



National Aquaculture Sector Overview

Replaces: Arabic version (2003), Spanish version (2003), French version (2003), Chinese version (2003)

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Characteristics, structure and resources of the sector

Summary

Aquaculture is currently the largest single source of fish supply in Egypt accounting for almost 65 percent of the total fish production of the country with over 99 percent produced from privately owned farms.

The development and expansion of modern aquaculture began in Egypt two decades ago following which the sector has witnessed a significant and rapid development over the last few years leading to a sharp increase in production. This sector is exhibiting the strongest growth of any fisheries related activity in the country and as a result aquaculture is considered as the only viable option for reducing the gap between production and consumption of fish in Egypt.

Except for a very limited number of isolated instances, most aquaculture activities are located in the Nile Delta Region. Aquaculture is practiced using a variety of systems with varying levels of technology. So far the majority of farmed fish are either freshwater species or those that can grow in brackish water. The production of fish and crustaceans in marine or brackish water is still in its early stages and its development is still influenced by technical and economical problems.

The majority of fish farms in Egypt can be classified as semi-intensive brackish water pond farms; this type of farming suffered a dramatic reduction in numbers during the early 1990s as a result of the competition for land and water from the expansion of land reclamation activities for agriculture. Intensive aquaculture, in earthen ponds and tanks, is now developing rapidly to counter act the reduction in the total area available for aquaculture activity.

Current developments in production are centred on the application of modern technologies and are a result of changes in the structure of the fish farming community. The high rate of return on investment in aquaculture FAO Fisheries and Aquaculture Department

has attracted a large number of small to middle level investors who tend to have a more scientific background than the traditional farmers. The sector is becoming more sophisticated and diverse and this is also associated with a rapid expansion in support activities such as local feed mills and hatcheries. The number of fish hatcheries has increased from 14 in 1998 (Barrania *et al*, 1999) to over 300 (GAFRD, 2009). More than 16 fish feed manufacturing companies have been established during the course of the last ten years.

History and general overview

Aquaculture has been known in Egypt since the beginning of written history; tomb friezes date back to 2500 B.C. and illustrate the harvest of tilapia from ponds (Bardach *et al*, 1972). A traditional form of aquaculture, known as "*hosha*", has been commonly practiced for many centuries (Eisawy and El-Bolok, 1975) in the Northern Delta Lakes Region until a few decades ago.

Modern aquaculture began in the mid 1930s following the introduction of the common carp at two research farms, from then until the early 1960s, the carp was kept purely for research purposes. The first modern semiintensive commercial farm was built by the Government in 1961. This farm had a total area of 120 hectares of earthen ponds growing Nile tilapia, common carp and flathead grey mullet.

In the late 1970s an aquaculture development plan was proposed to boost the development of the sector. By the end of the plan in the mid 1980s, annual aquaculture production had jumped from a mere 17 000 tonnes to 45 000 tonnes. During this period the Government built four large hatcheries, six fish farms and five fry collection stations. Extensive promotion of aquaculture and easy access to land led to a rapid expansion of the private sector's involvement in aquaculture. This period also witnessed the introduction of new aquaculture systems. By 1984 the first trials of tilapia cage culture in the Nile took place and the farming of common carp in rice paddy fields was undertaken as part of Government extension programmes.

Until the mid 1980s, aquaculture activities were confined to the Eastern and Northern Delta Regions. All production derived from either semi-extensive or semi-intensive pond systems using fresh and low salinity brackish water. Traditional, privately-owned aquaculture, producing mostly tilapia and mullet, operated using large shallow ponds of up to 25 hectares. Production per unit area was low (250–400 kilograms/hectare). This type of production depends mainly on enhanced natural productivity through the addition of natural fertilisers (manure) and limited use of artificial feeds (usually rice bran).

Semi-intensive aquaculture was more commonly carried out in farms operated by the Government where polyculture was practiced in smaller ponds of between 2–6 hectares with the use of fertilisers and supplementary feeding. The average annual production from these semi-intensive systems was in the range of 1.5–2.5 tonnes per hectare.

The farming of marine species such as European seabass, gilthead seabream, sole, meagre and penaeid shrimp began in the late 1980s and early 1990s. The majority of farming of marine fish still depends on the collection of seed from the wild. Marine aquaculture in Egypt is still far from being as successful as freshwater farming.

In the mid 1990s, intensive pond aquaculture was introduced with the aim of replacing the semi-intensive and traditional farms. Intensive farming is expanding as a result of the high returns on investments. These systems use smaller and deeper ponds, stocking densities are higher and intensive feeding and aeration is provided. Average annual production attained is in the range of 17.5–30 tonnes per hectare. Integrated desert agriculture-aquaculture activities started in the late 1990s generally in the form of intensive tank aquaculture. This form of aquaculture is also expanding rapidly particularly in the western desert region.

Total aquaculture production in 2009 in Egypt reached 705 490 tonnes with a total market value of USD 1 354.646 million (1 USD = 5.55 Egyptian pounds) (GAFRD, 2010).

Human resources

No accurate statistics exist on the number of people involved in aquaculture and related activities, however, the people involved in aquaculture can be divided into four groups:

- 1. The first are the land owners and those with Government issued land lease contracts for traditional fish farms. These people generally run a family business where all or most of the family members (sometimes two generations) work on or for the farm. These types of farms are generally labour intensive with a simple infrastructure and production technologies. Most of the farmers have only a limited education and apply production techniques inherited down through the generations. The total number of people involved in this type of activity has been estimated to be between 37 000 and 43 000 persons.
- 2. The second group includes people working in fish hatcheries, cage farms and intensive pond aquaculture. The majority of people working in this sector are hired staff and include trained technicians and skilled labourers. The figure given in the official documents of the General Authority for Fish Resources Development (GAFRD) estimate a total of 25 000 persons.
- 3. The third group includes staff working at Government run hatcheries, fry collection stations, juvenile production facilities and fish farms. They have differing levels of education and training, ranging from highly trained experts to unskilled labour. The total number of governmental employees working with aquaculture in the field is approximately 1 000 persons.
- 4. The fourth group includes consultants, feed mill staff, engineers, transport, processing and other support activities. The number of registered consultants is 228 and the number of people working in fish feed production is estimated to be 540 persons.

In the first, third and fourth group, man power is of mixed gender, the second group however, is dominated by males with a few exceptions in some private hatcheries.

Farming systems distribution and characteristics

Most aquaculture activities are generally located in the Northern Nile Delta Region, with fish farms usually found clustered in the areas surrounding the four Delta Lakes (Maruit, Edko, Boruls and Manzala). Fish hatcheries are also generally located in the vicinity of the fish farms except for five large Government hatcheries scattered along the course of the Nile in Upper Egypt. The distribution of aquaculture units is shown as blue circles on the next map.



Solution Click on the map's icons to get more detailed information on the main aquaculture production sites

Fig. 1. Distribution of the main aquaculture production sites (Google Egypt map, 2010).

Cultured species

Presently, 14 different species of finfish and two species of crustacean are cultured in Egypt. Ten are native and six are introduced species. The native species are: Nile tilapia (*Oreochromis niloticus*), blue tilapia (*Oreochromis aureus*), North African catfish (*Clarias gariepinus*), flathead grey mullet (*Mugil cephalus*), thinlip mullet (*Liza ramada*), bluespot mullet (*Valamugil seheli*), European seabass (*Dicentrarchus labrax*), gilthead seabream (*Sparus aurata*), meagre (*Argyrosomus regius*) and penaeid shrimp. The introduced species are: common carp (*Cyprinus carpio*), grass carp (*Ctenopharyngodon idellus*), silver carp (*Hypophthalmichthys molitrix*), bighead carp (*Hypophthalmichthys nobilis*), black carp (*Mylopharyngodon piceus*) and the giant river freshwater prawn (*Macrobrachium rosenbergii*).

Common carp and flathead grey mullet were the first species cultured in the country, with common carp being introduced in 1936 for experimental purposes. With the introduction of modern commercial aquaculture in the late 1970s and early 1980s, Egypt built four carp hatcheries and imported brood stock fish from ex Germany Democratic Republic and Hungary. Common carps were also extensively used in the government-financed national rice-cum-fish programmes. The total production of carps in 2009 was 73 958 tonnes or approximately 10.48 percent of the total aquaculture production, most from poly-culture in rice fields.

Flathead grey mullet has been farmed since the mid 1930s on experimental farms and in traditional "*hosha*" farming systems. The production of this species has always depended on wild fry collected from estuaries. With the expansion of aquaculture in the mid 1980s, Egypt established six fry stations collecting millions of fry of commercially valuable marine species. Current annual production of farmed mullet is approximately 209 980 tonnes accounting for approximately 30 percent of the total aquaculture production in 2009.

Until the late 1980s, the presence of Nile tilapia in pond harvests, although native to Egypt, was considered a sign of bad pond management. During the early period of aquaculture development, tilapia was not stocked in aquaculture ponds and when found in the harvest it was considered as accidental crop. It was only during the 1990s that Nile tilapia was rediscovered as an important aquaculture species. This rediscovery was associated with the beginning of intensive-pond aquaculture. The expansion in intensive tilapia aquaculture resulted in a boom in the development of privately-owned hatcheries and feed mill construction. The expansion in Nile tilapia was also associated with the production of all male tilapia and since then Nile tilapia has become the most important aquaculture species with a total harvest of about 390 280 tonnes, more than 55 percent of the total aquaculture harvest in 2009 (GAFRD, 2010).

All mullets species represent about 30 percent of the harvest and considered as important consummated species, while catfish production about 17 895 tonnes (about 3 percent), carps represent about 73 958 tonnes (about 11 percent of the total aquaculture production).

The European seabass, gilthead seabream and meagre are also produced in limited amounts in marine fish farms. Although several hatcheries are producing fry (beside the governmental one near Alexandria), but most production still depends on fry collected from the wild. The total production of the European seabass and gilthead seabream in 2009 was 5 381 and 5 335 tonnes, respectively.

The giant river prawn was introduced in Egypt from Thailand in 1989. The species, however, has not been widely accepted in the Egyptian market, but it is still produced in limited amounts (100–120 tonnes a year).

Production of meagre, and other species totals only a few hundred tonnes.

Practices/systems of culture

Semi-intensive pond aquaculture is the basic system used in the country; the majority of the ponds are large (between 2–8 hectares) with a recorded total production of 597 881 tonnes in 2009 (GAFRD, 2010) or approximately 86 percent of the total aquaculture production. Most of the farms are located in the northern and eastern parts of the Nile Delta where they utilize both brackish and freshwater. The stocking densities, energy input, level of management as well as the size and type of infrastructure varies greatly among different farms. The total land area used for this kind of aquaculture is 159 191 hectares with an annual per hectare production of between 2.8 to 8 tonnes.

Intensive pond aquaculture is now expanding to replace large areas of the semi-intensive ponds. Intensive pond systems depend on well designed and constructed earthen ponds (sometimes lined with polyethylene sheets) They are smaller in size (0.3 to 0.6 hectares) with higher dykes allowing water depths to reach 1.5-1.75 meters. Ponds are aerated with electrical paddle wheels and have a higher rate of water renewal (between 2–10 percent per day). Total production from intensive pond systems was 1860 tonnes or approximately 0.27 percent of the total production in 2009. The total area utilized for this kind of aquaculture is 19 938 hectares with an average production per hectare of 14 - 25 tonnes (mostly of tilapia, mullets).

Intensive aquaculture in tanks is another rapidly developing sector during the last ten years. Concrete tanks are used within integrated aquaculture and desert agriculture systems. This type of production is gaining an increasing acceptance as a result of the high rate of return on the utilization of water. The total number of registered farms is currently 530 with an annual production of 6 300 tonnes. Other land-based intensive fish farming using tanks is limited to another five farms with a total production of 500 tonnes per year mostly of tilapia.

Cage culture is common especially in the most northern branches of the Nile Delta. More than 4 500 cages with a total volume of 1.4 million cubic meters are presently in operation. The recorded total fish production from cage culture was 68 049 tonnes in 2009.

Poly-culture in rice paddy fields has been practiced in Egypt since the mid 1980s. This farming activity

fluctuates with changes in the acreage dedicated to rice production which in turn depends on the annual water budget. Poly-culture is however increasing once again following price subsidies of fingerlings by the Ministry of Agriculture and Land Reclamation. Total production was 26 012 tonnes in 2009 (GAFRD, 2010).

Sector performance

Production

Aquaculture is considered to be the only possible solution to increase fish production in Egypt. In its development strategy, the Ministry of Agriculture and Land Reclamation, plans to increase Egypt's total fish production to 1.5 million tonnes by 2017 and is targeting a harvest of 1 million tonnes from aquaculture. The sector is growing at levels exceeding those targeted in the plan. This expected increase, alongside the planned development in poultry production, will hopefully assist in improving the *per capita* consumption of animal protein. Aquaculture also creates employment opportunities for a large number of unemployed graduates.

Aquaculture integrated with rice production is considered by the Government as an indirect subsidy in animal protein consumption among the poorer rural population. Fish fingerlings (about 20 million/year) purchased by the Government from different hatcheries are distributed to rice farmers. This ensures a supply of animal protein to farmers as the harvested fish are not marketed, but consumed directly by the farmers.

Total aquaculture production in Egypt reached 705 490 tonnes in 2009 with a total market value of about USD 1 354.65 million (1 USD = 5.55 Egyptian pounds) (GAFRD, 2010).

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

Market and trade

At the retail level, aquaculture products are sold alongside wild caught products. Farmed fish are considered to be inferior in quality by most consumers although they are usually unable to differentiate between farmed and wild caught fish of the same species. There are currently no regulations requiring the origin of fish to be identified by the retailers and whether they are farmed or captured fish.

The marketing system for fish is simple but efficient. The market is controlled by a limited number of large wholesalers who determine the market price mainly in response to supplies and demand. Farmers are free to sell their products either through wholesalers or directly to retailers. In all major cities there is usually an official wholesale vegetable and fruit market where producers can bring their product. Here fish are auctioned daily.

Farmers also have agreements with wholesalers who purchase their harvest directly from the farm site. Agreements are usually informal and in many cases the wholesaler finances the production operations and receives the harvested fish at a price agreed in advance.

Aquaculture products tend to be consumed in the domestic market as Egypt is not yet self sufficient in fish (about 135 520 tonnes are imported IN 2009 to ensure an annual *per capita* consumption of 15.89 kg).

Contribution to the economy

Aquaculture is the single most important source of fish production in the country and is recognized by the Government as the only sector within fisheries which can provide for the increasing demand of fish. Aquaculture is developing rapidly from a traditional family-run business into a modern industry. As a result, the number of traditional family farms is declining and replaced by semi-intensive and intensive farming operations.

The rapid development in aquaculture has created a large number of jobs for farm technicians and skilled FAO Fisheries and Aquaculture Department

labour. Furthermore, new industries and financial services in support of aquaculture are also providing employment opportunities. The expansion of aquaculture has succeeded in reducing and stabilizing the cost of fish in Egypt allowing accessibility to the poorer rural population to healthy and affordable animal protein.

Promotion and management of the sector

The institutional framework

The General Authority for Fish Resources Development (GAFRD), a subsidiary of the Ministry of Agriculture and Land Reclamation, is the agency responsible for all planning and control activities related to fish production and the competent authority in charge of applying the 1983 Fisheries Law No.124. The chairman of the organization has the authority of a vice minister and, accordingly, is authorized to issue relevant fisheries and aquaculture decrees and regulations. The headquarter of the organization is in Cairo and three branches are located in the major fisheries regions. Seven general directorates cover the remaining geographical areas.

GAFRD, besides being responsible for applying different legislation regulating fisheries activities in the country, is also in charge of extension and support activities. Each of the major branches has an extension centre including a pilot farm, hatchery and laboratories for soil and water analysis with services provided upon request free of charge. Fish seed produced in the government hatcheries or collected by its fry collection stations is sold at nominal prices to private farmers.

The governing regulations

Law No 124/1983 on fishing, aquatic life and the regulation of fish farms is the main body of legislation on fisheries. The Act contains a number of provisions on aquaculture. The Act is administered by the General Authority for Fisheries Resources Development (GAFRD), established by Presidential Decree No 190/1983, falling under the Ministry of Agriculture.

For more information on aquaculture legislation in Egypt please click on the following link: **National Aquaculture Legislation Overview - Egypt**

Applied research, education and training

There are a large number of Government research institutions and university (e.g. the universities Cairo, Ein Shams, Alexandria, Suez Canal, El Azhar, El Mansura, Tanta, Asuit, Zagazig and Upper Egypt) specializing in fisheries research and education subjects. Research usually focuses on applied needs aimed at improving production efficiency. Specific research topics are usually selected through a close dialogue between research institutions, GAFRD, the Egyptian Aquaculture Society and the producers. Conferences, workshops and meetings are frequently held and producers are invited to discuss production problems with scientists.

On farm participation in the research activity is common in Government run facilities and in private enterprises. Research results are usually published in scientific journals, but simplified articles can be published in magazines and other publications produced by local aquaculture societies which are easily accessible to farmers, experts and technicians.

The GAFRD extension and training directorates are in charge of transferring information to farmers with a lesser degree of education by publishing simple extension papers. Free aquaculture training courses are also organized and delivered by GAFRD.

Trends, issues and development

Aquaculture has witnessed rapid growth during the second half of the 1990s particularly with the introduction

and increase application of intensive pond aquaculture technologies. By 1999 the number of fish farms utilising intensive pond techniques increased to 68 farms with a total area of 1088 hectares. Such expansion has created an increase demand for juveniles (especially mono sex tilapia), pelleted feed (both extruded and expanded) and skilled technicians. As a result, within less than six years, the number of fish hatcheries increased from 28 freshwater fish hatcheries to over 350 hatcheries in 2009, most of them not registered. Privately operated hatcheries produce mainly all male tilapia and silver carp. Similarly, the number of feed mills has increased from only two to more than 14 within the same period producing also floating feed pellets.

In 1997, at the beginning of the reform period in aquaculture technologies, production totalled 73 500 tonnes representing only 16 percent of the total fish production (GAFRD, 1997). Within this total, fresh and brackish water pond aquaculture accounted for 64 500 tonnes, cage production for 2 100 tonnes and polyculture in rice fields for 6 900 tonnes. Within the 64 500 tonnes produced using pond aquaculture, 56 600 tonnes were produced by privately-owned farms and 7 900 tonnes from pilot Government run farms. The harvest from ponds consisted of approximately 41 percent tilapia, 30 percent carp and 22 percent mullet.

By 2009, total aquaculture harvest reached 705 490 tonnes, representing approximately 65 percent of the total Egyptian fish production. Within this total, fresh and brackish water pond aquaculture accounted for 597 881 tonnes, 68 049 tonnes were produced from cages, 37 700 tonnes from aquaculture in rice fields and 1860 tonnes from intensive tank aquaculture. Of the 597 881 tonnes produced from ponds, 591 276 tonnes were produced by privately-owned farms and 6 605 tonnes from Government run farms. The harvest from freshwater and brackish ponds consisted of 55 percent tilapia, 30 percent mullet and 11 percent carp.

Traditional aquaculture has also witnessed great improvements in the production systems; traditional extensive and semi-intensive aquaculture moved towards semi-intensive system using supplementary feeding on a routine basis. Annual production per hectare increased from an average of 250–400 kg to 0.7–6 tonnes. Cage aquaculture flourished rapidly supported by experts and technicians with the required technical skills. GAFRD also provided support to the development of cage aquaculture as a means of providing employment to new graduates (soft loans of 50 000 Egyptian pounds).

Tilapia used to be the only fish produced in freshwater cages until 1999 when cage culture of silver carp began mainly in the fertile freshwaters of the Nile River branches near Rosetta. Production from cage culture has increased dramatically during the last decade. In 1993 the total number of cages was 355 with an annual harvest of 340 tonnes; by 2009 production reached 68 049 tonnes. Worth noting that cage aquaculture activities on the Nile is currently facing strong opposition from environmental groups and as a result the sector may suffer a sharp decline both in cage numbers and production in the future.

Further developments in the fresh and brackish water aquaculture sector are planned despite most of the land suitable for pond aquaculture is already in use. According to GAFRD, a large proportion of the targeted growth within its aquaculture development strategy, i.e. one million and half tonnes by 2017, can be reached by converting traditional farms to intensive pond culture systems. To encourage transformation of traditional aquaculture to intensive farming systems, GAFRD has recently issued a decree limiting public land leases for aquaculture to a maximum of 10 hectares. Furthermore, a land lease contract is valid for five years and renewal is dependent on conditions set be GAFRD.

Integrated aquaculture and agriculture in the desert have grown rapidly since the beginning of the millennium. A large number of desert land owners have established fish rearing facilities through the use of ground water. Desert aquaculture began with growing fish in the tanks used as water reservoirs for irrigation. Successes encouraged some farm owners to seek technical support to integrate fish farming into their agriculture businesses. A production of 1 030 tonnes has been reported (mostly from tilapia grown in intensive units). The Ministry of Agriculture is supporting this trend and it is expected to have several hundred of such farms operating within five years. Privately-owned tilapia and carp hatcheries have already been established in the area to supply the increasing demand for juveniles.

In the GAFRD aquaculture development strategy, marine aquaculture is considered as an opportunity to increase fish production in a country which has limited resources of freshwater. This sector is however facing numerous technical (mainly seed production) and legislative problems. Private investors, although attracted by the potential sales revenues, are deterred by the higher investment costs and associated risks. The legislative complication results from the complexity of land lease regulations in the coastal areas and competition for land use as tourism takes priority.

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