National Aquaculture Sector Overview

Sierra Leone

I. Characteristics, Structure And Resources Of The Sector
   a. Summary
   b. History And General Overview
   c. Human Resources
   d. Farming Systems Distribution And Characteristics
   e. Cultured Species
   f. Practices/Systems Of Culture

II. Sector Performance
   a. Production
   b. Market And Trade
   c. Contribution To The Economy

III. Promotion And Management Of The Sector
   a. The Institutional Framework
   b. The Governing Regulations
   c. Applied Research, Education And Training

IV. Trends, Issues And Development

V. References
   a. Bibliography
   b. Related Links

Characteristics, structure and resources of the sector

Summary

The shoreline of Sierra Leone is approximately 560 km long and includes the estuaries of three large river networks (Scarcies, Sierra Leone and Sherbro) and four coastal islands. The continental shelf has an estimated area of 25 000 km$^2$. 

The management, development and conservation of the fisheries resources of Sierra Leone – marine, inland and aquaculture – is currently the responsibility of the Ministry of Fisheries and Marine Resources (MFMR). The fishing industry consists of two sectors, the industrial and the artisanal, the latter comprising marine artisanal, inland artisanal and aquaculture. Fish is an important part of the diet, supplying about 80 percent of the total consumption of animal protein.

Aquaculture is concentrated in the provinces in the south (mainly in Bo and to a lesser extent in Moyamba and Pujehun), the north (mainly in Tonkolili and a little in Bombali) and the east (in Kailahun, Kenema and Kono) of the country. The culture of fish in earthen ponds is the most common system of aquaculture. The principal cultured species is the *Oreochromis niloticus*, but the catfish *Clarias gariepinus* and *Heterobranchus* sp. are cultured as well.

In the riverine villages consumption of freshwater fish provides the main source of animal protein. Villagers use scoop nets, fencing techniques and traps to capture fish from these water bodies. Gillnet fishing is practiced in the larger rivers. Annual production is currently estimated at 20 000 tonnes, of which about 5 000 tonnes come from lakes and 15 000 tonnes from riverine and flood plains. There is room for increasing annual production to about 40 000 tonnes (Fisheries Policy Document, 2003).

Tilapia culture and extension have been practiced for nearly 30 years, principally in the towns of Makali in the north and Bo in the south. The techniques for simple culture are now firmly established. In the 1990s there was a total of 453 fishponds (Agricultural Sector Master Plan, 1992). Policy measures for the development of
inland fisheries and aquaculture (including mariculture) aim at achieving self sufficiency in fish production for the rural populations bordering water bodies and those around the inland valleys and flood plains and as well as other inland communities. This would provide essential fish protein to complement that from marine fisheries. Mariculture development is being encouraged for the export market.

Aquaculture production systems were formally started by the Sierra Leone Government and IDRC (Canada) in 1974 with the culture of the mangrove oyster (*Crassostrea tulipa*). The project established the biological basis for the production of mangrove oysters from raft culture, but extension of the technique to oyster farmers failed. The project was discontinued in 1981 due to lack of financial support and the high cost of inputs (mainly the 44-gallon oil drums used for floatation and polyethylene strings used for suspending the oysters on rafts).

Freshwater fish pond culture started with Nile tilapia (*Oreochromis niloticus*) and catfish (*Clarias gariepinus*) at Makali in 1977 through a joint funding programme with the Ministry of Fisheries, Catholic Relief Services, USAID and the Peace Corps (FAO, 1992).

The rationale behind aquaculture development is to make available good quality fresh fish that will provide affordable fish protein to the poor and fast growing rural population. This will also reduce the pressure on capture marine environments.

### History and general overview

Finfish culture was started in 1977 in the town of Makali, and 10 years later in Bo. Earthen ponds were constructed and used for the production of fingerlings and table size *Oreochromis niloticus*. Farmers owned 1-4 fishponds, with surface areas ranging from 100 to 500 m² per pond. The yield from these ponds was 1.5 to 2.5 tonnes/ha/year, which is 50 percent of the maximum yield attainable under these conditions. Trials with other local freshwater fish species were also carried out and the production yields were very encouraging.

In 1974 a 10-year oyster culture research programme was implemented using a local mangrove oyster species, *Crassostrea tulipa*. Culture trials were undertaken using rafts, trays and sticks. Raft culture was found to be most suitable and the growth rate of oysters was very encouraging at 1 cm per month, producing marketable oysters from a 7-month cycle.

In Sierra Leone, the most common fish culture method is the rearing of fish species in earthen ponds. Subsistence culture of tilapia is common; the initial seeds were obtained from Cote d'Ivoire in the 1970s. The promotion of tilapia culture in earthen ponds was an important component in the Bo-Pujehun GTZ programme in the 1980s and this acted as a trigger in the dissemination of fish culture technology in the Southern Province, primarily in Bo and Pujehun districts.

The Bo-Pujehun project also included experimental trials of integrated fish and rice culture as a demonstration of the technique for swamp rice farmers in the Bo district.

Trials have also been conducted with other species of fish from the wild; catfish (*Heterobranchus* and *Notopterus* spp.) have been successful under experimental conditions but not yet universally adopted by fish farmers. The main constraint to their development is the difficulty of breeding them in captivity, and as a result most of the fingerlings are obtained from the wild.

### Human resources

It is common knowledge that aquaculture could provide much-needed employment, especially for poor rural communities. It is against this background that the Ministry of Fisheries and Marine Resources has placed aquaculture as a foremost priority in the PRSP (Poverty Reduction Strategy Paper).

A recent survey of the status of aquaculture shows that there are about 1 050 fishponds in the country, with over 60 percent in the Tonkolili District alone. About 22 percent of the ponds belong to village communities or
fishing associations; approximately 80 percent of the ponds are private ponds, with about 87 percent owned by males. Men play an active role in the construction and management of fishponds while the role of women becomes apparent at harvest time and women and children carry out the day-to-day maintenance.

There are trained aquaculturists at the Ministry of Fisheries and Marine Resources, but their role is largely restricted to extension, which includes training and demonstration in the construction of ponds and culture and management techniques of earthen fish ponds.

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<tr>
<th>Farming systems distribution and characteristics</th>
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<td>The main aquaculture production areas are in the northern, southern and eastern provinces of Sierra Leone, with heavy concentration in the northern district of Tonkolili, which has 541 active and 117 non-active ponds owned by 425 fish farmers. Earthen ponds are the most commonly found system and pond sizes vary from 31 to 6 160 m². Pond productivity is enhanced through the use of NPK fertilizer combinations as well as chicken manure. The most commonly used feed type is rice bran and termites.</td>
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Water is usually tapped from perennial streams. Availability of land is not considered a constraint to aquaculture development in Sierra Leone.

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<th>Cultured species</th>
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<td>The tilapia species, <em>Oreochromis niloticus</em>, is the main culture species in all parts of the country. The species was introduced from Cote d'Ivoire in the 1970s. There are two functional tilapia fingerling production centres, at Bo and Makali, which supply fish farmers across the country. Other fish such as the catfish species, <em>Clarias</em>, <em>Heterobranchus</em> and <em>Notopterus</em> spp. (cutlass fish) and <em>Mugil</em> spp. (mullet) have also been tried. Unlike tilapia, the catfish species have not been significantly cultured although they present an enormous potential for increasing aquaculture production. <em>Mugil</em> spp. is the target species in artisanal castnet fisheries in the marine environment and is also a source of cheap protein in poor coastal rural communities.</td>
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<th>Practices/systems of culture</th>
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<td>Inland fishery is practiced in ecosystems such as lakes, rivers, floodplains and other water bodies. It is mainly a capture technique and one of the oldest hunting practices. Its contribution to food security in Sierra Leone has been underplayed due to its low priority in the food production systems. However, more recent findings have shown that it contributes significantly to national protein intake.</td>
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Freshwater pond culture of tilapia and/or catfish has been the only promising venture in cultivation of fish by the rural population, given the low requirements of technology, expertise, inputs and capital. Fish culture in earthen ponds is the most common culture practice. Oyster culture practices using rack and raft were undertaken in the 1970s.

Extensive fish culture has been the norm. There are fingerling production centres in Makali and Bo which supply fingerlings to the fish farmers. In order to increase government inputs to these stations, fish farmers are required to pay some fees in return for the fingerlings from these stations. The most commonly used feeds are local feeds such as rice bran and termites. Chicken manure is frequently used to increase the productivity of ponds.

Oyster culture was practiced with spat being collected from the wild and transferred to rafts. Although technical problems of fouling were overcome and marketable oysters were produced, they could not compete with the wild stocks which are easily gathered from the surrounding mangroves.

Government fisheries personnel give technical advice to the farmers on matters such as site selection, pond construction, stocking techniques and densities.

Integrated fish and rice culture was tried out by farmers in the swamp area of Bo-Pujehun with GTZ support in
the 1980s, but was discontinued after the project ended.

## Sector performance

### Production

There are no recent estimates of total fish production from aquaculture mainly because information on details such as total number of ponds and productivity are lacking. The production figures in use are also estimates, the basis of which has never been made clear.

Fish farming accounts for only a small percentage of fish production, about 40 tonnes per annum (Agricultural Sector Master Plan Study, 1992). The fish is consumed by the rural population and is particularly important for non-coastal areas. The FAO annual statistical bulletin of 2001 estimates total production at 30 tonnes constituted entirely of Nile tilapia (**Oreochromis niloticus** ) with a total value of US$ 45 000, based on a cost of US$ 1.5/kg.

The graph below shows total aquaculture production in Sierra Leone according to FAO statistics:

### Market and trade

Fish farming is largely done on subsistence scale and any surplus is sold locally in the nearest market centre. The unit cost of cultured tilapia species varies between US$ 0.17 and US$ 0.33 per kg.

### Contribution to the economy

Aquaculture was introduced in the 1970s and now produces 40 tonnes of fish per annum consisting mainly of Nile tilapia (**Oreochromis niloticus** ) in earthen ponds. The fish is consumed locally by the rural population and is especially important in areas which are distant from capture fisheries.

The contribution of the fishery sector to GDP is 9.4 percent (National Statistics, 2003). Fish constitutes about 80 percent of the animal protein consumption in the country and per capita fish consumption is approximately 17 kg per annum. These estimates refer largely to marine fisheries, with insignificant contribution from aquaculture fish production. Total fish production from Sierra Leone marine waters is estimated at about 83 000 tonnes.

Aquaculture provides fresh fish to significant numbers of people in rural areas, contributing much-needed protein to their diet. It has great potential as an economic activity for enhancing household incomes and promoting rural employment.

Aquaculture is largely a subsistence activity that provides much-needed protein to significantly large numbers of rural households and constitutes an important component in the food basket. Although its contribution to food security and sustainable livelihoods is currently undermined by its restriction in terms of distribution and pond size, the practice has vast potential in Sierra Leone.

### Promotion and management of the sector

#### The institutional framework

The fisheries policy outlines the sectoral policy objectives and corresponding strategies for sustainable aquaculture development in Sierra Leone. The Ministry of Fisheries and Marine Resources is the government agency with the legal mandate to undertake all fisheries management and development activities. The Fisheries Management and Development Act, 1994, is the legal basis for the Ministry's functions and provides the
guidelines for the management of all aquatic resources including fisheries and fishing industries.

The exclusive management and control of fisheries and other aquatic resources within the fishery waters is vested in the government. Management and control may be exercised directly by the government or by the Minister, the Director of Fisheries or any other authorized officer. The Ministry of Fisheries and Marine Resources is headed by a Minister (political head), a Permanent Secretary (administrative head), and a Director of Fisheries (the professional head who must have expertise in fisheries).

The Director, subject to the policy guidance of the Minister, is responsible for the management, planning and development of research on fisheries and other aquatic resources of Sierra Leone.

The Ministry of Fisheries and Marine Resources is the sole government agency with the legal mandate to promote aquaculture activities in the country. The Ministry's overall responsibility is the control, development and conservation of all aquatic organisms, including marine and freshwater environments. Its specific role in aquaculture development is the promotion of sustainable aquaculture through research and extension, focusing in particular on: construction of community ponds in identified rural communities; maintenance of an aquaculture tool bank for hire to fish farmers and associations; provision of technical support to private fish farmers; identification and awarding of aquaculture research contracts to the university.

The Ministry has a separate unit in charge of inland fisheries and aquaculture. This unit is headed by an Assistant Director of Fisheries, supported by a Principal Fisheries Officer and a team of intermediate and junior technical field staff.

The governing regulations

The Fisheries Regulations pertaining to aquaculture forbid the following:

- Introduction of exotic species in aquaculture system without clearance from the Ministry.
- Undertaking of any aquaculture activity without clearance from the Ministry.
- Unauthorized fish processing activity.
- Utilization of unsuitable sites for reasons of environmental degradation.

Applied research, education and training

The Ministry contracts out fisheries research activities to the University of Sierra Leone. Aquaculture is a core subject in the curriculum of the Science Faculty of the University of Sierra Leone. As a strategy to diversify fish production, there are plans to introduce aquaculture in the school curriculum.

Aquaculture development priorities are identified by the Ministry and should fit within the Ministry's overall sectoral objectives.

The Ministry works in close collaboration with the Institute of Marine Biology and Oceanography (IMBO) of the University of Sierra Leone and Njala University College.

Trends, issues and development

The pace of aquaculture development in Sierra Leone is noticeably slow since its inception in the 1970s. Fish culture is still largely practiced at the subsistence level or as a backyard activity. The prospects for commercial aquaculture will remain gloomy until significant strides are taken towards large-scale aquaculture. Its potential for food security, employment and household income generation still remains to be properly exploited.

Promotion of aquaculture was a vital ingredient of the GTZ-funded Bo-Pujehun rural development project between 1970 and 1980. The project established an experimental fish culture station in Bo in the Southern
Province, with the construction of 12 demonstration ponds. By 1990 there were about 112 fish farmers in the two districts. Recent surveys show that there are now over about 300 private and community fishponds in the Bo and Pujehun districts (National Aquaculture Survey, 2005).

A major obstacle to aquaculture development can be attributed to over-reliance on marine capture fisheries and the extensive network of rivers and lakes in the interior of the country; inadequate government funding is another inhibiting factor.

Moreover, the lack of sustainability of previous aquaculture programmes of assistance is not encouraging. These programmes have been based on high-cost extension services which aim at transferring concepts of animal husbandry to the target rural population which is totally unfamiliar with them and which central government does not have the funds to sustain.

Fish and rice integration has been shown to have a good potential, particularly in the riverine grasslands, bolilands and inland valley swamps (FAO, 1989).

The basic policy objective for aquaculture is to achieve self-sufficiency through aquaculture in meeting the demand for fish among the rural populations bordering water bodies and those around the inland valleys, flood plains and other inland communities. This system provides much-needed fish protein to complement that from the marine fisheries. Mariculture development should be encouraged for the production of export oriented fishery products.

The national fisheries policy outlines several strategies to achieve its objectives. These are:

- Investigating and assessing the potential of inland fisheries and aquaculture.
- Initiating and establishing river basin management systems.
- Promoting the production and marketing of capture and cultured fish and shellfish.
- Improving the national nutrition status through aquaculture and inland fisheries.
- Facilitating the promotion of integrated freshwater aquaculture and mariculture production systems.
- Maintaining the biodiversity of the inland fisheries ecosystems.

A recent report (Bamba, 2004) has observed that aquaculture development in Sierra Leone needs refocusing and a new approach to make a meaningful contribution to poverty reduction and food security.

References

FAO publications related to aquaculture for Sierra Leone


**Related links**

FAO FishStatJ – Universal software for fishery statistical time series