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Egyptian aquaculture Status, constraints and outlook

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Introduction

Egypt has the earliest recorded history of tilapia culture, goes back to 2000 BC. A line-drawing on an Egyptian tomb shows angling for tilapia from an artificial garden fish pond (Hickling 1962).

In recent history the government has realized the need for managing fisheries resources and established the General Authorities for Fisheries Resources Development (GAFRD) in 1982, as a responsible body managing fisheries business. GAFRD is responsible for giving licenses to fishing vessels, gears and to establish fish farms.

Fisheries stock assessment studies for fishing areas in both Mediterranean and Red sea showed that there is generally limited scope for increasing capture fisheries production. That creates a need for increasing aquaculture production to fill the growing gap between supply and demand for fisheries products. Aquaculture also creates employment particularly depressed coastal and remote regions and contributes to the household economic of rural farmers.

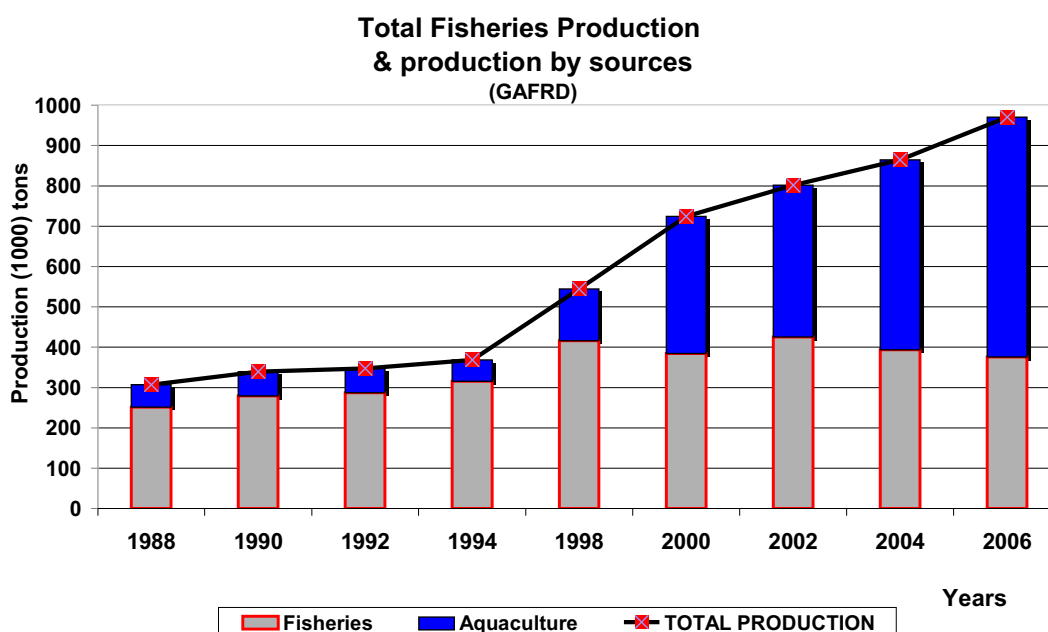
Analysis of Egyptian aquaculture status, success story, lessons learned, business constraints would be discussed. Aquaculture fisheries data analyzed were collected from GAFRD statistical year books, which are not trusted 100%, it is more likely to be estimates than accurate statistics, but it is the only source of fisheries data available, so this work tend to analyze production statistics for long time to get as close as possible from real situations.

1. Fish Production

Total fish production from both fisheries and aquaculture has increased more than 3 folds between year 1988 to 2006 (figure 1). It was 306.900 metric tons in 1998 and reached 970.923 metric tons in 2006. During the first ten years, (1988-1996) fisheries production quantity increased 40% from the base year 1988. While the remarked increase in fisheries production started after year 1998 up to 2006, during that time the production has almost doubled.

The increase in fisheries landing from all natural resources was around 50% between year 1988 and 2006, 251.900 and 375.900 metric tons respectively. Fisheries landing reached the peak in 1998 statistics and were stable for several years and started to decline after 2004. While aquaculture production showed remarked increase almost 10 folds during the same time. Aquaculture production trend after 1998 was opposite to fisheries landing trend. Aquaculture showed remarked increase started from 1998 statistics and onward. That explain the increase in total fish production came mainly from aquaculture, which was noticed starting from year 1998 up to date.

Figure 1
Total fisheries production and production by sources



The contribution of aquaculture to total fisheries supply increased from 18% in 1988 to reach 61% in year 2006 (table 1). The remarked increase in aquaculture contribution to total fisheries production started from 1998 which was 24% in that year and reached 61% in 2006 statistics. Aquaculture in 2006 statistics covered 50% of fisheries market supply (local production and imports), which reflect the growing important role of aquaculture to meet fisheries market demand.

Table 1
Shows the relative importance of aquaculture to fisheries production and fish consumption

	1988	1990	1992	1994	1996	1998	2000	2002	2004	2006
<i>Aquaculture as % of fisheries Production</i>	18%	18%	17%	14%	18%	24%	47%	47%	54%	61%
<i>Aquaculture as % of total fish consumed</i>	14%	13%	13%	10%	12%	18%	37%	39%	43%	50%

2. Farmed Fish Species

The most cultured fish species in aquaculture are tilapias, Mullet spp, and Carp spp., their production represent around 95% of farm cultured fish species. More than 40% of farmed fish are tilapias since 1998 till 2006 (table 2). The quantity of tilapia production increased from 27854 metric tons in 1996 to reach 258924 metric tons in 2006. Tilapias production has increased around 10 folds during that time.

The sharp increase in mullet production between 2004 and 2006 (table. 2) can't be explained. Neither actual farm experience nor number of mullet fry, which depend on collecting their fry from wild resources, would explain that high increase in mullet production in 2006 data. From two farm surveys done to different farm locations (unpublished data) percentage of mullet stocking rate was not more 20:25% of number of tilapia stocked, and mullet production in most of farms understudy was not more than 10% of tilapia production.

Table 2
Main cultured fish species in Egyptian farms

Species / Years	1996	1998	2000	2002	2004	2006
Species production from Aquaculture in 1000 tons by years						
Tilapia	27.854	52.759	157.425	167.735	199.037	258.924
Mullet	20.101	28.383	80.530	113.027	132.651	231.604
Carp	23.439	39.859	82.591	92.219	117.821	91.618
Production by species as % from aquaculture production						
Tilapia % of Aqua	37%	41%	46%	45%	42%	44%
Carp % of Aqua	31%	31%	24%	25%	25%	15%
Mullet % of Aqua	26%	22%	24%	30%	28%	39%
Total	94%	94%	94%	99%	95%	98%

3. Production systems

Earthen ponds

Most of the aquaculture production is derived from semi-intensive fish farms in earthen ponds (El-Gayar 2003). Size of earthen ponds fish farms have increased from 94,565 hectare in 1998 to 140,159 hectare in 2006. The contribution of state owned farms to aquaculture production has declined from 12.8% in 1996 to 1.3% in 2006, while privately managed farms production represented 87.2% in 1996 and increased to 98.7% in 2006 (GAFRD). The reasons for leading role of private farms are the flexibility in management and increasing private farms size.

Intensive systems

Intensive systems; Integrated intensive fish farms and orchard farms using ground water for fish farming and then use drain water for irrigation, are exist in desert area. These farms using flow water systems and mechanical aerations and produce around 10 kg of tilapia/m³/year. Cages were used for producing tilapia, mullet and silver carps in Nile river branches close to the sea, but it has been taken out of the river at the end of 2006 due to environmental considerations. Some cages have moved to estuaries in brackish water growing tilapia and mullet only.

4. Fisheries Demand and Supply

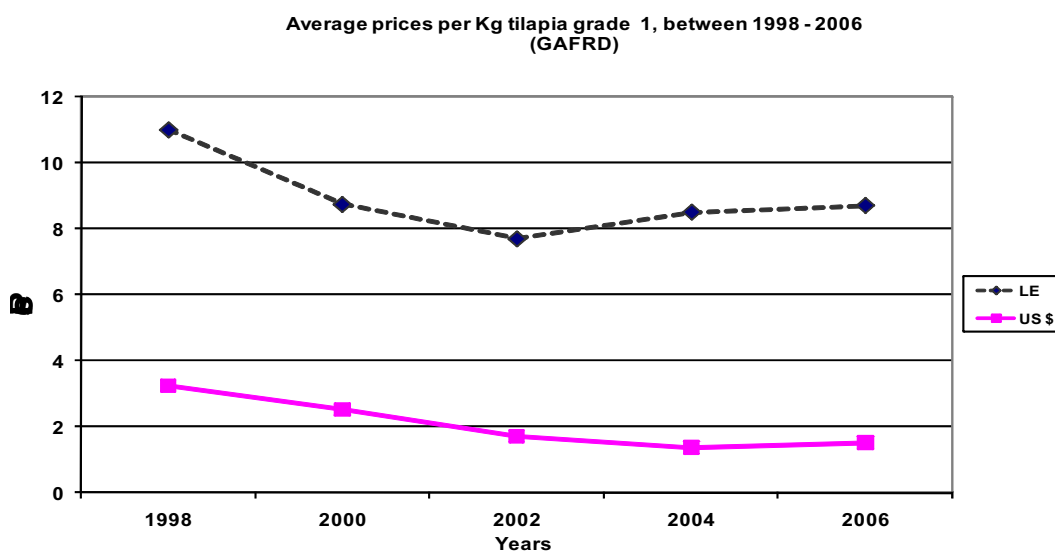
However, fisheries production increased more than three folds between 1988 to 2006, imports of fisheries products steadily increased during the same time to fill the gap between demand and supply. Fisheries imports increased but at slower rate 15% during the same time (table 3), due to the high increase in aquaculture production. Most of imports are low value species for lower income families. While high value marine fish species are exported to Europe. Exportation declined between from 1998 and 2000 as a result of enforcing EU imports legislation in 1998 and that reflected on Egyptian fisheries exports.

Table 3
Fisheries imports and exports and relative important of imports to market demand

	1988	1990	1992	1994	1996	1998	2000	2002	2004	2006
Export in (1000 m.t.)	0.9	3.3	2.1	1.7	1.7	0.5	0.9	2.6	1.9	4.0
Imports in (1000 m.t.)	100	122	133	145	181	176	191	154	221	208
Imports as % of Fish Consumption	25%	27%	28%	28%	30%	24%	21%	16%	20%	18%

Tilapia production increased from 52759 metric tons in 1998 to 258924 metric tons in 2006. That lead to decline its prices in the market from LE 11 (3.2 \$) to LE 8.7 (1.5 \$) per Kg of first class tilapia size (figure 2).

Figure 2
Average prices per Kg tilapia grade 1



5. Issues behind aquaculture development.

Aquaculture production increased mainly due to the increase in freshwater fish (tilapia & carp) and brackish-water fish (mullet). While marine fish species (Sea Bass & Sea Bream) production did show progressive increase during 1988 to 2006. There were several factors contributed to remarked increase in aquaculture production which started form 1998 statistics, could be summarized on the following points:

Resources Availability

Fish Farms are mostly concentrated in Delta regions around Northern lakes (Burlus, Edku, and Manzalla). The reason for that is following establishing Aswan High Dam in 1967, which controlled Nile River water flow, and reduced northern lakes size leaving fast area of unused land around those lakes. That land were close to lake water and/or end of irrigation and drainage canal going to the lakes, which make their site ideal for aquaculture use than agriculture crops.

Institutional Support

GAFRD in 1997 facilitated issued licenses for private hatcheries, which produce mainly mono-sex and/or mixed sex tilapia. That enabled farmers to stock their farm with Nile tilapia seeds in the right time. Before that the source of tilapia seeds was state hatcheries and natural resources. State hatcheries were not able to meet the demand for tilapia seed. So farmers collect tilapia fingers from water bodies, which were mixed with unwanted tilapia strains because of their poor growth rate.

Fish Feed Availability

Private feed mills producing fish feed starting from around mid nineties with pressed feed and extruded feed locally produced by year 2001. That enabled farmers to increase stocking rate and consequently increasing production quantity. Governmental feed mills produce exclusively pressed pellets, while 5 of the 9 private feed mills produce extruded pellets.

Technology transfer and training

Not only GAFRD send their staff for training abroad, but also GAFRD fish farms served as demonstrations farms to private sector, and the technical staff working in those farms transfer their experience to private sector farms. Also other organizations (Social Fund for Development, Multi-Sector Support Programm (MSSP), and the Egyptian Agribusiness Association (EAGA) started to organize training courses to private farmers since 1998 for improving their skills in managing their farms, and consequently increasing their production quantity and profitability.

6. Aquaculture Constraints

The constraints facing aquaculture sector have been arranged in order of importance, following the ranking provided by fish farmers in one production area (El-Naggar et al., 2006).

Among the listed problems, feed prices were considered the most serious problem. Since most of feed ingredient are imported and their cost are increasing due to both international market prices and declining LE value against US \$, falling from 3.4 LE per \$ in 1995 to 6.2 in 2004. Sadek et al., (2004) reported that fish feed prices continued to rise on the yearly basis from US \$ 165 per ton in 1995 to US \$ 304 in 2004. GAFRD statistics showed that first class tilapia prices has declined from 2.7 \$ to 1.5 \$ per kg from 1996 to 2006. That reflect squeezing profit margin due to increasing production cost and declining fish prices.

Of other important constraints are the declining fish prices, Lack of finance and fish price fluctuation. Feidi (2004) also reported that fluctuation in tilapia fish prices and that the instability was a function of seasonality changes.

Others problems are; government legislation, fish fry prices, high taxes, reliable and quality fish fry, availability of skilled labour among others. (e.g contingencies) respectively.

7. Challenges

In addition of constraints facing aquaculture business in Egypt, there are other challenges facing producers and they have to overcome for sustainability of the business.

Resource use conflict (land and water), would be important factor facing aquaculture in future. Egypt is one of the countries which has limited water resources and that reflect of quantity and quality of water available for fish farming. Also increasing prices of farm crops would give incentive to some farmers to switch to agriculture production, which would reduce fish farms size. Intensification of existing production systems either earthen ponds or intensive fish farms is must to increase production from existing resources.

Reduction of environmental impact of aquaculture on the surrounding water bodies have to be considered by producers for sustainability of the business. Improving quality of fish feed and reducing quantity of fertilizers are very better interaction between aquaculture and the environment. Also banning collecting wild fry from the sea is very important to avoid depletion of marine ecosystem, is very important environmental issues and have to sorted to improve aquaculture image.

8. Outlook

However aquaculture is facing many constraints and challenges, there are many opportunities for future increase of aquaculture production.

Market demand

There is strong market demand for fishery product either from aquaculture or from fisheries, for the following reasons:

- According to recent GAFRD statistics imported fish cover 18% of fish consumed, which express the existing market demand to fill the gap between local production and consumption.
- Goulding 2001, reported that population increase at 2% yearly, reflecting the need to cover the increasing demand for fisheries product due to increasing population.

Upgrading of existing production system

Water and land resources would be limiting factor for aquaculture development and intensification of existing production system is must to meet resources limitation. Many farmers have the technical skill or able to make joint venture with international consultant offices to develop high intensive production systems. Many organizations (such as EAGA, and American Soybean Association) are organizing expletory visits to private farmers and investors to other countries such EU countries, China and USA. That would open the door for technology transfer and develop contacts between local producers and foreign companies or external entrepreneurs.

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