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MARINE AQUACULTURE IN EGYPT

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1 INTRODUCTION

This report provides a review of the marine aquaculture sector in Egypt, and includes the following:

- Review of production and market development
- Assess the outlook for marine aquaculture development, in relation to a number of key constraints to be identified

Information sources include:

- CAPMAS data on fish production and trade
- GAFRD Annual Statistical Report on fish production, fry supplies and marketing
- Papers and reports by US AID Agricultural Policy Reform Program
- Proceedings of Workshop on Aquaculture Development, El-Arish, March 2001, Suez Canal University

The main references consulted were the following:

Capture of wild finfish fry in Mediterranean coastal areas and possible impact on aquaculture development and marine genetic resources
Sherif Sadek and Dan Mires
Israeli Journal of Aquaculture, Bamidgeh 52(2), 2000, 77-88

Seabream culture in Egypt; status constraints and potential
Sherif Sadek
Fish physiology and biochemistry 22: 171-178,2000

Suez Canal University
Minutes and recommendations of the Workshop on the benefits of marine aquaculture
March 12, 2001 Faculty of Environmental and Agricultural Sciences, el Arish, Egypt

Custom Tariffs for Imported Products - 2001
Ministry of Economy and Trade, May 2001

Central Agency for Public Mobilisation and Statistics (CAPMAS)
Import and Export Statistics, 1997-2000

Bureau Liaison Agricole France Egytpien (BLAFE)
Project d'Aquaculture Marine en Egypte "Proposition d'une projet pilote de grossissement de dorade et autres poissons marines en Mer Rouge
Cofrepeche France Aquaculture, Mai 1995

Mision d'evaluation des potentiales aquacoles en Egypte
IDEE for Ministere de l'agriculture, de la peche et de alimentation, Republique Française
Benoit Husson, Avril 1997

Mission for Marine Shrimp Farming Development in Egypt
Hervé Lucien-Brun
MSSP, 1999
Sepia Consultants

Report No.6: Identifying Policy Barriers for Fisheries Development
Ministry of Agriculture and Land Reclamation
Reform Design and Implementation Unit
Agriculture Policy Reform Programme, USAID, August 1999

Aquaculture in Egypt: Current Status and Development Prospects
Omar el Gayar and Ian Goulding, MSSP, November 1996

Fish Production Statistics, 1996 to 2000
General Authority for Fish Resource Development
Ministry of Agriculture and Land Reform

2 PRODUCTION AND MARKETING OF FISH IN EGYPT

2.1 Fish production

Production by source during the period 1992 to 2000 is shown in Table 1. During this period overall production of fish for human consumption has increased from 347,000 to 724,000 tonnes. Significant increases in production were obtained from the Mediterranean Sea and Lake Bardawil (due, in recent years to increased Nile flows). In 2000 marine capture fisheries accounted for 18% of production, lake fisheries 22%, and the River Nile 11%. Aquaculture (including carp production in rice fields) contributed 47% of production and 36% of consumption.

Source	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*	*1992-2000*
Sea fisheries										
Mediterranean	44.0	45.0	45.6	43.7	51.0	52.7	68.0	90.0	54.9	+ 25%
Red Sea	43.0	51.0	48.3	47.3	48.4	57.4	57.1	82.4	76.0	+ 77%
Lakes										
Manzala	59.0	64.0	59.0	59.6	52.5	63.1	78.3	65.0	74.1	+ 26%
Burullus	52.0	48.0	55.1	59.2	59.3	58.7	59.0	55.3	51.7	-+ 1%
Bardawil	1.8	2.2	1.6	2.2	1.6	2.2	1.9	3.9	3.3	+ 83%
Idku	8.3	8.3	9.7	8.2	10.1	10.8	10.3	9.5	8.9	+ 7%
Maryut	3.5	3.9	3.8	3.5	4.0	4.5	4.5	5.3	6.4	+ 83%
Qarun	1.4	0.8	0.4	0.7	0.9	0.9	1.0	1.5	1.8	+ 29%
Nasser	33.0	29.0	32.4	50.9	45.4	52.6	53.8	41.3	19.0	-+ 42%
Fouad	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.1	-+ 50%
Elrian	0.6	0.5	0.5	0.6	0.7	0.9	1.0	1.7	1.9	+ 217%
Rivers and canals										
Nile, canals and others	40.0	50.0	57.5	67.9	69.7	77.8	79.2	57.6	80.3	+ 101%
Fish farming	35.0	35.0	35.0	41.9	54.6	66.5	116.0	215.8	323.7	+ 825%
Rice fields	25.0	19.0	18.0	19.8	21.3	6.9	12.4	8.1	16.4	-+ 34%
Morra and Timsah	0.7	1.3	1.3	1.5	1.8	1.7	1.7	2.0	5.8	+ 729%
TOTAL PRODUCTION	**347.5**	**358.2**	**368.4**	**407.1**	**421.5**	**456.9**	**544.4**	**639.6**	**724.3**	+ 108%
(of which fish farming)	17%	15%	14%	15%	18%	16%	24%	35%	47%	
Net imports	**n.a**	**105.7**	**143.1**	**120.1**	**181.1**	**153.8**	**175.2**	**192.5**	**212.7**	+ 101%
TOTAL CONSUMPTION	**n.a**	**463.9**	**511.5**	**527.2**	**602.6**	**610.7**	**719.6**	**832.1**	**937.0**	+ 170%
(of which fish farming)		12%	10%	12%	13%	12%	18%	27%	36%	

Table 1 : Fish Production and Imports during 1992-2000 ('000 tonnes)

One of the major features of the pattern of production is the rapid increase in contribution of aquaculture, with an 800% increase in the eight years since 1992. Output doubled between 1998 and 1999, to 223,000 tonnes, and in 2000 production increased by a further 50% to 340,000 tonnes.

The most common types of fish produced in Egypt are tilapia (40% of production from all sources) and grey mullet[1] (about 14%), as shown in Table 2. These two groups account for more than half of all fish produced.

Source / Species		***Production 1998***		***Production 2000***	
		tonnes	***%***	***tonnes***	***%***
Marine capture fisheries					
	Mullets	2,656	0.5%	3,761	0.5%
	Seabass	559	0.1%	626	0.1%
	Seabream	553	0.1%	751	0.1%
	Other fish	81,762	15.3%	98,300	13.6%
	Crustacea	6,900	1.3%	10,949	1.5%
	Cephalopod & molluscs	13,389	2.5%	4,264	0.6%
	Others	19,244	3.6%	12,293	1.7%
	Sub-total	**125,063**	**23.4%**	**130,944**	**18.1%**
Lake fisheries					0.0%
	Tilapia	101,880	19.1%	100,391	13.9%
	Mullet	15,356	2.9%	16,697	2.3%
	Seabass	707	0.1%	1,541	0.2%
	Seabream	672	0.1%	1,727	0.2%
	Other fish	7,737	1.4%	31,933	4.4%
	Crustacea	3,804	0.7%	4,884	0.7%
	Molluscs	121	0.0%	916	0.1%
	Others	82,612	15.5%	15,045	2.1%
	Sub-total	**212,889**	**39.8%**	**173,134**	**23.9%**
Nile and canals					0.0%
	Tilapia	26,566	5.0%	30,885	4.3%
	Other species	41,686	7.8%	49,436	6.8%
	Sub-total	**68,252**	**12.8%**	**80,321**	**11.1%**
Aquaculture					0.0%
	Carp in rice fields	12,440	2.3%	82,591	11.4%
	Other carp	27,420	5.1%	-	0.0%
	Tilapia	52,755	9.9%	157,425	21.7%
	Mullet	28,383	5.3%	80,530	11.1%
	Seabream	3,682	0.7%	8,862	1.2%
	Seabass	3,612	0.7%	10,031	1.4%
	Catfish	197	0.0%	654	0.1%
	Sub-total	**128,489**	**24.0%**	**340,093**	**46.9%**
	TOTAL	**534,693**	**100.0%**	**724,492**	**100.0%**

Table 2 : Fish production by Source and Species

[1] In this report "grey mullet" (or mullet) is used generically to denote all fish from the genera *Mugil* and *Lisa*.

2.2 International trade in fishery products

Trade in fishery products is shown in Table 3. Net imports have risen from about 106,000 tonnes in 1992 to about 190,000 tonnes in 2000, although there were some strong fluctuations during the decade. Value of imports was over US$100 million in 2000. Most of the imports were small pelagic fish such as mackerel and herring. The main sources were UK, Norway and Holland. Imports enter processing (smoked herring and salmon) or are sold directly to consumers via the Cooperative Stores of the Ministry of Supply.

Year	Exports		Imports		Net imports	
	Quantity	Value	Quantity	Value	Quantity	Value
	Tonnes	US$	Tonnes	US$000	Tonnes	US$
1995	1,794	3,193,814	121,925	74,559,352	120,131	71,365,538
1996	1,697	2,766,578	182,774	109,113,174	181,077	106,346,596
1997	1,923	2,744,762	155,753	96,614,636	153,830	93,869,873
1998	1,125	1,888,797	176,301	91,220,492	175,176	89,331,695
1999	692	1,211,802	193,157	98,030,891	192,465	96,819,089
2000	919	1,124,272	190,794	101,627,918	189,876	100,503,646

Table 3 : International Fish Trade 1995-2000

In comparison, exports of fish are negligible (earning only US$3.2 million in 1995). After mid-1998 exports were reduced even further by loss of access to the EU market due to lack of sanitary controls in compliance with EU Directives. The main exports were fresh fish, frozen cephalopods, and fresh and frozen bivalve molluscs (clams), currently valued at US$1 million per year.

2.3 Fish supplies to market and consumption

Table 1 shows that supplies to market have increased significantly over the period 1992 to 2000 rising from 347,000 to 937,000 tonnes.

The resulting trends in fish consumption per capita are shown in Table 4. Annual increase in population is assumed to be in the region of 2%, whilst supplies of fish for human consumption have increased at an average rate of 13% during the 9 year period. Annual consumption of fish per capita has increased from 6.4 kg per capita/annum in 1992 to an estimated 14.7kg per capita in 2000. Although CAPMAS and GAFRD estimates are slightly lower in some years, it is clear that per capita fish consumption during the decade has grown significantly, at an average rate in the region of 9-10% per year.

Fish ('000 tonnes) / Year	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*
Production	347.5	358.2	368.4	407.1	421.5	456.9	544.4	639.6	724.3
Net imports			143.1	120.1	181.1	153.8	175.2	192.5	212.7
Total consumption	347.5	358.2	511.5	527.2	602.6	610.7	719.6	832.1	937.0
Population estimate (million)	54.7	55.8	56.9	58.1	59.3	60.5	61.7	62.9	64.2
Consumption (kg/capita)									
PMU estimate	6.4	6.4	9.0	9.1	10.2	10.1	11.7	13.2	14.6
CAPMAS statistics	6.9	8.2	9.4	9.7	8.8	9.3			
GAFRD statistics	7.8	7.2	8.2	9.4	10.1			13.2	14.7

Table 4 : Fish Consumption during 1992-2000

2.4 Contribution of aquaculture to fish consumption

Figure 1 shows the contribution to total consumption from capture fisheries (all sources), imports and aquaculture, over the period 1994 to 2000.

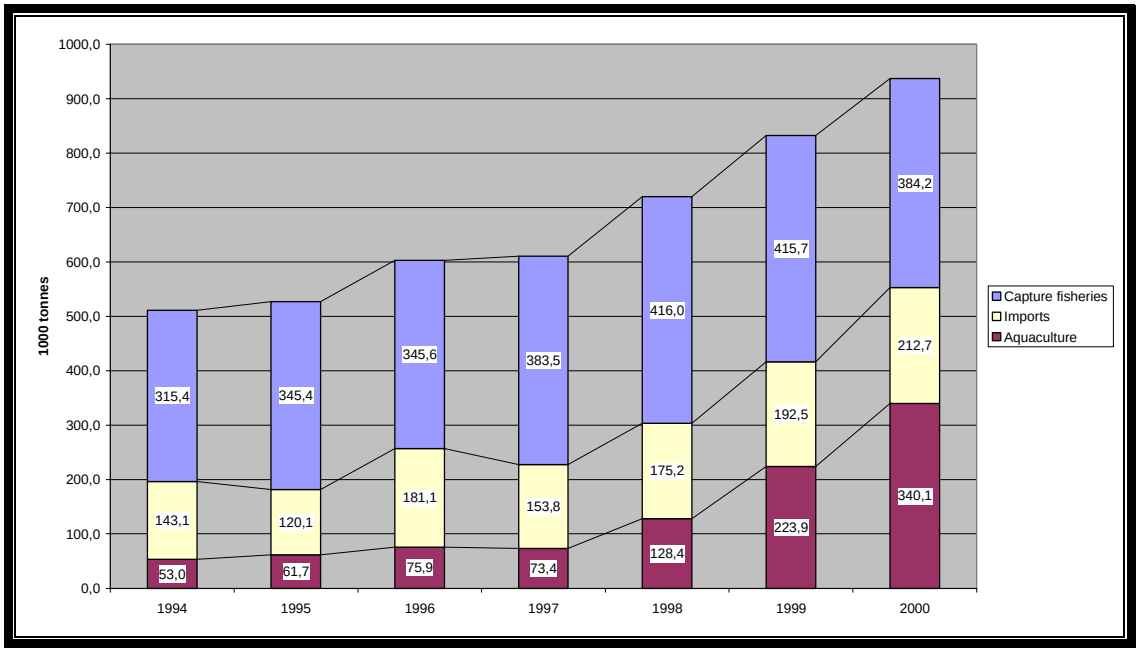


Figure 1 : Sources of Fish for human consumption

Imports have continued to play an important role in fish supplies to the Egyptian market, accounting for a relatively constant 23% of domestic consumption. Aquaculture has made a very significant impact on improving the supplies of fish for human consumption, rising from just 35,000 tonnes in 1992 (10% of supplies) to 340,000 tonnes in 2000 (36% of supplies to market).

Since 1994 about half of the increase in consumption and in per capita consumption has been provided by aquaculture, with the balance supplied by capture fisheries (Mediterranean and the northern lakes) and imports. Aquaculture development has therefore had a significant impact on the supply pattern of fish to the Egyptian market. Egyptian people presently eat about twice as much fish now than they did 10 years ago, and about half of the increase is due to improved supplies from aquaculture.

Figures 2 and 3 show that the impact of this change has been mainly in terms of supplies of mullet and tilapia, which together account for 43% of fish consumed. In 2000, 80% of the 101,000 tonnes of mullet consumed, and 55% of the 289,000 tonnes of tilapia were derived from aquaculture. About 75% of the seabass and seabream consumed were from aquaculture. However, the markets for these species are much smaller (about 8-10,000 tonnes, although even this may be an overestimate) and production data is also of doubtful validity.

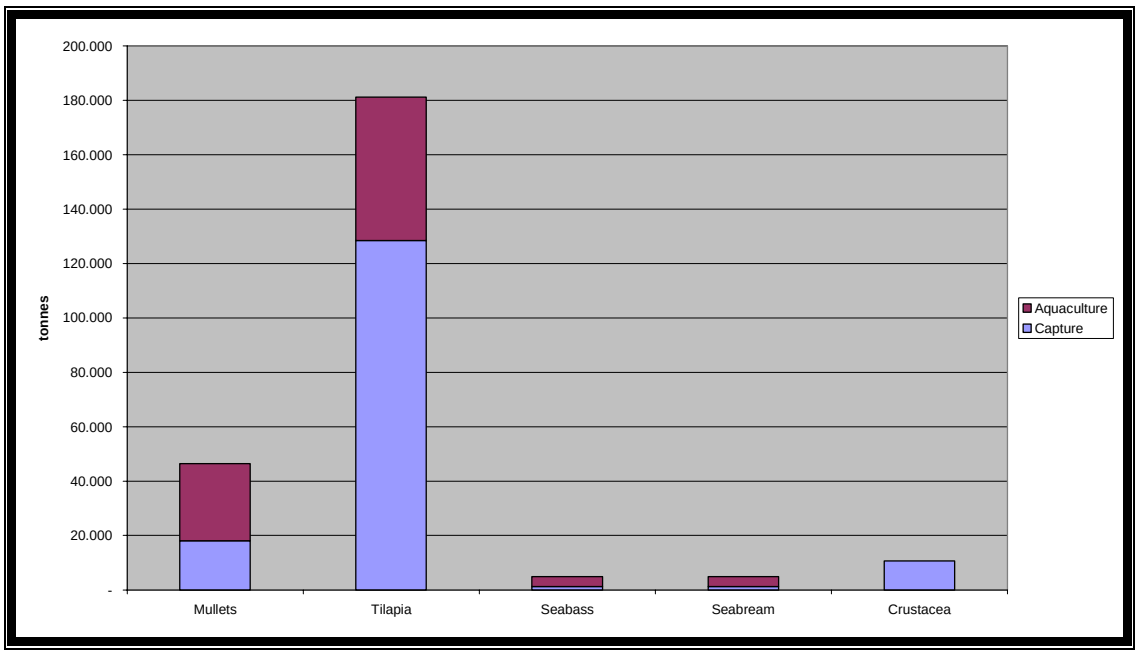


Figure 2 : Sources of Cultured Fish Species in Egypt in 1998

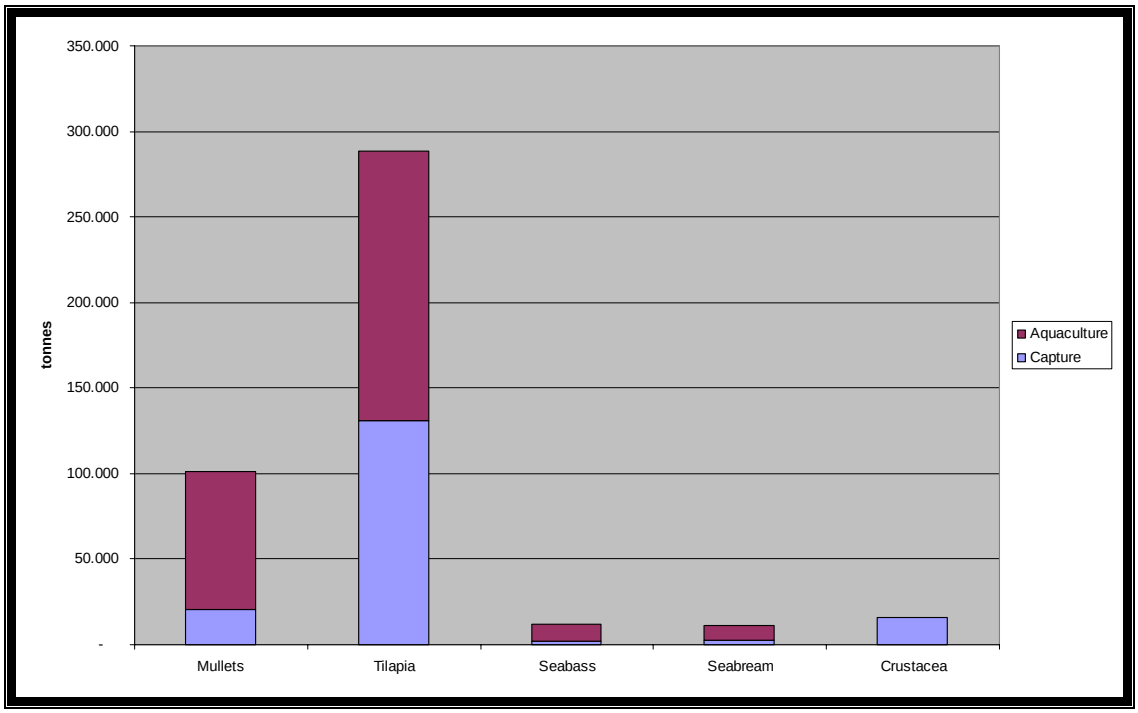


Figure 3 : Sources of Cultured Fish Species in Egypt in 2000

2.5 Prices of fish products from aquaculture

GAFRD has published price data for fishery products since the opening of el-Abour Wholesale Market in 1996.

Figure 4 and Table 5 show the price trends for different grades of farmed tilapia and mullet during the period 1997 to 2000 inclusive. It appears that during the period 1997 to the end of 1999, the price of mullet Grade 1 fell slightly in money terms, from around 13LE/kg to about 11.5LE/kg. However, thereafter, the price increased to over 14LE/kg in September 2000. Prices of all grades of mullet fell at the end of 2000.

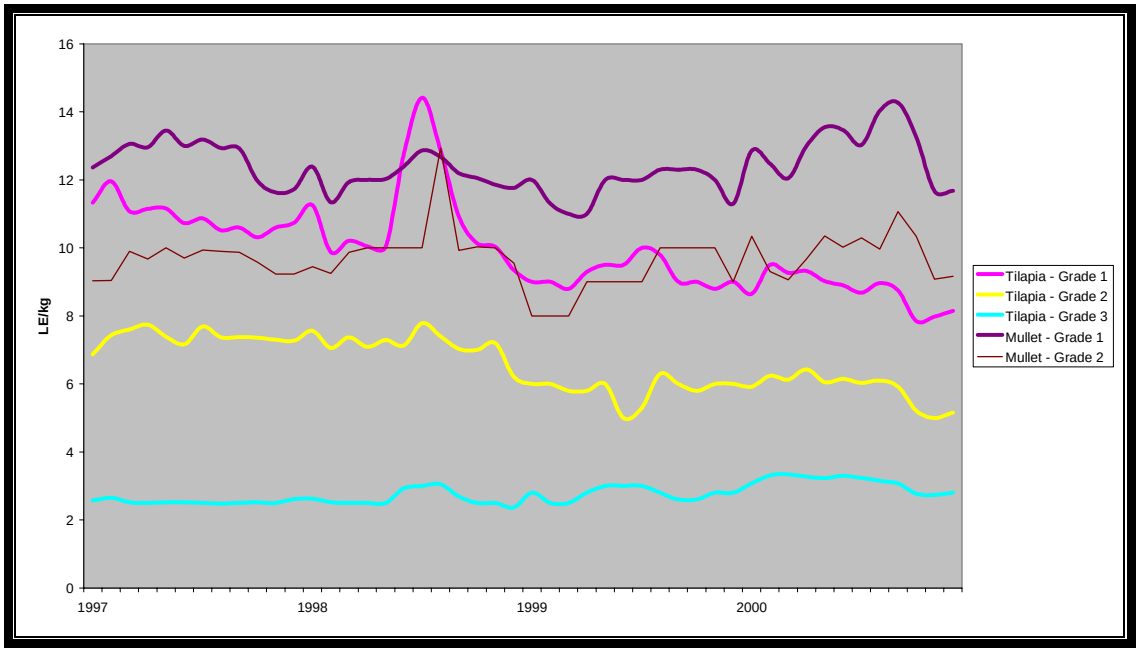


Figure 4 : Wholesale Prices of Mullet and Tilapia el Abour market, 1997 - 2000

The price of tilapia has fallen steadily during the period. The trendline for tilapia Grade 1 has the equation:

$$y = -0.0673x + 11.626$$

This would suggest a fall of 6.7% per year in the price of tilapia. Interestingly, mullet grade 2 shows similar price levels and trend features as tilapia grade 1, suggesting that they may well appeal to the same market segments, although the price of mullet grade 2 price has been relatively constant (in money terms).

The price of second grade tilapia also fell by 5% per annum, represented by the trendline:

$$y = -0.0484x + 7.7487$$

Prices of 3rd grade tilapia rose during the period, by about 1% per year.

Tilapia prices have therefore fallen both in money and real terms, with an average decline of 5 to 7% per annum in money terms over the four year period. Assuming a rate of inflation of 3% per annum, over the four years 1997 to 2000, the relative price of tilapia (Grades 1 and 2) has fallen by about 36% (or about one third) in real terms.

It would appear that mullet (both Grade 1 and 2) have managed to more or less sustain prices in money terms. However accounting for inflation, both show a decrease in real prices of about 10% over the four year period.

It is clear that the changes in consumption of these species is driven by lower prices due to significant supplies entering the market from aquaculture. This is a desirable condition. The market functions well, and producers compete on the basis of production efficiency, improving yields and driving down costs.

2.5.1 Seabass and seabream

Figure 5 and Table 6 show the equivalent price information for seabass and seabream.

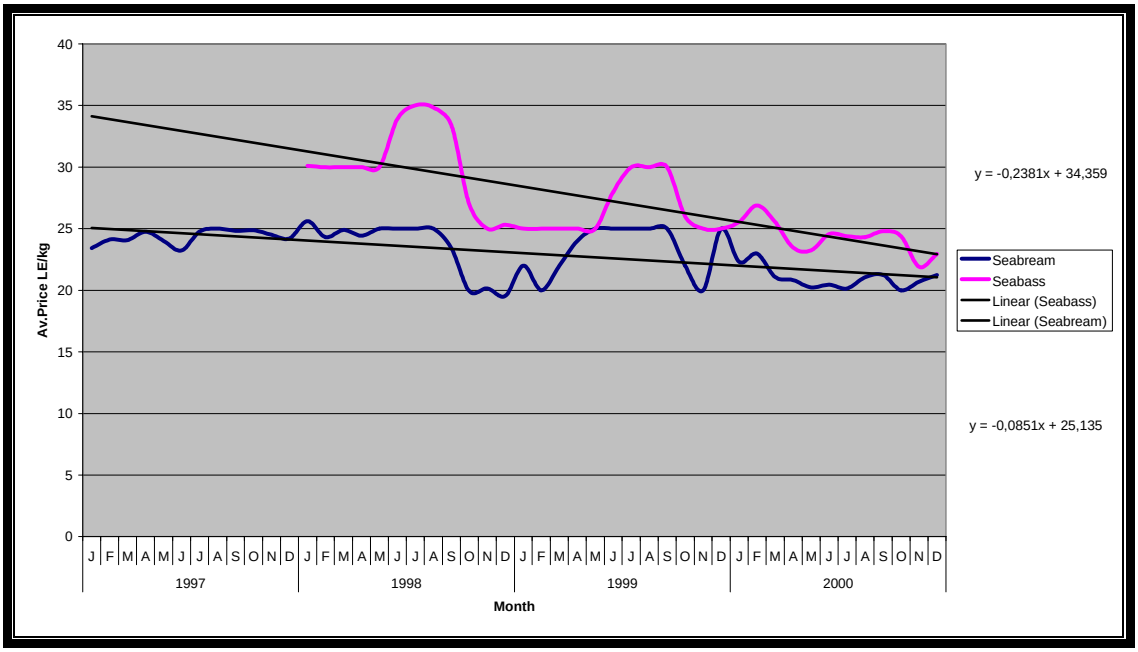


Figure 5 : Wholesale Prices of Seabass and Seabream, 1997 - 2000

Both species show a marked fall in prices around October 1998, which is believed to correspond directly with the loss of access to the EU market, and the increase in supplies to the local market. It would appear that about 1000 tonnes of fish had to find national markets, causing a price fall of some 30-35% for seabass, and about 20% for seabream over a relatively short period.

Seabream has been able to substantially recover (possibly finding alternative export or local markets) and the price has stayed in the region 20-25 LE/kg since the end of 1998. However, seabass, which appears to have a local market which is more sensitive to volume effects on price, has not recovered its pre-1998 prices. Prices have remained depressed in the region of 25LE /kg, and in fact at the end of 2000, fell to below this level, substantially converging with seabream.

The price changes experienced in the last four years are as a result of relatively small changes in the volume of supplies of fish. The data indicate:

- the sensitivity of the market for these species to over-supply

and/or

- a decline in economic circumstances depressing demand for more expensive fish.

The volume of production involved is relatively small (maximum production from all source is less than 10,000 tonnes). Any future changes in amounts entering the market will have an immediate and lasting impact on price.

Therefore fish farmers considering investment in production systems for these species (both hatchery and grow out) should be careful not to base their assessment of feasibility on current prices. Similarly banks assessing current loan applications should assume an approximate 20% fall in the price of seabass for every 1000 tonnes of supply, and a 8.5% fall in the price of seabream for each 1000 additional tonnes of seabream produced (all prices changes in money terms).

Species / Grade	1997												1997
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Tilapia - Grade 1	11.33	11.96	11.08	11.15	11.16	10.73	10.87	10.52	10.60	10.31	10.60	10.74	10.92
Tilapia - Grade 2	6.87	7.43	7.60	7.74	7.39	7.17	7.69	7.37	7.38	7.36	7.30	7.27	7.38
Tilapia - Grade 3	2.57	2.65	2.52	2.50	2.52	2.52	2.50	2.48	2.50	2.52	2.50	2.61	2.53
Mullet - Grade 1	12.37	12.70	13.06	12.96	13.45	13.00	13.19	12.94	12.93	11.97	11.63	11.73	12.66
Mullet - Grade 2	9.03	9.04	9.90	9.67	10.00	9.70	9.94	9.90	9.87	9.58	9.23	9.23	9.59

Species / Grade	1998												1998
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Tilapia - Grade 1	11.26	9.88	10.21	10.05	10.03	12.77	14.42	12.87	10.93	10.14	10.03	9.35	11.00
Tilapia - Grade 2	7.56	7.06	7.37	7.09	7.29	7.13	7.79	7.40	7.03	7.00	7.20	6.21	7.18
Tilapia - Grade 3	2.62	2.52	2.50	2.50	2.50	2.93	3.00	3.05	2.69	2.50	2.50	2.37	2.64
Mullet - Grade 1	12.39	11.34	11.94	12.00	12.03	12.40	12.87	12.68	12.20	12.06	11.86	11.77	12.13
Mullet - Grade 2	9.45	9.25	9.87	10.00	10.00	10.00	10.00	12.94	9.93	10.03	10.00	9.55	10.09

Species / Grade	1999												1999
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Tilapia - Grade 1	9.00	9.00	8.80	9.30	9.50	9.50	10.00	9.80	9.00	9.00	8.80	9.00	9.23
Tilapia - Grade 2	6.00	6.00	5.80	5.80	6.00	5.00	5.30	6.30	6.00	5.80	6.00	6.00	5.83
Tilapia - Grade 3	2.80	2.50	2.50	2.80	3.00	3.00	3.00	2.80	2.60	2.60	2.80	2.80	2.77
Mullet - Grade 1	12.00	11.30	11.00	11.00	12.00	12.00	12.00	12.30	12.30	12.30	12.00	11.30	11.79
Mullet - Grade 2	8.00	8.00	8.00	9.00	9.00	9.00	9.00	10.00	10.00	10.00	10.00	9.00	9.08

Species / Grade	2000												2000
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Tilapia - Grade 1	8.65	9.5	9.27	9.32	9.02	8.9	8.68	8.97	8.75	7.85	7.98	8.15	8.75
Tilapia - Grade 2	5.92	6.24	6.13	6.43	6.05	6.15	6.03	6.1	5.92	5.21	5	5.16	5.86
Tilapia - Grade 3	3.07	3.31	3.34	3.27	3.23	3.3	3.23	3.15	3.07	2.77	2.73	2.8	3.11
Mullet - Grade 1	12.86	12.48	12.05	13	13.55	13.47	13.03	14.03	14.27	13.26	11.67	11.68	12.95
Mullet - Grade 2	10.34	9.31	9.06	9.67	10.35	10.02	10.3	9.97	11.07	10.34	9.08	9.16	9.89

Table 5 : Wholesale Priceso of Tilapia and Mullet during the period 1997-2000 (El Abour Market Cairo)

Species/Grade	1997											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Seabream	23.43	24.11	24.07	24.76	24.00	23.23	24.77	25.00	24.83	24.87	24.50	24.21
Seabass												
	1998											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Seabream	25.61	24.32	24.90	24.43	25.00	25.00	25.00	25.00	23.40	19.93	20.16	19.55
Seabass	30.10	30.00	30.00	30.00	30.00	33.90	35.00	34.84	33.40	26.96	25.00	25.32
	1999											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Seabream	22.00	20.00	22.00	24.00	25.00	25.00	25.00	25.00	25.00	22.00	20.00	25.00
Seabass	25.00	25.00	25.00	25.00	25.00	28.00	30.00	30.00	30.00	26.00	25.00	25.00
	2000											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Seabream	22.31	22.98	21.09	20.83	20.23	20.45	20.15	21.06	21.25	20.00	20.70	21.24
Seabass	25.55	26.88	25.55	23.47	23.24	24.55	24.39	24.32	24.80	24.39	21.90	22.95

Table 6 : Wholesale prices of Seabass and Seabream, 1997 to 2000

3 OVERVIEW OF SECTOR DEVELOPMENTS SINCE 1996

3.1 Production of marine species

3.1.1 North Sinai

The Ministry of Water Resources and Irrigation is responsible for managing the development of some 28,000 feddan of land in North Sinai, to the immediate east of the Suez Canal, an area known as Sahel el Tina. The Ministry has constructed a major irrigation canal (Salem Canal) to bring Nile water to the region, with the primary objective of developing agricultural settlement.

However, the area in the most Northern part of Sahel el Tina (north of the main el-Arish highway) is considered to be unsuitable for agriculture, and was allocated permanently for aquaculture in 1996. Several farms were leased to farmers via the Egyptian Fishing Company and GAFRD. Water supplies and high salinity are the main problems experienced here, and most farms have failed. In addition, in the past uncertainty has been generated by allocation of some of this land for industrial development, although this is now resolved. At present a few farmers survive by extracting seawater from the limited inlet canal that exists, by pumping groundwater or using agricultural drainage water (where these resources are available).

The area has good potential for aquaculture production, but requires substantial engineering work (by GAFRD) to provide adequate seawater supplies and drainage.

One important investment (estimated to be about US$12 million) is the facility at Sinai Shrimp 21. Presently this farm is 420 hectares, with plans for expansion to up to 1500 hectares in future. The farm at present comprises hatchery (capacity 80 million post-larvae per year), nursery and grow out ponds. Future plans include supply to the EU market, construction of processing factory, and extension of grow-out to other regions (Fayoum, Maryut).

With respect to other aquaculture activities in the area the MWRI leases land directly to farmers in the southern part of Sahel el Tina (to the South of the road). The land is intended for agricultural production (irrigated by Nile water from the Salem Canal). The farmers undertake to recover the land for this purpose, using fresh water from the Canal to leach the soils. A grace period of four years was provided to undertake this process. However, much of the land has been sub-let and used for (unlicensed) aquaculture production, since this is one way of generating cash flow in the much shorter term.

Although resisted by the farmers (who in many cases have rented small plots as fish farms from the primary lease-holder) the MWRI intends to return this land to agricultural use. The problem identified by consultants advising the Ministry, is that rapid leaching of the salt from the soil with fresh water will cause long-term damage to the soil structure, making it impossible to plough with draught animals in the future. This can be avoided by gradual desalination (with brackish, or even seawater at first) along with regular treatment with gypsum and lime, to replace the sodium with calcium in the soil structure. However, this type of treatment is not being undertaken, and there is a real risk of damage occurring.

3.1.2 South Sinai

Development of aquaculture in South Sinai is restricted by land use conflicts involving tourism, military and environmental considerations. A case in point is the planned investment in bass and bream production by Red Sea Aquaculture Company at Abu Zenima on the Gulf of Suez. The Governorate of Sinai halted the project in early 2000. Other investors also report difficulty in obtaining all of the separate permissions required. A specific problem is the reported reluctance of the Ministry of Environment to approve any project which will involve a species which is not native to the Red Sea. Seabass and bream fall into this category.

The only investment of significance is the Safico Shrimp farm located near Sharm el Sheikh. Production has now ceased.

3.1.3 Mussallas, Damietta

This area is defined by Damietta to the west, the Meditteranean Sea to the north, and Lake Manzala to the south. It comprises a triangle of low-lying and reclaimed land, which has found a natural use for aquaculture, being unsuitable for other purposes.

There are four complexes of fish farms, comprising an estimated 517 farms, with 110 more in preparation[2]. Total area under production may be as high as 20,000 feddan (including *hosha* systems). Inputs consumed are about 50 million mullet fry, plus 4 million seabream and 1 million seabass in 2000. Output is estimated to be in the region of 3,000 tonnes of fish per year.

The main commercial and governmental farms in this region are shown in Table 7.

Name	Size (feddan)
Teba	500
Harmien	500
Idku	1,000
El-Fateh	250
Boskunia	100
Kamel	700
Ratama	1,900
Durgham	600
TOTAL	**5,550**

Table 7 : Main fish farms in Musallas region, Damietta

Almost all farms are extensive polyculture ponds, using fry exclusively from wild sources. The main species are mullet (Mugil cephalus - *bouri* and Mugil capito - *tobar*), seabass (Dicentrarchus labrax) and gilthead seabream (Sparus aurata). The area provides the majority of marine aquaculture production in Egypt. The two species of mullet account for 90 to 95% of output.

The problems experienced by farmers in this region are:

1. Low levels of technology resulting in high mortality, low yields and only marginal levels of profitability

2. Poor and variable water quality; high salinity (up to 50ppt due to soil conditions and high rates of evaporation); organic pollution from Lake Manzala and land drains. There is no monitoring of water quality. Some farms have constructed their own inlets from the sea. In 2001 the GAFRD has completed construction of a new canal bringing seawater from the mouth of the Nile; farmers report a significant improvement in inlet water quality since they now rely less on land drains and L.Manzala.

3. Lack of fry to enable increases in stocking levels;

4. Use of low price and usually low quality (low protein) protein feeds

5. Presence of *Tilapia zilli* (which consumes feed to produce biomass) with efforts at control limited by poor design and construction of most ponds. However, this product does find a market at low prices, including as a feed for culture of carnivorous fish.

[2] Dr.Sherif Sadek, personal communication

6. High percentage of illegal farms, resulting in high uncertainty and under-investment.

It is a tribute to the farmers that somehow they are able to produce fish under these circumstances. Without doubt the new canal will provide a more stable basis for development. There is a need to encourage farmers in this region to intensify production, use proper feeds, and manage water quality more effectively. However, the main constraint is the difficulty in obtaining fry. This issue is considered in more detail in Section 10.

3.1.4 Mersa Matrouh

GAFRD, in association with the Governorate of Mersa Matrouh, has nominated about 9000 feddan of land for aquaculture, in 9 sites to the west of Matrouh. A technical evaluation is required to assess the suitability of each site proposed for aquaculture.

There is a pilot scale cage farming venture in Marsa Matrouh lagoon, under the joint control of the Governorate/Institute of Oceanography and GAFRD. The project has about 10 cages and has been running for 2 years, ending in April 2001. Six people were trained and are now engaged in small scale commercial activity growing mullet and black bream using fry collected from the lagoon. Seabream fry would have been preferred but were not available.

The venture is under capitalised, and although the lagoon has a large sheltered area (800 feddan), the depth averages only 4 metres, with 6 metres in some locations. Few sections are therefore likely to be suitable for cage culture.

3.2 Fish hatcheries

There are five commercial hatcheries operating in Egypt.

3.2.1 El Wafaa

This is the main commercial finfish hatchery, located just North of Ismailia. It was constructed in 1998, with a capacity for 2.5 million shrimp post larvae, and 500,000 each of seabass and seabream. Production level in 2000 was about 2 million shrimp, but only about 100,000 fish

3.2.2 Haraz Hatchery

The Haraz hatchery is a small venture, created by Eng.Mohamed Haraz (former technical manager and currently adviser at el Wafaa hatchery). The unit is located north of Ismalia and was constructed in 1999 and 2000, with an investment of LE250,000. Production capacity is 1 million shrimp PL, 100,000 seabass and 100,00 sole fry in 14 rearing tanks. Full production will be reached by 2002.

The unit comprises one spawning and 14 nursery tanks. There is no separate algal production, nor rotifers (and hence seabream production is not possible). The larval rearing tanks relies on fertilised natural production of algae followed by feeding of decapsulated artemia eggs.

The technology is basic, but sound and based on a good knowledge of the biology of the species concerned. The production methods are low cost, and not capital intensive.

3.2.3 Abu Telaat

A finfish hatchery is owned by GAFRD at Abu Telaat, west of Alexandria. This hatchery was constructed under a World Bank loan to the Maryut Fish Farming Support Project, and was originally established as an experimental mullet hatchery. The unit comprises algal production, rotifer production and rearing tanks. A feedmill for production of juvenile feeds was installed, but does ot operate due to lack of spare parts. The hatchery cannot feed beyond age 2 months, and is therefore forced to sell output at an age when mortalities in transport and stocking may be unacceptably high.

Capacity of production is about 2 million fry per year. Production in 2000 was 50,000 seabass and seabream. Planned production for 2001 is 500,000, of which 20% is seabass, in one production cycle (April to September

3.2.4 Shrimp hatcheries

There are two dedicated shrimp hatcheries at Sinai 21 and at Safico, both in Sinai. Details are supplied under the relevant farm in Section 6.1.1 and 6.1.2.

3.2.5 Research hatcheries

Suez Canal University operates a marine fish hatchery for research and training purposes at el Arish. For a period it was supplying fry to commercial farmers, but this practice has since stopped (in 1998). A small research hatchery for shrimp is operated by the Institute of Oceanography, at Qait Bay, Alexandria.

3.3 Egytpian Aquaculture Society

This professional association has recently registered with the Ministry of Social Affairs. Its objectives are to represent the interests of the Egyptian aquaculture sector to Government and also internationally. Dr.Samir Ghoneim, Dean of Faculty of Environmental Agricultural Sciences, Suez Canal University, is the Chairman.

The Society will provide a major step forward in the way in which sector policy is developed since for the first time there will be a formal interface between government and the sector, which will allow improved communication, and importantly, allow the industry to speak with one voice.

The EAS can and should play an important role in promoting an inter-ministerial approach to resolving land and water use conflicts which severely constrain aquaculture development in Egypt.

3.4 EU market access for Egyptian aquaculture products

3.4.1 Compliance with health conditions

Egypt is presently unable to export fishery products to the European Union, since it has not yet complied with the requirements of European Council Directive 91/493/EEC in respect of "health conditions for the production and placing on the market of fishery products".

Egypt lost access to the EU market for fishery products in October 1998, when the European Union harmonised health conditions for imported fishery products based on the requirements of the Directive. Egypt has only made slow progress in meeting these requirements.

The General Organisation of Veterinary Services (GOVS) of the MoALR is nominated as the Competent Authority. In February 2001 the EU/Egypt Food Aid Counterpart funds supported a short project to initiate steps towards market access. Six weeks of Technical Assistance inputs were delivered by the project.

The main outputs of the project were:

1. Two new Joint Ministerial Decrees were prepared and passed in August 2001, establishing a comprehensive legal framework for controls over hygiene and health conditions of production.

2. A new inspection system of establishments for fishery products exports was designed. This is presently being implemented by GOVS. The MoALR will need to prepare and submit a dossier to the European Commission. One establishment is now approved (in Port Said).

3. A training programme was designed, and implemented by GOVS. Fifteen veterinary inspectors are now trained in basic inspection methods and HACCP.

A dossier of information will be sent to the European Commission (in late 2001) requesting that Egypt be considered for exports to the EU of products from capture fisheries. On approval by the Commission, Egypt will be placed on List II (permitted to supply the EU market pending inspection by Commission Technical Services). At that point the Egypt will be able to supply fishery products from marine capture fisheries (except bivalves) to the EU. Export of aquaculture products requires additional controls to be implemented.

3.4.2 Control and monitoring of residues in farmed fish

In addition to the general requirements in Directive 91/493/EEC, the supply of aquaculture products to this market is subject to the requirements of additional European regulations:

- **Regulation 2377/90** which harmonises approval procedures for veterinary medicines for different applications, and establish maximum residue limits and conditions for each

- **Directive 96/23** which defines measures to monitor certain substances and residues in live animals and animal products (residue monitoring programmes)

There are three parts to the residue control system, which must be implemented in third countries:

1. Legislation for :

- system for approval of veterinary medicines and establishing Maximum Residue Limits (MRLs)
- farm level controls on application of veterinary medicines

2. Inspection at farm level of use of veterinary medicines
3. Implementation of residue monitoring to check that the control system achieves its objective

In terms of legislation, farm level controls are introduced by the Joint Ministerial Decree "Regarding Regulations and Procedures Related to Fish and Marine Products Exports to the European Union Countries". This Decree also specifies veterinary medicines permitted for use in aquaculture and the Maximum Residue Levels in the final product.

The legislative framework for residue controls is therefore already in place and complies with the requirements of the EU Directives. However there is no implementation of the residue controls (either by direct inspection on the farm, or of monitoring of residues in farmed fish products). There is a need for the Competent Authority (GOVS) to implement this legislation, through commencement of on-farm inspections and introduction of residue monitoring programme (possibly integrated with residue monitoring for other animal products).

However, until such time as the residue control and monitoring arrangements are approved by the Commission, the EU market will remain closed to Egyptian aquaculture products. This is clearly an issue of strategic importance to the marine aquaculture sector, since domestic markets for some of the species concerned could easily be subject to over-supply.

3.4.3 Export establishments

Once EU market access for Egyptian aquaculture products is secured, then producers are free to supply this market. However, in accordance with the new decree, all fish, including farmed fish, must be processed and packed in an approved establishment (which is certified by the GOVS as meeting the requirements of the Decree).

At present there is only one such establishment in Egypt (Salah Company, Port Said). Clearly if the Egyptian aquaculture sector is to benefit at all from access to the EU market, there is a need for more

processing and packing establishments to provide the vital distribution infrastructure required by farmers.

3.5 Import tariffs

3.5.1 Imports into Egypt

A revised import tariff regime was introduced by Ministry of Economy and Trade in 1999, with lower levels of import duty for some fishery products.

Table 11 summarises the import tariffs for fishery products (from any source).

HS Code	Classification	Import duty (%)	Sales duty (%)
0301	Live	5	0
0302	Fresh Fish	5	0
0303	Frozen fish (excluding fillets)	5	0
0304	Fish fillets (fresh or frozen)	5	0
0305	Dried, salted or smoked fish	30	10[1]
0306	Crustacea	40	10
0307	Molluscs	40	10[2]
1604	Canned fish	10[3]	0
1605	Canned mollusc and crustacea	40	0
2301	Fishmeal	5	0
2309	Prepared animal feeds	30	10

[1] *Sales tax applies to smoked salmon only (Pacific and Atlantic); other species zero rated*
[2] *Except for fresh or shelled shellfish, where duty is zero rated*
[3] *Except for canned sardine, mackerel and pilchards (30%)*
Source: Ministry of Economy and Trade

Table 8 : Tariff and sales tax rates for imported fishery products

Note that fresh fish imports attract only a 5% import duty. Efficient producers of marine fish species in Greece are know to be investigating the Egyptian market, with a view to either exporting fish to Egypt, or investment in production facilities. Egyptian producers need to recognise the possibility of competition on price and quality from imported fishery products of the same species.

In addition, the tariff structure in relation to seabass and seabream needs to be taken into account during the negotiations on the Egypt-EU association agreement. In the medium term, until marine hatcheries are established in Egypt, some tariff-quota protection for Egyptian producers may be considered appropriate.

4 LEGAL ASPECTS OF AQUACULTURE DEVELOPMENT

4.1 Presidential Decree 90/1983

The decree forms the General Authority for Fisheries Resources development (GAFRD) under the Ministry of Agriculture and Land Reclamation.

4.2 Presidential Decree 465/1983

The decree describes powers and duties of GAFRD, including the right to lease all lands within 200m of shorelines for aquaculture and fisheries activity.

4.3 Law No. 124 on Fisheries

This represents the main law on fisheries in Egypt. The key sections relating to aquaculture are:

4.3.1 Article 19

It is prohibited to gather, transfer or possess fish fry from the sea or lakes or other water bodies, without the written consent of the GAFRD.

4.3.2 Article 47

If the period of aquaculture lease is to be less than five years, then priority should be given to public authorities, public sector companies and cooperatives.

4.3.3 Article 48

It is forbidden to construct fish farms except on infertile lands which are not suitable for agriculture, and where the water supply comes from drains and lakes, and not from irrigation (fresh) water. Government hatcheries are exempt from this rule.

To obtain a license for fish farm, formal agreement must be obtained from the Ministry of Agriculture (GAFRD), which is issued after obtaining permission from the Ministry of Irrigation, which will specify the volume of water available, its source, inlet size and mechanism of drainage.

4.3.4 Article 49

Fish farming areas will be declared by the decision of the Ministry of Agriculture. The Chairman of GAFRD has issued two such decisions:

4.3.5 Article 50

Except for irrigation canals, it is prohibited to cut or spray any water weeds specified by Decree of GAFRD.

4.4 Decision No. 70/ 1986

This decision relates to the renting of land allocated by GAFRD for the establishment of fish culture and hatcheries.

A Committee of the GAFRD is responsible for defining areas suitable for fish farming and hatcheries, and for dividing them into economic units suitable for leasing. Rental value should take into account the capacity of production, location and availability of public utilities.

Land is to be rented by public auction unless:

- Rental is to government bodies, public companies or legal persons
- Projects are large, and have been proved economically feasible
- Where no bids are received, or bids are below the rentable value

- Where existing leases are in operation at the introduction of the decision

Period of lease is to be five years, with 20% of annual rent paid as deposit, non-refundable in case of breach of conditions.

The GAFRD may revoke the lease with two weeks written notice.

4.5 Enforcement of legislation

Enforcement of the legislation is the responsibility of the Military Force for Marine and Related Affairs (on the seas) and the Police Force for Inland Water and Fisheries Affairs ("the water police").

5 SWOT ANALYSIS FOR KEY MARICULTURE ACTIVITIES

Activity	Strengths	Weaknesses	Opportunities	Threats
SHRIMP HATCHERY	Native species suitable for hatchery culture	Lack of well developed grow -out sector limits market for Post-Larvae Low winter water temperatures limit production season unless heating		Shrimp farming development will be restricted by high costs and reduced growing season Oversupply of PL to the sector will keep prices depressed.
FINFISH HATCHERY	Good sites available Well developed fish farms already established based on wild fry inputs	Lack of national technical and management expertise	Strong demand can be satisfied by regular supplies of good quality, single species fry	Variable levels of supplies from wild fry will undermine hatchery planning
SEA BASS AND BREAM CULTURE	Native species with strong market image and good culture characteristics in Egyptian waters	Hatchery development very weak; most farms forced to rely on wild fry - insufficient, variable quantity and mixed species Problems with water quality in many areas (high salinity) limit sites Domestic markets small and very price sensitive; export necessary, but EU marke requires additional controls	New marine hatcheries will improve supplies Improved yields and efficiency available through better feeding practices.	Farms will close because they cannot reach profitable levels of production due to lack of fry inputs EU Association Agreement will zero rate tariffs for Greek bass and bream imports to Egypt Even modest increase in production will cause price collapse unless EU market is available.
MULLET CULTURE	Native species with high demand and good culture characteristics in Egyptian waters	Supplies of fry from the wild are mainly dependent on illegal unregulated trade, with high mortality and poor distribution	Hatchery production of fry will improve quality and quantity and season of supply Improved yields and efficiency available through better feeding practices.	Continued unregulated capture of fry will result in collapse of wild mullet stocks
SHRIMP CULTURE	High demand in Egyptian market	Short growing season, even in best sites in the Red Sea. Land-use conflicts (with tourism, military, oil) and environmental concerns limit available sites. Lack of processing establishments for packing and freezing.	Good tourist market in some areas (e.g. South Sinai)	National market will be oversupplied at the end of the growing season. Egyptian farmed shrimp will not be able to compete with imported product due to high production costs (even with 40% import duty production).

6 OUTLOOK FOR MARINE AQUACULTURE DEVELOPMENT

6.1 Demand for fish from aquaculture

Concern was expressed by the author in 1996 that a rapid growth in aquaculture output would affect prices and profitability of aquaculture enterprises. In fact, as we have seen output has increased significantly, with about half of the increase in total consumption since 1994 (340,000 tonnes) and in per capita consumption provided by aquaculture. The balance of the increase is supplied by capture fisheries (Mediterranean and the northern lakes) and imports.

Figure 4 has shown that prices of tilapia and mullet fell in money terms, respectively by 6.7% and 3.3% per annum during the period 1996 to 1999. Also it should be noted that retail prices (both general and food) have been rising in this period (as shown in Table 12) by an average of about 5.7% per year. This suggests that the real price (relative to other goods) of farmed fish have fallen by 12.4% per year in the case of tilapia and 9% per year in the case of mullet. The data suggests that the price elasticity of demand for tilapia is also around -1.0.[3]

Year	Price index	
	Retail	Food
1993	100	100
1994	108.1	109.7
1995	117.2	120.9
1996	134.2	135.3
1997	140.4	140.8
1998	143.9	148.6
1999	162.0	165.0

(1993=100)

Table 9: Retail and food price changes, 1993 to 1999

Increased production of fish from aquaculture has clearly benefited the Egyptian consumer, with falling prices stimulating consumption. All things being equal, as production develops, a further gradual and relative decline in prices can be anticipated. However, various external factors appear to operate, and in particular during 1999 and 2000 Mediterranean catches were unusually high, due to higher than average flows in the Nile. As these levels are unlikely to be sustained, and as continued population growth of 2% can be anticipated, it is likely that demand for aquaculture products will continue to increase more or less in line with growth in supplies. As prices fall, aquaculture products will compete more strongly with imports of cheap small pelagic fish, and aquaculture will serve to replace imports as a significant source of supply (as indeed it already does to a substantial extent).

The market is competitive, and the main route for development of production will be through improvements in efficiency, as the most efficient farmers consolidate their position in the market. Thus the focus of promotion for aquaculture investment from MSSP and similar projects, must be on the introducton of more efficient production systems. This would suggest a change of emphasis, especially in relation to tilapia, from production per se, to intensification and efficiency improvements. This is especially the case given the limitations on new sites due to land and water use conflicts.

It should also be noted that the Egyptian consumers are quite specific about the species consumed. So far aquaculture production has focused on the most popular species of tilapia and mullet, which have very substantial markets (390,000 tonnes or 42% of all fish consumed in 2000). In this respect aquaculture development in Egypt has met exactly with market needs.

[3] The percentage increase in consumption due to a 1% increase in prices

Development of hatchery production of seabass and seabream can be expected to increase supplies of these species, but both have very much smaller market shares (with a total supply of less than 10,000 tonnes, or 1 to 1.5% of the market). There is very strong evidence that increased supplies of these species to the domestic market due to loss of EU exports resulted in a price fall of 20-35% (depending on species and grade). Here, the present prices on the domestic market can be expected to fall more rapidly in response to growth in supplies.

Without access to export markets, the introduction of hatchery production of fry of these species is likely to cause prices to collapse, since the domestic market will not be able to absorb the significantly increased level of production. EU market access is therefore of vital strategic importance for the development of marine aquaculture in Egypt, and the EU health control issue is therefore one of the central policy issues to be addressed. It is highly fortuitous for the marine aquaculture sector that lack of access to EU markets has coincided with restrictions to access of fry. Otherwise many producers would have lost their investment.

6.2 International competition

In order to sell into the EU market Egyptian producers must be able to compete with seabass and bream produced by particularly Greek fish farmers. The prospects for this are not clear at present.

Egypt and the EU have initialled an Association Agreement which will introduce bilateral tariff reductions across a wide range of agricultural products, including fishery products. The precise goods, tariffs and quotas are still subject to negotiation. However, there is a possibility that EU fishery products may have improved access to the Egyptian market, and this may include farmed seabass and seabream. Even so import tariff levels at present are low (5%) and do not provide much protection to Egyptian producers. However it will be in the interests of the Egyptian industry to maintain a measure of protection for this sector, especially at a time when there is a need to encourage investment in domestic production capacity in the hatchery sector.

6.3 Availability of human resources

Policy support for aquaculture is very limited (for example in access to land and water resources). As a result aquaculture is a residual activity, in that aquaculture is only considered as a potential when no other uses of the resource are available. In such circumstances, any production is desirable, whether efficiently undertaken or not. In the case of marine aquaculture, the geographical range is much more limited (to coastal regions) and the activity must compete with other land uses (for example tourism). Nevertheless, throughout the sector there is marked lack of a sound business approach by participants in the sector, with many farmers putting little in and getting little out, and most not understanding the need for even basic requirements like reasonable quality feed materials.

One of the reasons why it is difficult to break this chain is the lack of technical skills available to the sector. Although many universities offer courses in aquaculture as part of their animal production syllabus, few participants work in the sector after graduation, and it is in any case not established that the courses offer much practical value to the sector. Lack of technical skills continues to be a constraint on the sector.

One of the central policies for the new Egyptian Aquaculture Society should be to develop a sound approach to the training of new entrants, to include practical experience on real fish farms, for example to be offered through industrial placements.

6.4 Supplies of fry

6.4.1 Fry supplies

Most marine fish farmers interviewed state, without any hesitation, that the major constraint on their business is the lack of fry for their production. They would be more than willing to increase and intensify production, if only they could obtain supplies of fry. Lack of access to fry supplies must therefore be regarded as the most immediate constraint to marine aquaculture development in Egypt.

There are three sources of supply; official supplies of wild-caught fry via the GAFRD fry collection centres; black market supplies of illegally caught and traded fish; and hatcheries.

Firstly the MoALR undertakes the collection of juvenile fish from the wild, and licences a number of fishermen to catch fish for official supply through the fry collection centres of the GAFRD. These fry are used to supply governmental fish farms, for stocking of Lake Qarun and may also be sold to private farmers. GAFRD will only supply fry to properly licenced farms. Some traders are also licensed to distribute fry. The selling price is controlled at a level well below market value. The intention is to provide an incentive in support of fish farmers.

The quantity of fry supplied through this channel has been relatively consistent over the period 1995 to 2000, ranging between 120 to 130 million per year. In recent years almost all of the fry has been mullet. According to the best estimates of GAFRD officials in Alexandria and Damietta, *M.cephalus* accounting for 30%, and *M.capito* 70%, of supply.

By maintaining official prices at an artificially low level it is inevitable that fishermen and traders are encouraged to operate a black market, in which they sell fry at market prices to commercial fish farmers. GAFRD believes that most of the black market in fry is directed to unlicenced fish farmers, who are unable to purchase fry through the official channels. However, numerous discussions with licenced fish farmers suggest that even they rely on the black market supplies, claiming that the official supply from GAFRD is:

- insufficient, being directed towards supplying government-owned farms and restocking Lake Qarun
- difficult to get hold of (requiring producers to wait for several days in queues at the fry collecting stations).

Table 13 shows the official and black market prices in 2001. The black market appears to operate efficiently, in that all farmers know prices, and the price is reported to be sensitive to volume supply, size, species and quality (species purity) of fry.

Species	Official Price LE/1000	Market price* LE/1000
M.cephalus	20	150
M.capito	8	20
D.labrax/S.aurata	40	250

* *depends on season and size of fish*

Table 10 : Official and black market prices of fry, 2001

Table 14 shows how supplies of fry have developed over the period 1995 to present, with both official and illegal supplies from the wild, and some, albeit limited hatchery production.

Source	*Species*	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*
Wild	Mullet	122.00	115.40	97.50	128.90		122.50
	Sea bream	3.70	2.90	2.90	0.30		0.00
	Sea bass	2.20	0.00	0.00	0.30		0.00
	Shrimp	0.01	0.00	0.00	0.00		0.00
	Sub total	**127.91**	**118.30**	**100.40**	**129.50**		**122.50**
Hatchery	Mullet	0.00	0.20	0.50	0.50		
	Sea bream	0.00	0.00	1.00	1.50		
	Sea bass	0.00	0.00	0.10	2.00		
	Shrimp	0.00	0.00	2.50	5.50		
	Other	0.00	0.00	0.00	3.00		
	Sub total				**12.50**		
Illegal	Mullet	488.00	461.60	390.00	515.60	0.00	490.00
Estimates	Sea bream				(*) 4.00		
	Sea bass				(**) 3.00		
	Shrimp				0.00		
	Other				0.00		
	Sub total				**522.60**		
TOTAL	Mullet				645.00		
SUPPLY	Sea bream				5.80		
	Sea bass				5.30		
	Shrimp				5.50		
	Other				3.00		
	Sub total				**664.60**		

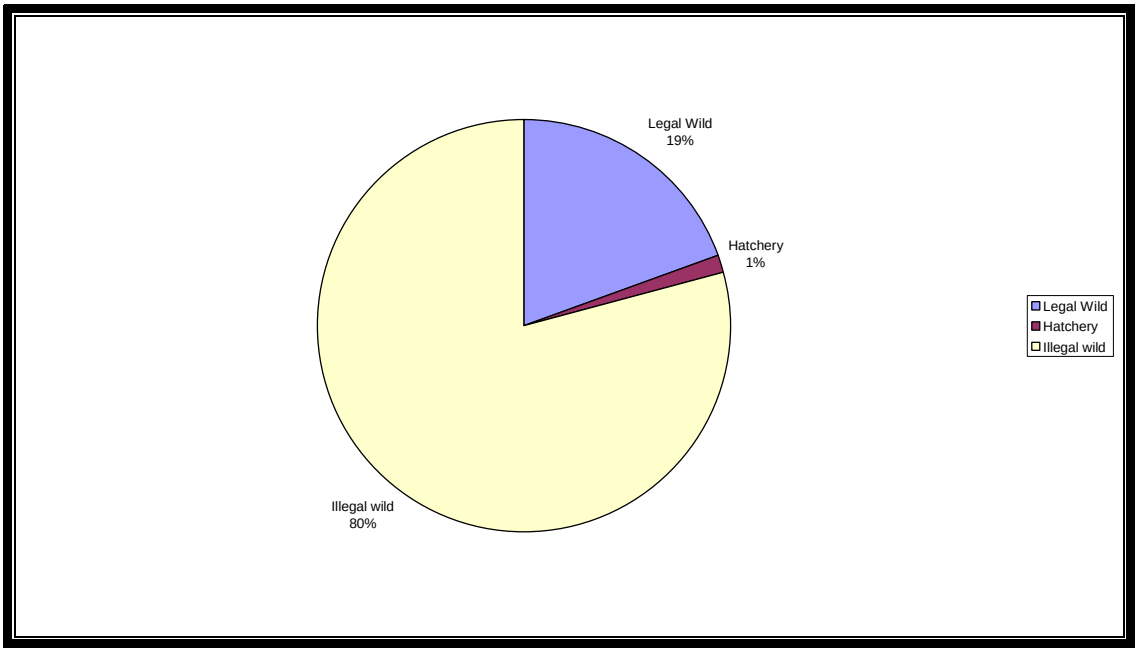
(*)Estimated (Sherif Sadek)
(**)Roughly estimated (Ian Goulding)

Table 11 : Marine Fry Supplies ('000s)

Official supplies from the wild, collected and distributed via the GAFRD fry collection centres and authorised traders, appear to be relatively constant, at a level of 120 to 130 million per year. Although these did include some seabass and bream previously, these fry are now so valuable that all are now all sold on the black market directly to farmers.

Black market trading is carried out by fishers and traders, many of whom are also licensed for official trade. Different key informants independently estimate that the unrecorded trade in fry is a factor of 4 or 5 times greater than the official trade. This would suggest that a conservative estimate of the illegal trade is over 500 million per year. Again the majority are mullet, but this quantity includes an estimated 4 million seabream and probably 3 to 4 million seabass.

Finally against this volume of production, the contribution of hatcheries is insignificant, with a total of 12 million in 1998, of which half were shrimp. Supplies of fry from hatcheries accounted for an estimated 2% of fry produced as an input for the aquaculture sector. If we consider the hatchery production of finfish (shown in Figure 6) fry supplies from hatcheries contribute less than 1% of present requirements.



Source GAFRD 2001

Figure 6 : Marine Fish Fry Supplies in 2000 ('000)

6.4.2 Demand for fry

By using GAFRD production data for marine aquaculture species in 1998, we can estimate the associated fry requirements. Production of marine fish (mullet, seabass and seabream) from aquaculture was 35,677 tonnes in 1998, according to GAFRD statistics (Table 1) equivalent to an estimated 128 million individuals. Based on the estimated numbers of fry caught in the same year (664 million) the overall mortality rate was in the region of 82%. Approximately 25% of the mortality takes place on the farm (according to discussions with farmers) and the balance of 57% (corresponding to 378 million fry) corresponds to mortality during distribution.

Therefore not only does the capture and distribution of marine fish fry distort the market, but it is also highly inefficient, whilst at the same time increasing pressure on the wild fish stocks, with only modest benefits from aquaculture.

In addition, it would appear that the estimates for seabass and bream fry supplies required to produce the 7,000 to 8,000 tonnes of output of these species corresponds to double the highest estimates of the illegal fry trade in these species. It seems that there is an overestimation of aquaculture output, particularly for seabass and bream. A more realistic aquaculture production figure, based on fry estimates, is probably less than 2000 tonnes of both species. It is not known how the GAFRD estimates are derived, although it is most likely based on a factor related to area under production. Given the importance of aquaculture supplies to the Egyptian market, there is a need for an annual sample survey of fish farms, to provide a better statistical basis for aquaculture.

Species	Production 1998 (Tonnes)	Average size at harvest (Kg)	Calculated No. of fish	Fry mortality rate (%)	No. of fry required
Mullet	28,383	0.25	113,532,000	(a) 50%	227,064,000
				(b) 70%	378,440,000
Sea bream	3,682	0.50	7,364,000	25%	9,818,667
Sea bass	3,612	0.50	7,224,000	25%	9,632,000
TOTAL	**35,677**		**128,120,000**		**a) 246,514,667**
					b) 397,890,667

Table 12 : Mariculture in Egypt - Estimated Fry Requirements (1998)

Whatever the precise level of the demand, it is significantly higher than the available supplies of fish fry. Key evidence for the growth in demand for seabass and bream fry is indicated by the trends in fry prices (Figure 7). Since 1996 prices of seabream fry have increased by a factor of 6 or 7 times. Most farmers report that they would like to produce more seabream, but cannot obtain fry, and therefore instead stock with lower value species, including some species of mullet which would not normally be stocked such as sahili (*Lisa sahili*). This scarcity has also provided an incentive to experiment with other fish available from wild harvest of fry, such as loot (*Sciaena aquila*).

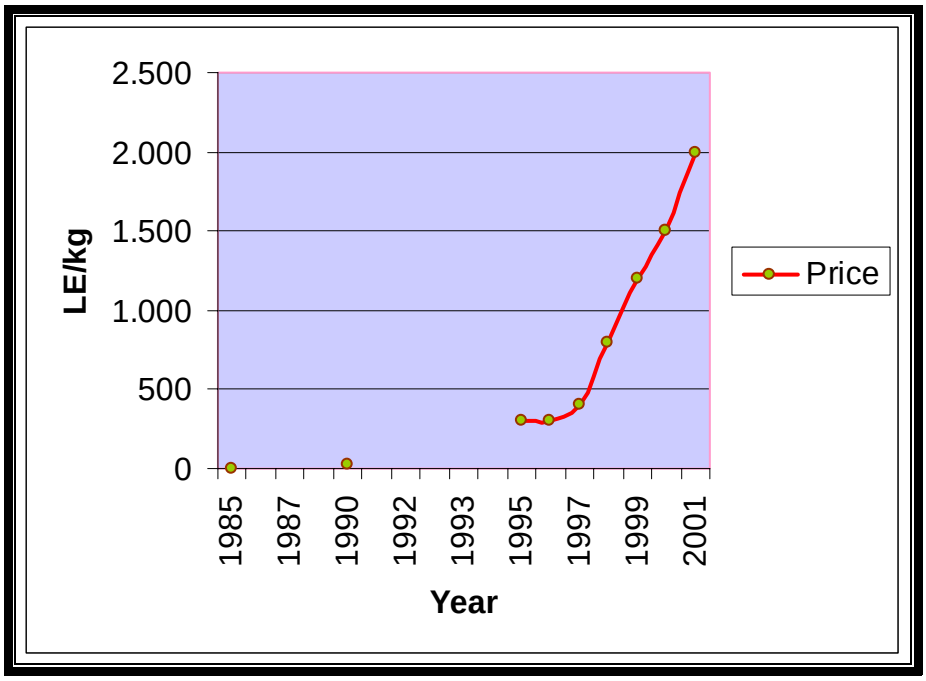


Figure 7 : Price of Sea Bream Fry 1985 - 2001

It is clear that the development of the sector is being held back by the lack of marine fish fry, and need for hatchery production is now greater than ever.

6.5 Supply of other inputs

The intensification of marine aquaculture continues to be held back by poor feeding practices. Higher quality fish feed is now available from a national source. Zoocontrol at 6th.October City has installed a modern feed mill with technical capacity for manufacture of most specifications of fish feed. The factory has only been on line for a few months, and so far uptake by the sector is rather limited. The reason for the lack of adequate feeding is poor awareness amongst farmers of the nutritional needs of fish. Many farmers appear not to discriminate on the basis of feed quality, preferring to use the cheapest consumable materials. There is a need to demonstrate and extend the use of properly formulated feeds within the sector.

However, ultimately, the apparent lack of poor quality feeds is not considered to be a constraint. Proper feeds are not used because present aquaculture production systems (with forced use of low value species due to lack of fish fry) do not make it economic to do otherwise. If the fry requirements of farmers can be met, they will be forced by competition within the market to optimise their production system, and feeding practices will be modified accordingly.

7 CONCLUSIONS

This report has shown that the last decade has been an immense success story for the Egyptian aquaculture sector. Aquaculture has made a very significant impact on improving the supplies of fish for human consumption, rising from just 35,000 tonnes in 1992 (10% of supplies) to 340,000 tonnes in 2000 (36% of supplies to market). Per capita consumption of fish has increased as a result. Egyptian people presently eat about twice as much fish now than they did 10 years ago, and about half of the increase is due to improved supplies from aquaculture.

Most of the increase in supplies have been in terms of tilapia (with new supplies of fry derived from monosex hatcheries) and mullet (fry derived from capture fisheries). In 2000, 80% of the 101,000 tonnes of mullet consumed, and 55% of the 289,000 tonnes of tilapia were derived from aquaculture.

There is good evidence that these production systems operate in line with market demand. Prices to consumers are falling both in money and real terms, with an average real term decline in tilapia price of 12.4% per annum, and 9% for mullet, bringing the benefits of price competition to consumers.

With respect to developments in marine aquaculture, although the growth in mullet production utilises a marine species, much is grown in fresh water at inland sites, rather than coastal aquaculture. Until now, only a few isolated developments in marine fish culture are evident in coastal regions. Most regions and sectors operate under significant constraints. The parts of Sahel el Tina allocated for aquaculture are largely unsuitable unless inlet water supplies are upgraded. Projects in the Red Sea region frequently conflict with other land uses (particularly tourism) and are limited by concerns over environmental impact (especially of introduced species). Many of the sites allocated to the West of Mersa Matrouh are not suitable. Two shrimp farming investments have established that water temperatures are too low (even in the Red Sea) to obtain decent growth rates (even with native species). The Mussalas region, near Damietta perhaps has most potential for marine aquaculture development in the short term, now that water supplies have been improved by a GAFRD supply canal project. However, even with the site constraints removed, production systems remain extensive, with low levels of fry and feed inputs and minimal management, with the consequence of poor yields. Without doubt, the main factor limiting development is the lack of fry.

Culture of marine species of fish in Egypt cannot develop further without new inputs of fry from hatcheries. The harvest of wild fry from the coastal zones of the Mediterranean (which produces an estimated 650 million fry per year) is not able to supply significantly more fry than it presently does. There is concern over the impact of this fry fishery on the wild stocks. There is also evidence of elevated levels of mortality during transport (estimated at 57%). In the long term, this activity is not sustainable, and cannot supply the fry requirements of the sector. Prices paid by farmers for fry of seabass and seabream have risen from LE5 to LE2000/kg over the last 15 years and there is a clear need for hatchery production of marine fish fry to supply the grow out sector.

Until now, only two private sector hatcheries for marine fish (seabass and seabream) have been commissioned. One (el Wafaa) has potential to supply large quantities of fry, but has never reached capacity. The other (Haraz) is a small intermediate technology unit. A public sector hatchery at Abu Telaat has consistently failed to reach capacity. New investment in the sector is inhibited by lack of investor confidence, due to the relatively unknown technology and the uncertainty created by the market in wild fry. Although technology for the production of mullet fry is known, the commercialisation of this more complex process can only proceed after the introduction of the more basic hatchery technology for seabass and seabream. Investment in marine finfish hatcheries, especially for seabass and seabream, should continue to be a high priority for MSSP.

In terms of Government policy, aquaculture provides the land and water use of last resort; it is confined by law to lands which are unsuitable for any other purpose (and which are therefore inevitably sub-optimal for aquaculture activity). The policy is unlikely to change in the short term; new lands for aquaculture investment are increasingly difficult to find. The sector can only grow by intensification of production on existing sites. Therefore MSSP should focus efforts on existing farmers, to encourage higher levels of stocking, feeding, and improved pond management. This is the concept behind the marine farm demonstration unit of Mr.Sharaf el-Din, already supported by MSSP.

Capture of wild fry is nominally a government run monopoly, with prices fixed significantly lower than market prices. The consequence is a thriving black market, with illegal fishing, unrecorded catches and trade in fry. Without doubt corrupt officials play their part in this market. As with the "smuggling" of fish from Lake Nasser, the short-term solution is to remove the government monopoly and allow the free market to operate, whilst exerting more rigorous control over the catching of fry. By permitting a legal trade, new investment in handling and transport can be expected to reduce mortalities. In the longer term, there is a need to consider selective bans on harvest (defined by region and season). The objective should be to remove supplies of wild of seabass and seabream, whilst minimising the reduction in supplies of mullet (particularly *M.cephalus*). This would create stronger incentives for investment in marine hatcheries.

Production of marine fish relies substantially on inputs purchased on the international market. The higher levels of production costs and risk in Egypt make it unlikely that Egyptian marine aquaculture will be able to compete internationally with for example, the Greek bass and bream sector. Mass export markets are therefore not likely to be available. However, the EU market remains strategically important, since Egypt may find niche markets eg. early season production (as with potatoes) or special species (eg. *loot* - meagre). Egypt lost access to the EU market for fishery products in 1998, as a result of non-compliance with the Council Directive 91/493/EEC on hygienic production of fishery products. New systems of control and inspection introduced by the Competent Authority (the General Organisation of Veterinary Services of the MoALR) should ensure access in early 2002, but this will not apply to aquaculture products until residue controls are implemented for this sector. In addition, at resent there is only one processing establishment which is considered to meet the requirements of the EU Directive. Lack of suitable distribution infrastructure is therefore a further constraint to the development of aquaculture exports.

Most commentators in the sector focus on the production constraints. However, the Egyptian market for fish from aquaculture is not unlimited. National markets for mullet and tilapia show a steady fall in prices in real terms due to increased supplies from aquaculture. Markets for seabass and seabream are much smaller, and therefore more sensitive. Prices of these species have fallen significantly since 1998, both as a result of increased supplies from aquaculture and loss of the EU market for fish from capture fisheries. Clearly new investment in the marine production sector (including hatcheries) should consider the impact of increased supplies on prices, since this will be significant.