This workshop recognized the importance of aquaculture and the high precedence attached to it by many governments. It was further noted:

"failures of some of the ill-conceived programmes during the early part of the century have continued to remain a major constraint in convincing the

Five years later, FAO, assisted by other collaborators, assembled a series of aquaculture reviews from countries3 responsible for 90 percent of the region's aquaculture production (Coche, et al., 1994). These reviews identified major constraints on the continental level as:

no reliable production statistics; credit availability limited for small-scale farmers; very low technical level of fish farmers; unavailability of local feed ingredients; lack of well-trained senior personnel; prohibitive transport costs; and lack of juvenile fish for pond re-stocking.

Today, although production from the region reflects a 60 percent increase over the previous decade (FAO, 2000), this is only 0.4 percent of the world total. In spite of this modest showing, aquaculture is now recognized as an important production system throughout the region. Some countries such as Côte d'Ivoire, Madagascar, Malawi, Nigeria and Zambia now have well-established aquaculture programmes. Commercial or industrial systems have also been established in Nigeria, Madagascar, Zambia, Zimbabwe, South Africa and elsewhere. South Africa is, furthermore, the most prominent producer of marine

farmers and investors of the economic viability of aquaculture. Insufficient appreciation of the basic requirements of an effective aquaculture development programme and consequent inadequacy of governmental support activities, have handicapped the orderly and rapid development of the industry."

Following the workshop, there was renewed interest in aquaculture, with nearly every African country launching donor-supported fish farming projects. However, results remained below expectations.

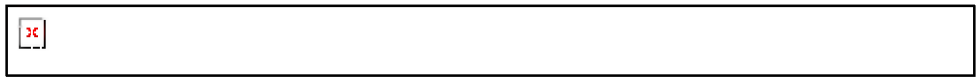
African aquaculture was thus a topic at the 1988 FAO Expert Consultation on Planning for Aquaculture Development (ADCP/REP/89/33). This consultation concluded that output from sub-Saharan Africa was still very low; most production attributed to small-scale, semi-intensive farming of tilapia, with few large-scale commercial ventures able to demonstrate long-term economic viability. Ineffective or nonexistent policies combined with inadequate infrastructure, poor extension support and unavailability of inputs (including seed, feed and credit) were cited as major problem areas.

aquaculture products.

It is generally accepted that the potential for significant growth of aquaculture in the region exists. Labour is available and economical, while the demand for fish is high and often unsatisfied. In many areas, land and water resources are readily available and frequently under-utilized.

There is growing impetus for aquaculture to achieve this potential. As populations grow and competition for resources becomes more acute and the need for food security more critical, it is necessary that aquaculture assume its long-foreseen role as an important contributor to increased nutritional and economic well-being. This review also attempts to analyse past experiences and elaborate valuable lessons learned that can guide future aquaculture development and allow long-awaited expectations to be met. These lessons are then used to define the opportunities, challenges and the way forward.

Some of the main challenges include the shrinking role of governments as countries are faced with varying degrees of socio-economic volatility combined with low levels of industrialization, dependence on the export of primary goods, on-going structural economic adjustment programmes and inadequate or nonexistent development policies.



The recommendations for the way

In many cases, these projects had strong

forward cover three main approaches: (a) to promote a greater involvement of interest groups, including the private sector, to replace the shrinking role of the public sector; (b) to better understand the socio-economic and socio-cultural constraints affecting the adoption of fish farming; and (c) to increase subregional and regional networking.

Introduction

The region concerned by this review consists of the 48 countries4 of Sub-Saharan Africa, including five island nations. Most of these countries practice some form of aquaculture, although often at a low level.

Aquaculture for food production in Africa was introduced over 50 years ago. Tilapia were successfully produced in ponds for the first time in Democratic Republic of Congo (DRC) in 1946 (Vincke, 1995). By the end of the 1950s, there were almost 300 000 ponds in production in Africa (Satia, 1989). Raising fish for sport purposes has even a longer history, with trout introduced in South Africa between 1859 and 1896, as well as the late 1920s in Kenya (Vincke, 1995) and the 1930s in Zimbabwe. According to Vincke (1995), rice/fish farming has existed in Madagascar since the turn of the century. Initial production was based on fish that naturally found their way into rice fields through waters supplying these fields; these were captured and raised in cages (Randriamiaran et al., 1995).

During the early 1960s, as many colonial regimes were coming to an end and resources were becoming scarce, infrastructure and manpower development aspects geared to establishing effective national aquaculture services. Unfortunately, a variety of internal and external factors limited sustainable aquaculture development, albeit that some remarkable but temporal aquaculture successes were achieved. This perceived lack of long-term viability led to another era of disenchantment with African aquaculture on the part of foreign and domestic applicants. The 1990s evidenced a notable slump, as sustainability issues came to the forefront, problems magnified by deteriorating global economies. However, the end of the 1990s showed a new optimism for aquaculture development, as apparent failures of past efforts were better understood and previously unnoticed assets surfaced. The closing chapter of the millennium served as an effective sieve which separated true aquaculture practitioners/adopters from those motivated by other considerations. In the aggregate, this resulted in a core of practising fish farmers in most countries; farmers perhaps not raising fish optimally but farmers raising fish -- aquaculture had become an accepted agricultural production system and proponents of aquaculture were gaining a better understanding of how aquaculture fit and effective ways for its promotion.

In the present context, the objectives for aquaculture development in the Sub-Saharan Africa can be identified as:

- to improve food security;
- to increase domestic fish production (import substitution);
- to generate employment;
- to promote diversification and

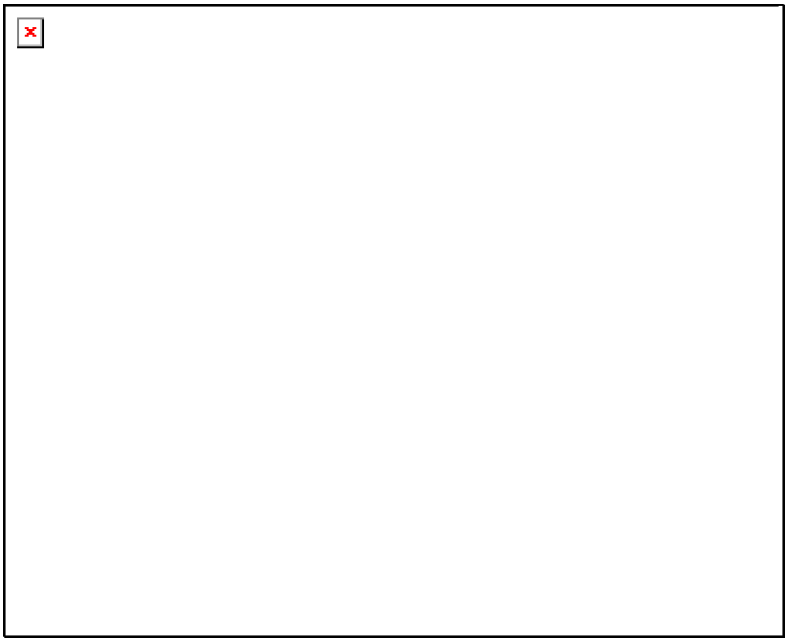
aquaculture develop-ment dramatically slowed (Aguilar-Manjarrez & Nath, 1998). In many areas, ponds were abandoned due to low yields, poor location and/or lack of government support (Vincke, 1995). Subsequently, aquaculture development accelerated in the late 1960s as a result of increased donor aid and technical assistance (Vincke, 1995).

The 1970s and 1980s witnessed numerous aquaculture development projects aimed at filling the growing fish supply gap with farm-raised fish and/or bolstering sagging economies with high-value aquaculture products.

reduce risk;
- to promote economic development; and
- improve use of resources, especially water.

Production Trends

A genuine potential for increased aquaculture production in Africa exists and is yet to be fully realised. This potential should not be overzealously interpreted as aquaculture filling the capture fisheries shortfall5 and eliminating seafood imports overnight. There is a long way to go, and the process will be time-consuming, but prospects are indeed favourable. The region produced 40 300 mt in 1997, having a value of US$102 million. The trends in aquaculture production in the Africa Region over the past decade are given in Figure 1.



These aquaculture development trends are analysed over a ten-year period (1988-1997), focusing on different production systems. Systems can be classified in terms of scale (size) and/or intensity. This analysis uses definitions that combine these two aspects:

- *Small-scale* aquaculture production systems are extensive/semi-intensive utility-oriented pond systems operated by the household and integrated to varying degrees with other agricultural enterprises. The "utility" orientation implies that risk avoidance and diversification are prime motives, as well as household food security. The level of intensity indicates that these systems will rely primarily on on-farm inputs including organic fertilizers and simple supplemental feeds, most of the labour being provided by the family. Small-scale systems generally require minimum or no capital investment and are not mechanized. This definition covers traditional systems such as "acadjas"6 and "fish holes"7 or fences along with culture-based systems. To assist in classification, small-scale pond systems are often considered as those with a water surface area of one hectare or less, but this surface area consideration is not applicable to traditional or culture-based systems. Small-scale systems tend to be "rural", if not in location then in the sense that they do not rely upon urban markets for their
- *Medium- to large-scale* aquaculture systems could also be classified as commercial systems where profit is the principle motive. Large-scale systems have been referred to as those having a water surface area of five hectares or more or producing more than five metric tonnes annually. Profit-oriented systems smaller than this are referred to as medium-scale. Medium- and large-scale systems rely on organized urban markets to move their product or may operate through brokers or middlemen. These systems tend to be capital intensive, relying on wage labour, external energy sources and mechanization.

Small-scale fish farmers are certainly the major producer group in the region. It should be noted that there are many small-scale producers in the region whose aquaculture

product, with most consumed by the family or sold on the pond bank.

motives can include selling fish for profit. In a number of cases, these farmers could represent a transition from small- to medium-scale production and, for continued expansion in aquaculture industries, it is necessary that this group be supported and helped to grow through conducive policies and services that facilitate and even encourage this transition.

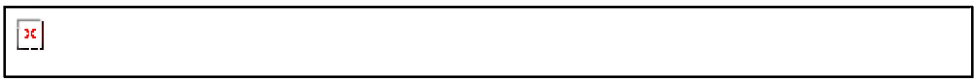
While more than half of the countries in the region report annual production of less than 100 mt, there are some relatively large producing nations. The largest individual producer is Nigeria (17 700 mt), followed by Madagascar (5 100 mt) and Zambia (4 700 mt). The major aquaculture products are fresh- and brackish-water finfish, where 33 250 mt were reared in 1997. The complete production from aquaculture is presented in Table 1, while the contributions of different species (by quantity and value) are presented in Table 2.

Aquaculture in the Africa is primarily small-scale rural (this component estimated at 95 percent of total production), characterized by one or

more small (i.e. 100-500 m2) ponds, integrated into the mosaic of agricultural activities. Currently, mean yield from these ponds, on a regional basis, is approximated as 500 kg/ha/yr, although reported yields vary considerably, from less than 100 to more than 10 000 kg/ha/yr.

The following could be considered as a general scenario for this situation:

- 300 m2 of pond, producing +/-15 kg of fish per year;

344 

- family labour, involving all family members, estimated at six individuals; and
- raising tilapias and/or catfish (Clarias or Heterobranchus species) with some limited carp production, mostly Cyprinus carpio.

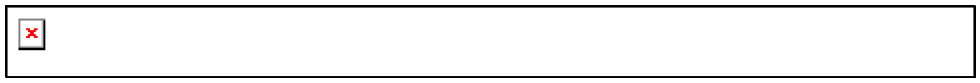
Considering this scenario, the Sub-Saharan Region's *small-scale finfish production can be estimated at 21 900 mt8.* Extrapolating from previous descriptions of small-scale systems, this yield corresponds to the activities of 1

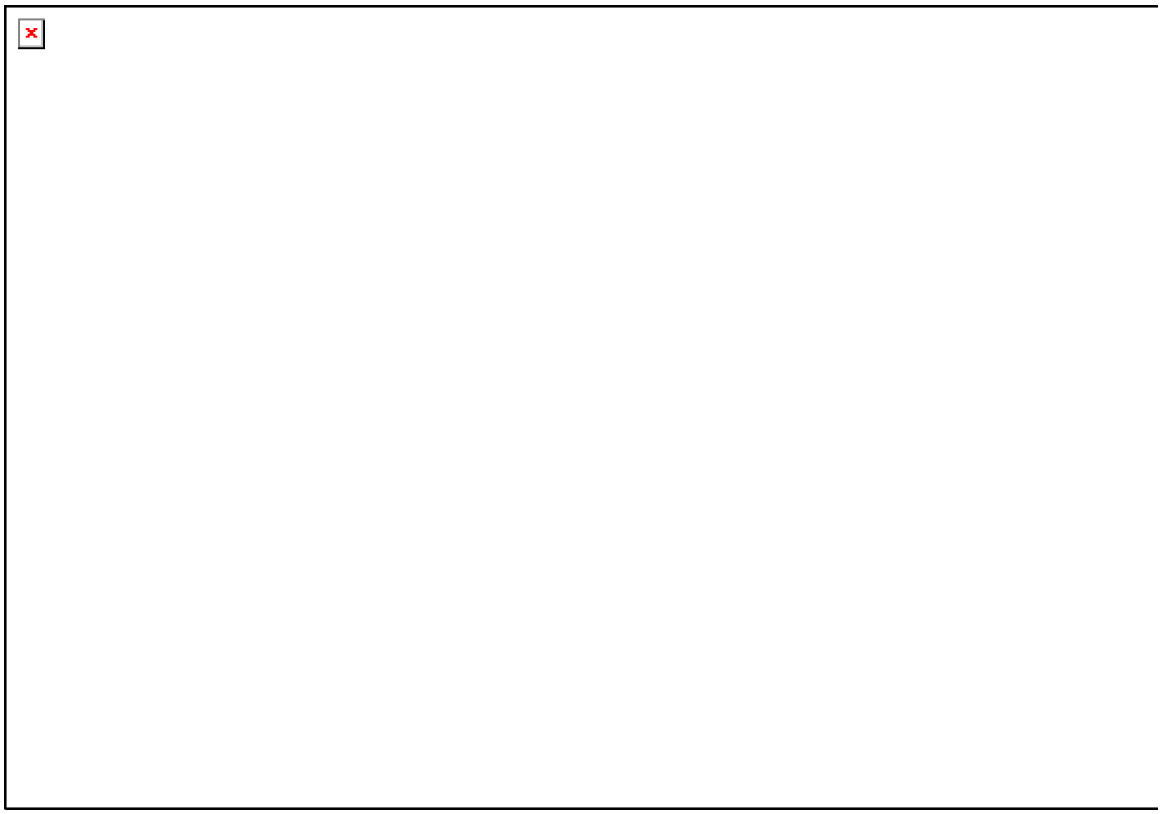
Commercial production would be estimated at 11 350 mt. Commercial tilapia farms report yields of 10 000-15 000 kg/ha/yr, while Clarias yields reach 20 000 kg/ha/yr. There are commercial farms using cage, raceway and recirculating systems, but ponds are the principal production unit. Marine shrimp culture is concentrated in Madagascar, although there are a few farms in Seychelles, Kenya and Mozambique, as well as plans to begin raising shrimp in Gabon and Nigeria. Mollusc culture is limited to Namibia and South Africa, where the latter has regionally significant

460 000 families, representing nearly 9 000 000 individuals involved in family-scale aquaculture.

Commercial finfish aquaculture is fresh or brackish water and is concentrated in Côte d'Ivoire (Chrysichthys, Clarias, tilapia), Nigeria (Clarias, Heterobranchus, tilapia, carp), Zambia (tilapia, carp), Zimbabwe (trout, tilapia), Kenya (trout, tilapia) and South Africa (trout).

production of mussels and oysters, as well as the beginnings of an abalone industry. Seaweed culture is limited to South Africa, Namibia and Tanzania.





Production increases have been seen for several product groups over the decade, while others have declined (e.g. mullets, turtles, diverse marine fish). The greatest growth in production has been seen for

Main constraints to development

The bulk of the African population is

catfish (64 percent), crustaceans (primarily marine shrimp – 4 101 percent), cyprinids (common carp – 127 percent), tilapias (58 percent), diverse freshwater fish species (1 690 percent) and shellfish (mussels – 401 percent). The increased production of Eucheuma in Tanzania dominates the data reported for algae.

In 1988, tilapias represented 42 percent of the region's production, but this figure dropped to 28 percent by 1997. Similarly, the contribution of catfish dropped from 23 percent to 16 percent. This demonstrates a general trend of diversification that is reflected by the increased production of other aquaculture crops. Tables 3-5 summarize and compare the contribution of sub-Saharan aquaculture to global production. Comparison is made of all aquaculture products, ish, shellfish and crustaceans.

rural. The rural economy is frequently based on subsistence cropping and extensive livestock grazing. This augurs well for the potential for aquaculture development, as aquaculture is essentially an agricultural activity. However, aquaculture must compete with other crops for basic inputs such as land, water, labour and nutrients. Further growth will depend upon its ability to compete and meet related challenges of availability of feed, seed and credit, as well as ensuring an investment climate conducive to industrial development.

The Africa Regional Aquaculture Review Meeting (CIFA/OP24, FAO, 2000) identified a number of constraints affecting the development of the aquaculture sector in Africa. Among other things, the review concluded that:

"Small-scale farmers have rural social constraints that affect their needs, priority assessments and aspirations. But these are poorly understood. These constraints are complicated further by being location and agro-ecological specific."

Additional constraints to aquaculture development are also elaborated by Satia (1989), Costa-Pierce (1991), Coche, (1994) and Coche & Pedini (1997). Table 6 categorizes and summarizes various constraints.

The following sections further analyse the constraints confronting aquaculture development in the region.

Poor aquaculture development policies

Many countries have not established comprehensive aquaculture policies or appropriate aquaculture legislation that are needed to promote sustained growth of the aquaculture sector. This is in part a remnant of previous donor dependence, where a lack of such guidelines made all proposals suitable for all donors, but this situation is also due to the perception that aquaculture is technically complex and capital intensive, thus difficult to handle. Aquaculture has, moreover, often been looked at in isolation from other sectors whereas, it

Few fish farming traditions

Agriculture, habitually involving traditional subsistence crops, has an established base and dominates many economies in the region. On the other hand, little traditional aquaculture knowledge exists among farmers in most areas. Although fish farming existed in Madagascar since the turn of the century (the system based on rearing fish that came naturally into rice fields), techniques of producing fry did not exist until recently (Randriamiaran et al., 1995). Some traditional systems such as “acadjas” and “fish holes” also existed in African countries such as Côte d’Ivoire, Benin and Ghana, but the technology to manage broodstock and

should be viewed as one of the many agricultural enterprises for which countries must cater. Some countries like Madagascar and Mozambique are developing appropriate aquaculture policy and legal frameworks, and an awareness of the importance of relevant policies is increasing.

The poor economic situation of most countries

Sub-Saharan Africa has suffered from social and economic instability over past decades through civil unrest, drought and other natural disasters along with high population growth (Vincke, 1995). These have retarded economic growth and often created less than ideal climates for foreign and local investment. Development has also been adversely affected as trained personnel have left for other countries, reducing technical expertise and institutional memory. This economic situation has been aggravated by the fact that many countries have a dependence on primary agricultural goods that produce fry has not accompanied these production units.

have not generated adequate foreign currency earnings due to global market fluctuations. Structural adjustment programmes have further complicated national programmes and institutions, making delivery of limited government services all the more challenging. These problems have reduced the public-sector capacity to deliver, and the aquaculture sector has suffered.

Inappropriate technologies and approaches

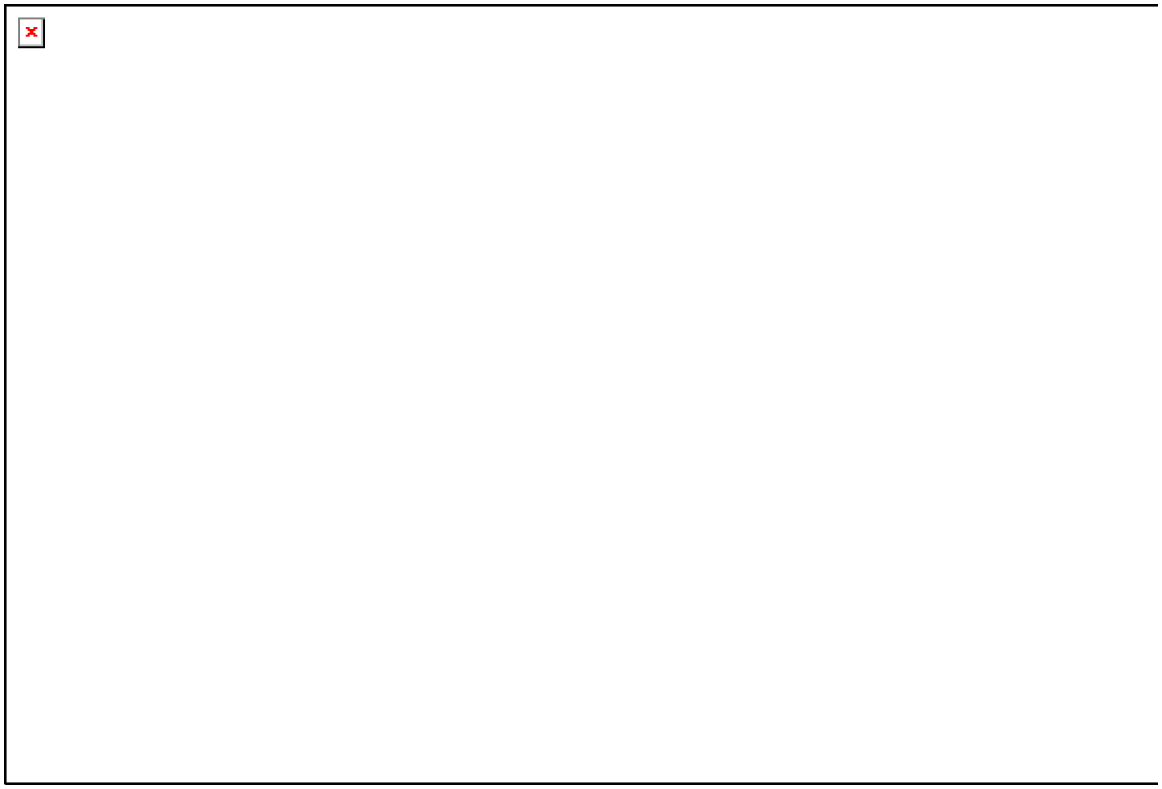
As aquaculture technologies did not exist in the traditional setting, these had to be introduced. Unfortunately many of these introduced technologies were inappropriate and unsuited to the needs of the intended beneficiaries. There was lack of appreciation for the prevailing social, cultural and economic factors, as well as a lack of understanding of important supply and demand considerations, including competition for most production inputs. Additionally, fish-farming development was not seen in the context of rural development, and aquaculture was considered as a separate entity from agriculture. More often than not, the external technical assistance prevalent promoted technologies they felt

Lack of fish seed

This has been a problem constituting a serious restriction to aquaculture development. Early efforts focused on public-sector production and distribution of seed, and as a result, there is now often a government monopoly where the price of seed is subsidized to the point where private producers cannot compete. However, production from government hatcheries rarely meets demand, and many governments lack the means to effectively distribute seed to farmers. Recently, as economies continue to suffer to maintain minimum services, many government hatcheries have lost the few funds they previously had access to, and public sector supply of seed is on the decline. In its place in many countries like Côte d'Ivoire, Kenya, Zambia,

to be the most appropriate, as opposed to those most useful to would-be producers. Weaknesses in this top-down technocratic approach became apparent, as sustainability was lacking, and a new emphasis was placed on participation and understanding the human factors of technology adoption.

Tanzania, Mozambique, Madagascar and Uganda, private seed producers are entering the market and providing better services to farmers who had become disenfranchised with excessive waiting periods for poor-quality seed coming from government facilities. Private seed production has been undertaken for some time by larger commercial companies, which have vertically integrated and have the capacity to produce their own.



Unavailability of feed

Although many small-scale producers rely on fertilization and enhanced natural food for their crop of fish, increases in

The existence of many nonfunctional government stations

In most countries, numerous aquaculture

production will require corresponding increases in nutrition; feeding more and better food stuffs. There are three components to this problem: (a) quality, (b) quantity and (c) varying requirements of different species. Feeds can be produced by the family, community or the industry. Family feeds tend to be of variable quality and quantity, typically dependent upon by-products available from the home and farm. Community feeds may be fabricated by local entrepreneurs, producer groups or others serving a relatively restricted geographic area. These feeds are often based on commercial agricultural by-products available in the area and may be of modest quality but of a reliable quantity. Commercially produced feeds require cost-effect inputs and the industrial means to manufacture feeds, the preference being pelletized feeds. Countries that have expanding agricultural sectors and produce surpluses are often well placed for the economical production of commercial fish feed. In Zimbabwe, the private sector is now meeting the demands of the industry. In South Africa, feed requirements are met by the private sector, while private businesses in Nigeria, Kenya and Zambia also produce commercial fish feeds. Nonetheless, in many countries commercial rations, especially pelleted feeds, are still not available unless imported. Feed remains one of the most prominent barriers to expanded aquaculture production, especially medium- and large-scale production. Unless affordable feed costs can be maintained, farm-raised products cannot compete with those coming from capture fisheries, unless there is significant value added through the production of luxury items.

stations were built for research, seed production and training and even food-fish production. These were generally operated through donor funding and constitute an excellent example of the lack of sustainability after donor support is withdrawn. The justification for continuation or re-establishment of these facilities no longer exists in most instances. It is widely accepted that food fish and seed production are the domain of the private sector in today's environment with down-sized government budgets in many countries in the region. Furthermore, such facilities are largely inappropriate for farmer training or as nuclei for aquaculture extension as the emphasis shifts to producer groups and on-farm activities. In the final analysis, the main reason to maintain government stations is for research and maintenance of broodstock, these activities requiring a limited number of stations in any given country, at least during early development phase. For example, Cameroon has more than 30 government fish culture facilities where one or two would be adequate for research and broodstock maintenance. A reduction in stations through privatization of redundant facilities concentrate limited funds in a few stations, ensuring their satisfactory operations.

Weak extension services

Aquaculture extension services were initiated in the 1950s, but declined in many countries after independence, when technical staff and funds were no longer available (Vincke, 1995). These services were then incorporated into projects restarted in the 1960s through technical assistance. These projects frequently adopted a similar approach to

Prohibitive transport costs and poor transport infrastructure

Transport is a key factor in aquaculture development. Feed and seed must often be transported to isolated producers, while harvests must frequently be carried to markets where profits can be optimized. Transport infrastructure in many areas is poor. Some roads are not passable during the wet season, while other areas may completely lack access for four-wheeled vehicles. Meagre infrastructure due to the mountainous nature of the country is cited as one of the major problems affecting the distribution of fry in Madagascar (Randriamiaran et al. (1995); the same applies to many other countries across the region, including Cameroon, Rwanda, Angola, Gabon and CAR.

aquaculture development: establish government hatcheries to address the acknowledged seed shortage and to serve for training farmers, while training and equipping government fish-farming extension workers to introduce and monitor the country's aquaculture programme. The result was a service dedicated to aquaculture extension which was expensive to operate; expenses for logistic support to service distant fish farmers were often excessive. In the majority of cases, these projects demonstrated little sustainability, as increased infrastructure and staff compounded financial constraints, and the resulting extension services were weak or non-existent.

Weak research institutions and their impact

Research activities were hindered by the general economic difficulties already cited. Furthermore, research agendas were often dominated by inappropriate technologies, as researchers frequently had little contact with the farm environment. The situation was aggravated in many cases by the fact that some research stations had high staff turnover, lacked comprehensive research programmes and adequate evaluation, and suffered from weak administrations. However, as aquaculture research advanced world-wide, the main

Inadequate information management systems

Access to aquaculture information is inadequate, limiting the scope, quality and utility of aquaculture research and development activities. There is a lack of information flow (networking) between institutions and countries. Although considerable valuable information is published as grey literature, this is not being collected or disseminated.

Opportunities for further

impediment in the Africa Region was lack of access to current knowledge and technologies. Communications were often difficult, and restricted research budgets often precluded access to those communications systems available, while few libraries, universities or other institutions could afford subscribing to current technical literature.

Limited coordination between research and development sectors

As pointed out, in many cases the research and development efforts carried out are not responsive to the needs of targeted stakeholders. They are not demand driven. For the needs to be appreciated in community settings, research and development should be used to evaluate (a) those social aspects found in many rural areas that negatively affect the adoption of new technologies described by Sen (1995) as "levelling mechanisms", (b) power relationships, (c) intra-household allocation of resources, (d) the role of gender, (e) labour supply and demand and (f) marketing. It is also important to understand and appreciate the complexities of land tenure.

Few reliable production statistics

Most countries do not have effective data collection systems set in place to collect aquaculture production statistics. Yet this is critical for purposes of monitoring, evaluating the performance of the sector, and justifying the allocation of resources to the sector. This is in part due to the low priority given to the sector and the complexity of collecting data from dispersed rural farmers.

growth of the aquaculture sector in sub-saharan africa

The current area under aquaculture production is estimated at 38 214 to 102 406 ha compared to the estimated available surface area of 30 million ha suitable for aquaculture and 12 million ha of floodplains also suitable for fish production. There is also a potential for cage culture, given the availability of water bodies throughout the region.

Careful planning is necessary to guide future aquaculture development and ensure that available resources are well used. Small-scale aquaculture should be developed such that it fits as an agricultural component of a broader farming system and not as an secluded technology where communities will see it as a separate or added risk venture. Socio-economic diagnostic approaches to aquaculture promotion should be considered of high priority and focus on techniques that allow the full participation of communities in the identification, analysis and evaluation of projects.

There is need to facilitate the participation of nongovernmental organizations (NGOs). There are many NGOs involved in empowerment in different disciplines. The private sector has a key role in the production of fingerlings, feed and marketing, as well as possibly in providing extension support. Producer groups are essential to serve as an interface between government, private entrepreneurs and farmers themselves. These groups will empower farmers, reduce inputs costs, improve services, minimize market

bottlenecks and foster efficient information exchange, including feed-forward and feed-back.

There is need to develop national policies and plans that promote the development of aquaculture and that facilitate participatory activities in the field. In the multidisciplinary approach to integrated aquaculture, there is need for strong liaison with other relevant institutions.

A strategy for aquaculture development

The Africa Regional Aquaculture Review (CIFA/OP24, FAO, 2000) developed a number of strategies for enhanced aquaculture development (Box 1). The strategies recognize that some programmes can best be implemented at a national level, whilst others can best be implemented at subregional or regional levels.

This strategy is an opportunity for governments to seriously examine aquaculture development and take advantage of the review and adopt the recommendations. Due to economic problems in most countries, there is increased need for inter-sectoral approaches to tackling the challenges of aquaculture development. Many interest groups and new institutional arrangements with civil society will be

However, challenges facing smallholder farmers across the region are often the same, and common approaches can indeed be applied to a broad spectrum of the region's fish-farming community.

The main strategies include farmer-to-farmer methodologies which focus on the farmer through on-farm research and demonstrations, identifying farmers with leadership potential, such that those trained will effectively train others, and encouraging the formation of farmers associations. The farmer-to-farmer approach is demanding, requiring significant resources that can involve universities and other public institutions, as well as NGOs and the private sector.

Networking

Information flow is critical. Consultative fora composed of stakeholders involved in aquaculture at the subnational and national levels, or other forms of coordination, need to be encouraged. These should have scheduled meetings to analyse problems and trends, assess supply and demand, seek solutions to pending problems and set up monitoring and evaluation systems. Interest groups could be linked through electronic media, and national information facilities

needed to fill the void left by the reduced capacity of governments. Technicians and administrators must assume more responsibility to assist aquaculture in achieving its unmet potential.

Conducive policy framework

There is need to review the existing administrative and legal frameworks. This is normally a protracted process, as it needs parliamentary approval. But sector plans calling for the participation of relevant public agencies, civil society, individuals etc. may be developed by the concerned departments awaiting those elements that require legislative endorsement. In this way, existing regulations may be reviewed and revised to incorporate appropriate aspects of the Code of Conduct for Responsible Fisheries (CCRF), national consultative fora established, and prerequisite data collected.

Appropriate research and extension

There is need to mobilize research and development institutions to develop interest in aquaculture and remove prevailing impediments to expanding aquaculture production. To do this, governments should join forces with the private sector.

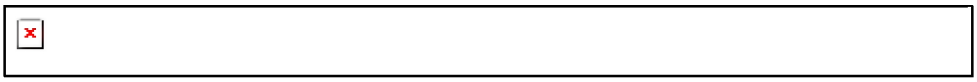
Small-scale farmers have social constraints that affect their needs, priorities and aspirations. These constraints are often location and agro-ecologically specific. If differences are greater than commonalities, it can be difficult to generalize approaches to problem solving.

could also be affiliated to have the widest impact possible. Farmers' associations and consultative frameworks will be key to future aquaculture development in Sub-Saharan Africa.

Training and extension

There is need to set up relevant training courses for technical staff, extensionists, farmers and other stakeholders. There is justification for developing a regional approach to training when promoting aquaculture development. Most countries have limited finances, and it is cost effective to centralize and meet these requirements through identified regional centres. The other advantage is that location within the region will permit the use of regional case studies as examples in the training packages.

Subregional organizations could assist with coordination of training and develop protocols to harmonize policies in the development of aquaculture. These protocols could promote synchrony of legislation, cooperation and integration of economic activities, human capacity building, information sharing, research and technology transfer, defining and promoting the role of civil society, implementing of the CCRF etc.



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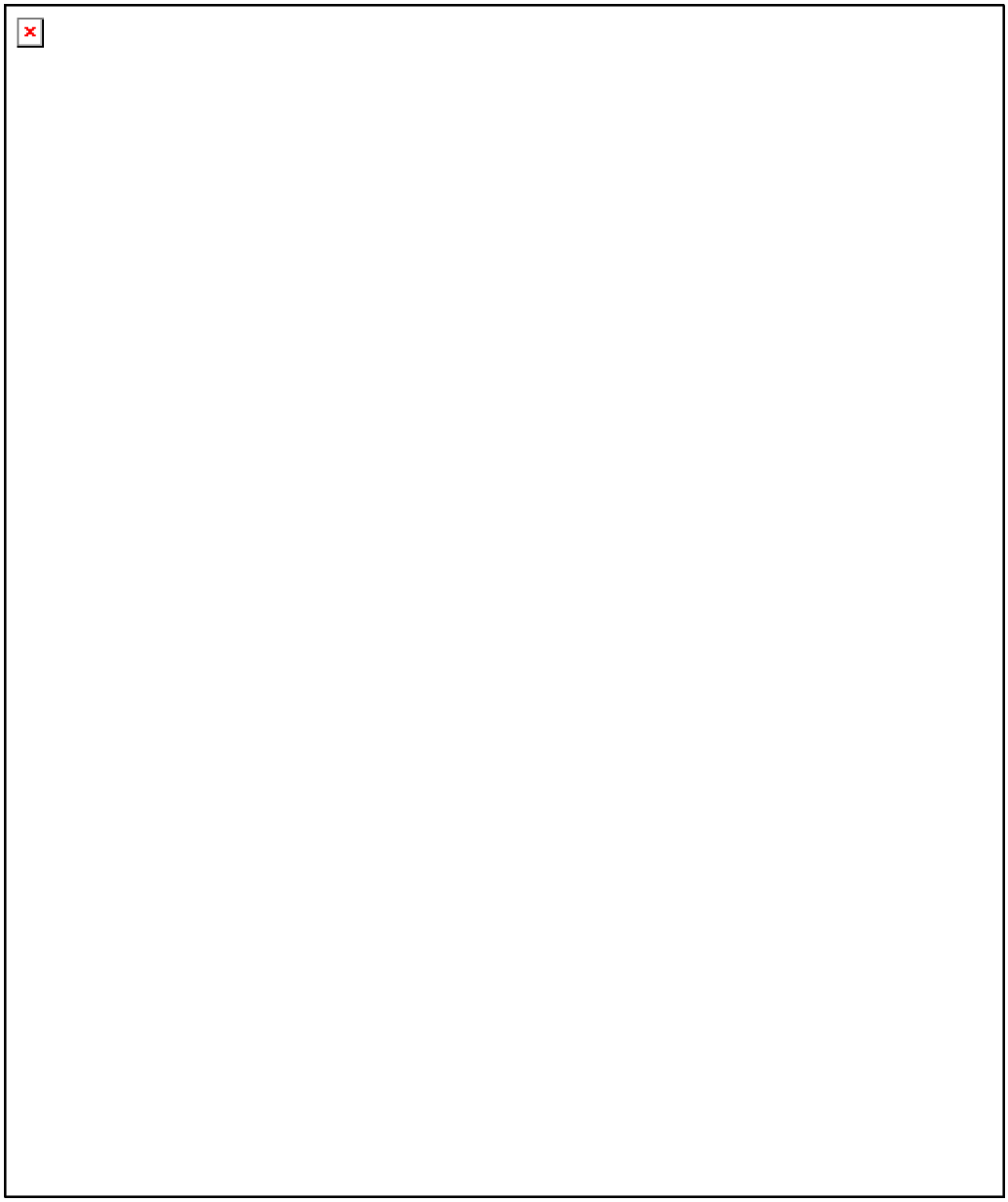

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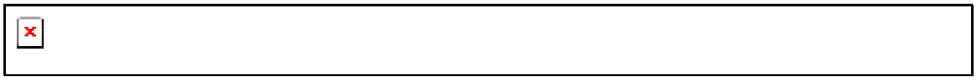


Conclusions and recommendations

There is little doubt that aquaculture is now a known enterprise throughout Africa and has become well established in a number of countries, including Côte d'Ivoire, Madagascar, Malawi, Nigeria, Zambia etc. However, growth and development of the sector are confronted by numerous challenges if aquaculture is to achieve it widely accepted potential.

This analysis of the trends outlines constraints, challenges, opportunities and the potential for aquaculture development. The challenge is to increase the adoption rate of aquaculture across the region, as well as to improve production from existing producers. This challenge is translated for countries as the need to see aquaculture as a tool that has the potential to contribute significantly to food security and development. Food production will remain an overriding priority, and intensification as well as diversification in food production will constitute important approaches to development.

In a number of countries, high population density leaves little room for extending cropping of terrestrial crops. The best prospects for increasing production, therefore, lie in intensification and diversification. Aquaculture is one area that can still be developed and realise significant gains. It holds promise to increase food and financial security in rural areas.

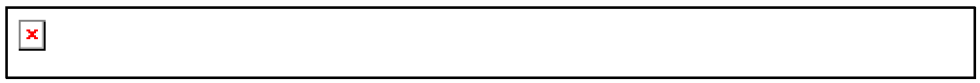
As a way forward to the development of aquaculture in Africa, it is important to look at the aquaculture production systems in a regional context and with

- Due to the contracting role of governments following toughening economic conditions, structural adjustment programmes and weakening currencies, governments must encourage the participation of interest groups and the private sector at the national, regional and international levels, through establishing partnerships, consultative frameworks, and access arrangements to designated areas and under-utilized government facilities and by providing the necessary support services.
- Taking the above into consideration, there is an urgent need to reduce redundant government infrastructure and streamline services, concentrating limited resources on those areas that will provide the highest returns on investment.
- Promoting aquaculture as a separate and isolated farming system has given the impression to governments and smallholder farmers that it is technically complicated and has missed out on the opportunity of developing linkages with other farming activities. Integrating aquaculture with traditional cropping and livestock production systems has the potential not only to increase fish production, but also overall farm production. In addition, nutritional levels, food security and household incomes will increase.
- On the other hand, governments need to recognize aquaculture as a distinct agricultural enterprise, in the same way as any specific

regard to regional resources, priorities and prospectives. Past efforts have successfully introduced the innovation of aquaculture, but the number of producers and overall production remain low. Several factors have been discussed that have contributed to the present situation, and these have served as lessons learned to elaborate a strategy for aquaculture development that will build on the strengths of the past, take into consideration the realities of the present and fulfil the realistic expectations of the future.

agricultural commodity, and need to review existing legal frameworks, policies and institutions to address the specific characteristics and needs of aquaculture.

- There should be a focus on the farmer through on-farm research and demonstrations, identifying farmers with leadership potential and training them, so that they train others, encouraging the formation of farmers' associations.
- All levels of aquaculture production should be promoted, from small- to large-scale commercial. Each has its unique requirements, most of which can be met through increased private-sector involvement. Credit is often not a limiting factor for small-scale operations, but is an important consideration for enterprises of medium- and large-scale. Credit providers, both formal and informal, should be educated as to the opportunities for investment in aquaculture and its potential profitability.



- Efforts must be taken to establish reliable supplies of private-sector-produced seed and feed, the private sector also assuring the distribution of these products. Furthermore, private-sector support to, or participation in,
- Marine culture is under-developed and should be expanded through careful analysis of opportunities, while ensuring the environmental soundness of any undertakings. Seaweed farming has benefited

aquaculture extension needs to be examined.

- Information exchange is essential for aquaculture development, and access to existing information needs to be significantly improved. To a large part, the perceived lack of technologies is not due to the fact that the technologies have not been identified or evaluated, but because this information is not widely available across the region. Functional networks joining stakeholders from all areas of aquaculture development and research will go a long way toward fostering improved information flow.
- Subregional organizations could develop protocols to harmonize policies in the development of aquaculture. These protocols could promote harmonization of legislation, cooperation and integration of economic activities, human capacity building, information sharing, research and technology transfer, defining and promoting the role of civil society, implementing of the CCRF etc. These organizations could also be key brokers as regards regional approaches to research and training.
- Data collection and its management need urgent attention. The need for countries to establish comprehensive data collection systems is evident - baseline data to use when elaborating development strategies and periodic data to monitor progress and growth of the industry. The involvement of many coastal people and coastal communities in other countries could adopt this system.
- Many traditional fish-farming practices are inadequately documented. Efforts are needed to document and study local traditional practices, so that they can be adopted and improved to meet the needs of today. Indigenous fisheries enhancement strategies could be extended to other locations in Africa, especially where culture-based fisheries are being promoted.

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producers in this activity is essential.

- Medium- and large-scale aquaculture production has the potential to expand, as more and more people are motivated to invest in aquaculture and both the local and export markets are insatiable. Governments need to provide an enabling atmosphere to promote investments in these systems. Large production levels are valuable in terms of foreign currency earnings and import substitutions.

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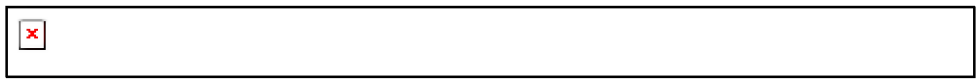

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d' Ivoire, Democratic Republic of Congo, Djibouti, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Nigeria, Réunion, Sao Tomé/Principe, Rwanda, Sénégal, Seychelles, Sierra Leone, Somalia, South Africa, Swaziland, Sudan, Tanzania, Togo, Uganda, Zambia and Zimbabwe.

[5] Growth rates for marine fisheries, which account for most of the world's fish supply, decreased from 6 percent/yr in the 1960s to only 0.6 percent/yr in 1995/96, while population growth rates continue to rise (FAO, 1999).

[6] Acadjas are fish aggregators where artificial reefs composed of branches are placed in estuaries to concentrate fish looking for food or shelter. Fish may be enclosed in these areas and fed prior to harvesting.

[7] Fish holes or "drain-in ponds" are fish concentrators which collect fish from flood plains as waters recede and the plains dry. Fish can be kept in these ponds for a considerable period and fed prior to harvesting.

[8] With the exception of Nigeria, 95 percent of the region's production is considered as originating from small-scale producers; in Nigeria the small-scale contribution is estimated at 40 percent (the remaining 60 percent coming from commercial producers). Thus small-scale production is 95 percent of the regional total exclusive of Nigeria (14 820 mt) plus 40 percent of the Nigerian production (7 080 mt).