

# Development and outlook of Egyptian aquaculture

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# Fishery resources in Egypt

# Fishery resources in Egypt



Mediterranean, Red Sea, River Nile & lakes are the main sources for capture fisheries.

Total fish production from all resources reached 1,362,174 tons in 2011

Aquaculture contribution represents 72% of total fish production in 2011.

Egypt is the 8<sup>th</sup> globally in aquaculture

# Aquaculture development

World Bank Mission (1978): findings and recommendations

Potential acreage for aquaculture: 23,400 feddan\*

Potential production from aquaculture 35,000 tons

Average production: 1.5 ton/feddan

Tilapia 50%

Mullet 30%

Carps 20%

\* Feddan = 4200 m<sup>2</sup>

The production of aquaculture reached about 20 folds of estimated production

**However:**

Average production from earthen ponds is almost as estimated

Species composition in the present is close to what was estimated

# Aquaculture development

Building upon the World Bank mission, it became obvious there is a good aquaculture opportunity in Egypt.

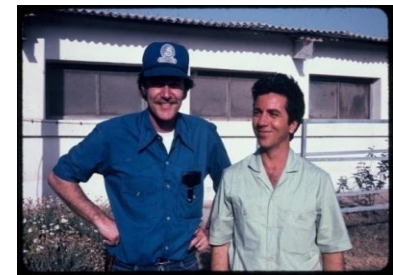
The practice started with the use of traditional practices whereas inputs and so outputs are low.

No use of Nile waters, no use of agricultural land.

Capacity building and international experience played a major role in the development.

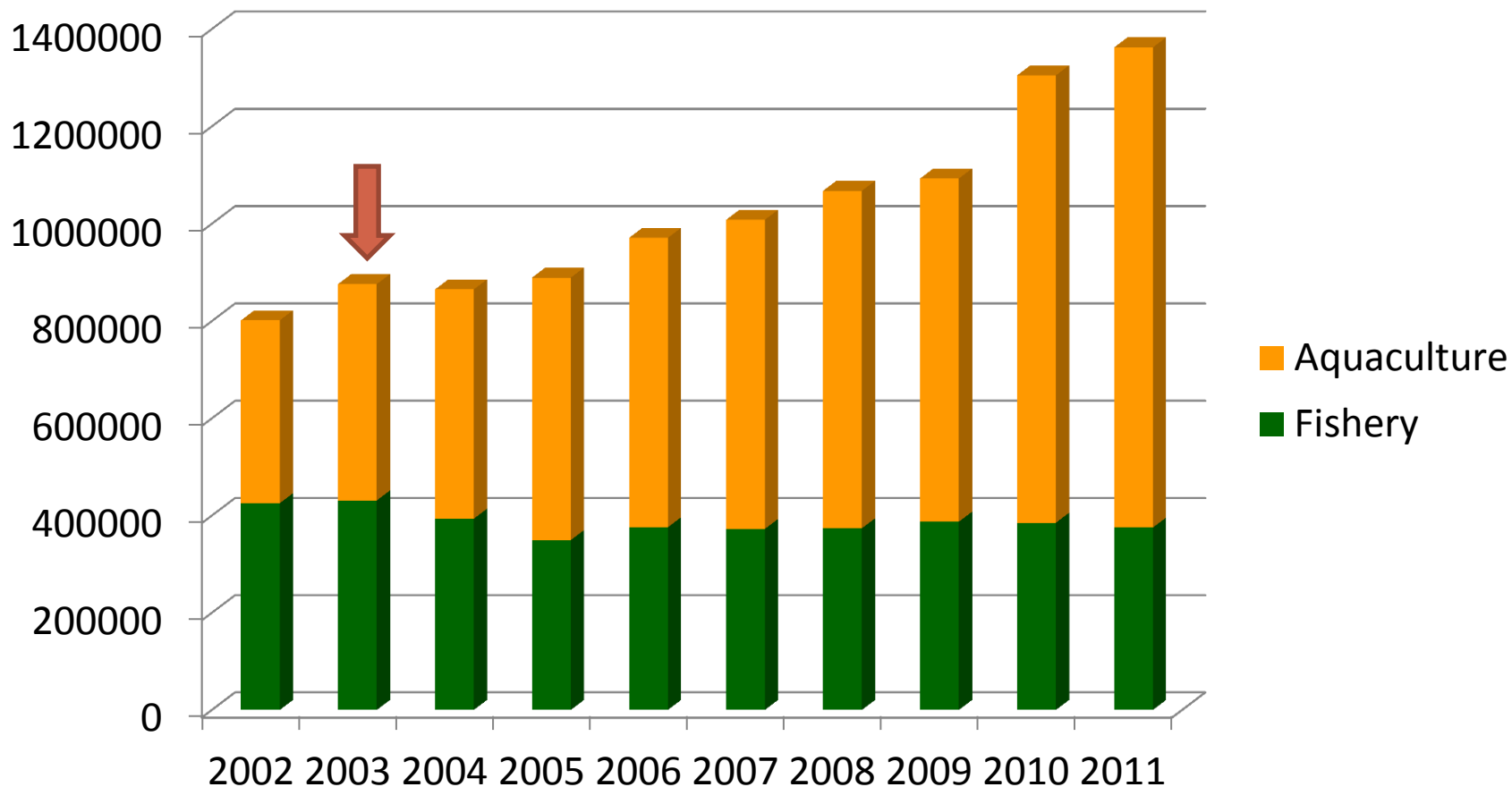
Rapid then remarkable development in aquaculture took place in mid 1990s.

Development has been credited to the all-male tilapia as well as to the commercial feed.



# Features of Egyptian aquaculture

# Contribution of aquaculture and fishery in total production (2002-2011)



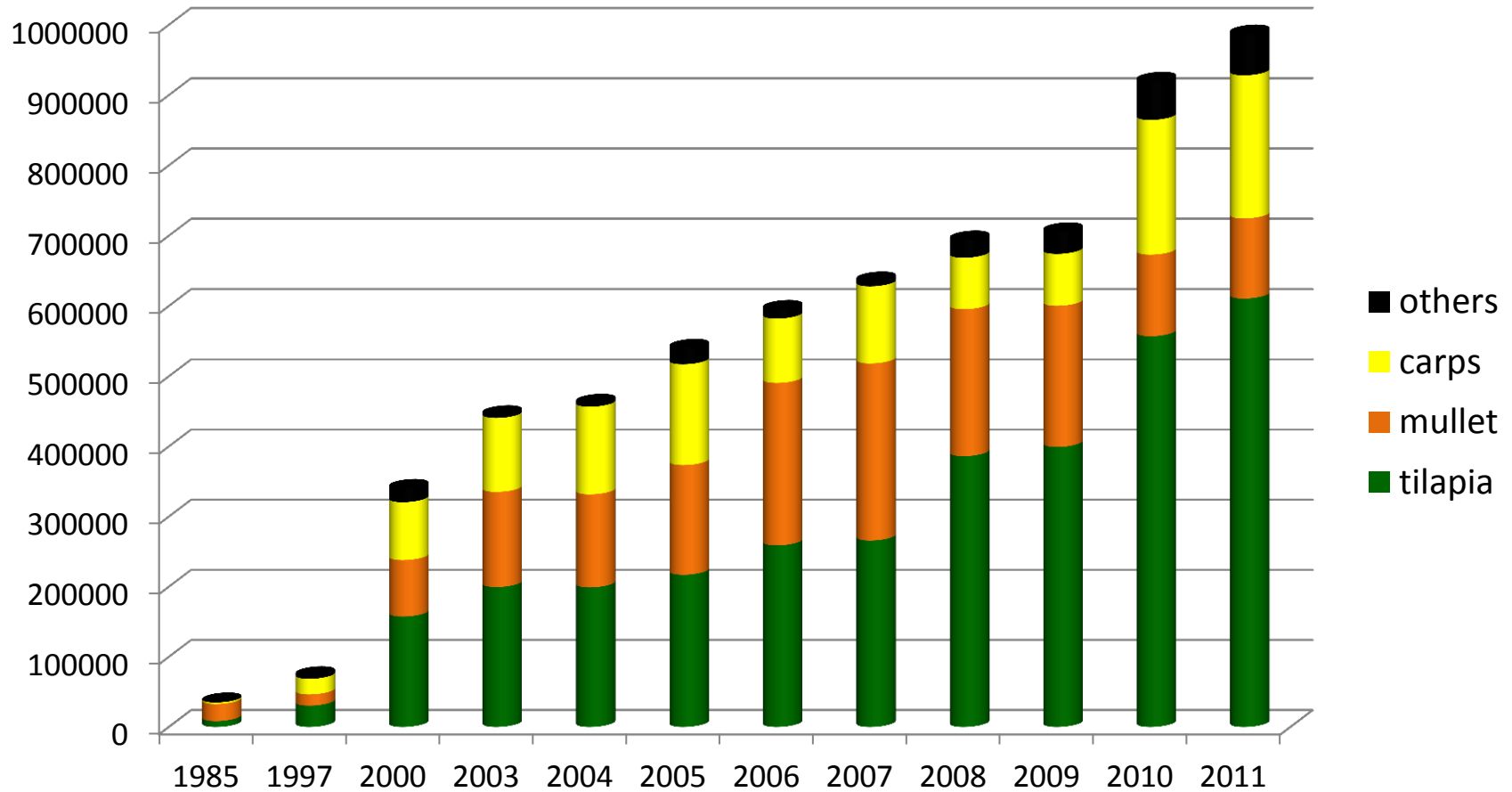


# Egyptian aquaculture

## (Global perspective - 2010)

Country	Production (ton)
China	36,734,215
India	4,648,851
Vietnam	2,671,800
Indonesia	2,304,828
Bangladesh	1,308,515
Thailand	1,286,122
Norway	1,008,010
Egypt	919,585
Myanmar	850,697
Philippines	744,695

# Tilapia in Egyptian aquaculture



# Features of Egyptian aquaculture (narrow production basket)

Species	2009		2010		2011	
	ton	%	ton	%	ton	%
Tilapia	399280	55.32	557049	60.58	610617	61.88
Mullet	209980	29.77	116029	12.62	114001	11.55
Carps	73958	10.48	191721	20.85	203662	20.64
Others	31272	4.43	54786	5.95	58540	5.93
Total	705490	100	919585	100	986820	100

Egypt is the world second in regard to tilapia production, first in mullet production (China has the lead for tilapia)

A part of the slight increase in “others” is attributed to marine aquaculture

# Fish farming and tilapia

Tilapia is a limiting species (intolerance to cold) –  
Because of that:

- Growing season starts when temperature warms up (April)
- Peak of harvesting (October – December/January)
- Farms rely on warm ground water enjoy flexible management systems – Similarly marine farms
- Greenhouses (hatcheries): Starting activities during winter months (low water use; high energy)

# Fish farming and tilapia

**Tilapia (harvesting)**



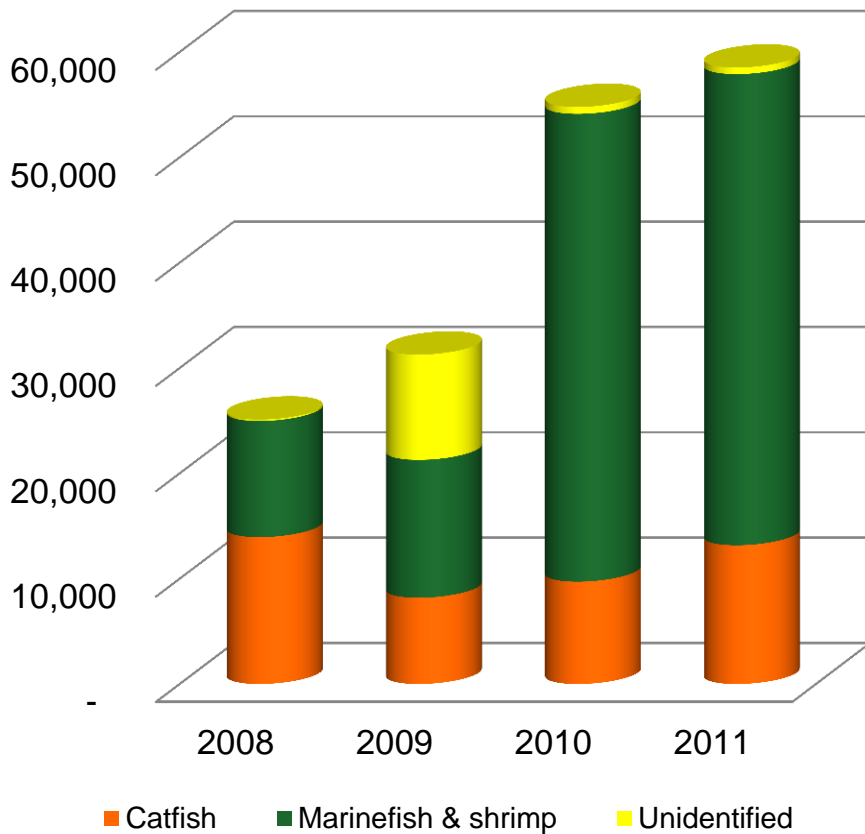
**Over-wintering tilapia**



**All-year round tilapia farming  
(well water)**

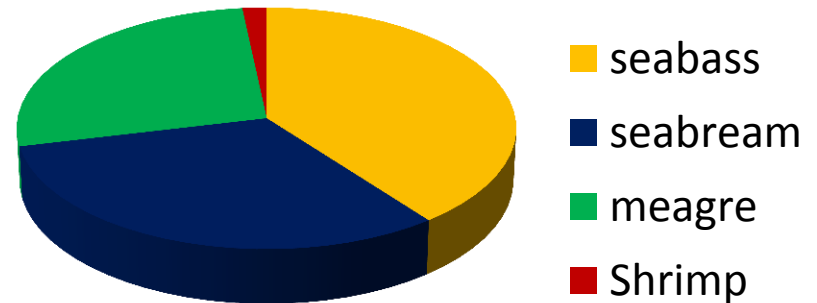
# Breakdown of others/marine

## Others (ton)



## Marine

%



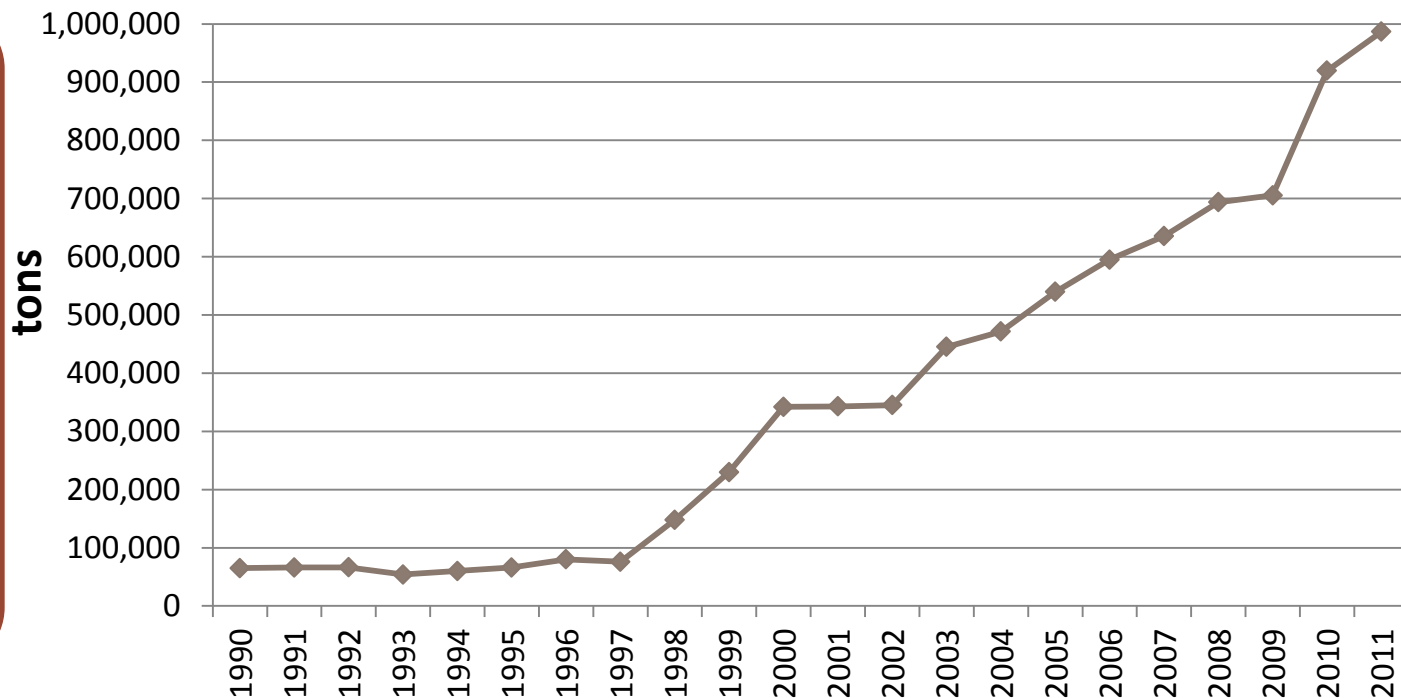
# Facts – Total fish production (ton)

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Fishery	425400	431123	393494	349553	375894	372491	373815	387398	385209	375354
Aquaculture	376066	444867	471535	539747	595029	635517	693815	705490	919585	986820
(% of total)	(46.92)	(50.78)	(54.51)	(60.69)	(61.28)	(63.04)	(64.98)	(64.55)	(70.47)	(72.44)
Total	801466	875990	865029	889300	970923	1008008	1067630	1092888	1304794	1362174

**Source:** General Authority for Fish Resources Development, Yearbook statistics

## Aquaculture Development (1990-2011)

Starting mid-1990s, aquaculture witnesses periods of sharp increase or slight increase  
**BUT**  
Never decreased till now



Production economics is the key factor in determining the mode of production and so the degree of development



# Aquaculture types – earthen ponds



**Earthen ponds:** Will remain the main production system (for economic reasons)

Earthen ponds are the main aquaculture producer: 731,786 tons; 74% of total production in 2011

Any improvement in pond productivity will be felt on the national level

Total acreage of earthen ponds amounted 285,833 feddans (120,050 hectares) in 2011

>95% of pond acreage belongs to the private sector

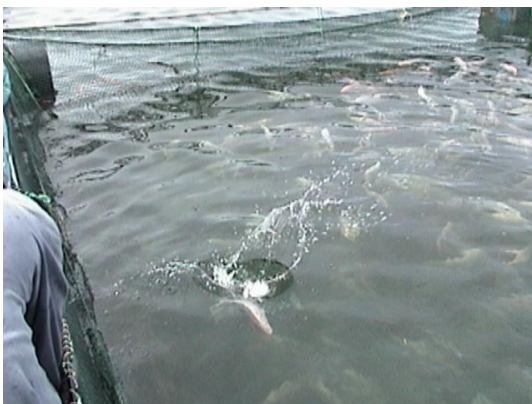
Owned land represents 14% of the total area; the remaining areas are either leased or utilized temporarily for aquaculture

Productivity vary significantly

# Other aquaculture types



Intensive farms



Cages

Integrated rice-fish



# Nile cage aquaculture

## Banning/Piloting



**Damietta/Rosetta Branches  
(banned – lifted)**



**In operation:  
Rayaan (Fayoum)  
Behira**

# Emerging systems (desert aquaculture)

## Advantages:

- All-year production
- Good candidate for export
- Usually integrated with other plants or livestock

## Limitation:

- Sustainability of underground water



Fresh  
or  
Marine

# Fish seed collection

The only source for mullet farming (no commercial mullet hatchery)

Same is true for European seabass and gilthead seabream (few million are hatchery produced)

Collected fry is on the decline (62 million in 2011 compared to 148 million in 1990)

Negligible numbers of seabass, seabream and meagre are collected fry (omitted in 2011 statistics)



## Where collected fry goes?

Aquaculture

Stocking of natural waters

There is always a debate between fishermen and fish farmers about fry collection

Fishermen claim that the collection of wild fry is harmful to capture fishery

Fish farmers claim that higher survival and biomass are achieved in aquaculture facilities

The value of stocking programs requires validation



# Stocking of grass carp

Since 1990, the use of herbicides in the control of aquatic plants in the River Nile and irrigation canals has been banned.

Instead, the use of grass carp, *Ctenopharyngodon idella* has been introduced as a biological control agent.

The Channel Maintenance Research Institute (CMRI) of the Ministry of Water Resources and Irrigation is in charge of the program (seed production and release)- Grass carp seeds are produced in collaborating governmental hatcheries.



Two components are needed to supplement this program:

- Impact assessment
- Creating awareness and introduce catch and release among fishermen

# Fish seed production

About 110 tilapia hatcheries operate in the present with the dominance by the private sector. Realistically, actual tilapia fingerlings should exceed by far the reported 247 million in 2011.

Fingerlings of carps are produced mainly in governmental hatcheries with a total of 213 million in 2011 of three species (common, silver and grass carp).

Most of common carp fingerlings are produced for rice-fish culture.

About 77 million of grass carp fingerlings are produced for the biological control of aquatic plants (in 2011)

Few marine hatcheries are in limited operation (15 million in 2011). Most of the recent increase is credited to shrimp.





# Fish feed industry

More directed towards tilapia

A growing industry (about 500,000 tons at present) produced by feed mills with different capacities and technologies.

Most of feed ingredients are imported.

Some feed mills have got “Good Manufacturing Practices” standards.

Active joint venturing with international companies.

Some exports to Arab and African countries.

Also some imports of manufactured feed for marine fish/shrimp



Fish consumption, trade and quality

# Fish consumption and trade

Per capita fish consumption in Egypt is close to world average (16 kg/year). National strategy aims to maintain this level from local production by 2017.

Fish import fills the gap between national production and consumption (182,222 tons in 2011). Foreign exchange rate influences fish importation.

Only a modest quantity of marine capture fishery is exported (9,489 tons in 2011). Most of the exports are Mediterranean fish.

# Fish trade - quantities of fish import & export (ton)

Fishery resources	2007	2008	2009	2010	2011
Local production	1008008	1067630	1092888	1304794	1362174
Imports	258931	136807	135523	256813	182222
Exports	4417	6727	7594	10596	9489
Available for consumption	1262522	1197710	1220817	1551011	1534907

**Source:** General Authority for Fish Resources Development, Yearbook statistics

Importing cold water fish is required in some markets & needed for smoking  
Importing species of production shortage is quite normal (e.g. shrimp)  
**However, importing tilapia is a real concern**

# Wholesale fish marketing

The central fish market “Obor” is located in Cairo. The market receives fish from various sources (capture fishery, aquaculture and imports).

The wholesale fish market in Kafr El Sheikh has been established to serve the fish trade in the governorate especially about 44.1% of total fish in Egypt is produced in Kafr El Sheikh; out of which 496,706 tons from aquaculture which represents 50.3% of total Egyptian aquaculture (2011). From this market, fish is distributed within and outside the governorate based on demands.

Auctioning is the system practiced in the central/wholesale markets whereas a fixed fee is deducted from the sale transaction for providing the market service.



Obor  
Kafr El Sheikh



# Retail fish marketing

Retail shops provide fish to consumers directly.

Retail shops vary in size and in fish displayed.

Depending on locations, purchasing power and preferences of consumers, fish sold varies.

In coastal areas, marine fish and shell fish will be displayed more compared to the delta regions whereas tilapia and mullet are more common.

Retail shops are either clustered in bigger markets or could be individually located where the demand exists. Weekly village markets are very important in fish marketing.

Large supermarkets often display fish of different species and in different types of preparations.



# Marginal fish sale

It is common to find fish individuals selling fish along main roads especially close to lakes

Those could be related to fishermen or just a job for individual

Interestingly, many buyers believe more in the freshness of these fishes based on the closeness to the fishery resources



# Quality issues

Quality awareness is steadily developing among producers and consumers over time.

The competition among producers led to new marketing initiatives such as selling live fish.

Improving fish quality is more adopted when associated with economic returns.

Media plays an effective role in that issue and may discourage fish consumption whether based on true information or on rumors.





# Fish processing

The main types of fish processing in Egypt are:

**Salting:** this is applied to mullets (*Mugil sp.*) to meet the peak of demands during eastern. The sources of mullets to be salted are either capture fishery or aquaculture. Few processors label their salted mullet enabling their products to be displayed in supermarkets and to access regional markets. On-boat salting is also done on several species of Lake Nasser catch of *Alestes sp.*, *Labeo sp.*, *Hydrocynus sp.*, and *Eutropius niloticus*. Wild caught sardines are salted.

**Smoking:** smoking is performed on imported frozen fish of cold water species (herring like species). A trial was done on African catfish and common carp but was never commercialized.

**Filleting:** performed mainly on large-size tilapia and Nile perch from Lake Nasser and few of Red Sea species such as grouper. Fish fillets (fresh/frozen) aim to meet market demands as well as to achieve efficient transportation to target markets.



# Issues of Concerns

# Limitation of natural resources

## Water

Severe competition on water use especially the per capita water consumption is 680 m<sup>3</sup>/year (in the water poverty zone).

Agricultural crops enjoy priority over aquaculture in regard to water use.

Existence of unutilized water resources (under-ground, brackish, marine).

## Land

Almost all suitable land for fish culture are being already utilized as fish farms.

Converting the temporarily fish farms into agriculture after salt washing –if happened- would significantly reduce the acreage of fish farms and so fish production.

Desert when used for aquaculture requires much higher investments .

# Legislations on the use of natural resources

## Water

With the exception of freshwater hatcheries, farms are not entitled to use river waters.

Only agricultural water is allowed in fish farms. Ensuring that water should be safe.

Even though the use of brackish water in northern delta is encouraged, roads, power and other utilities are needed



## Land

The lease term was five years and then ten years. Because most of fish farms are on leased lands, longer lease term encourages the investments as well as benefitting of available credit lines. Recently, the lease term has been extended to 25 years conditioned to good farming practices.

Aquaculture should not be practiced over agricultural land. Hence, once the salt content of the temporarily fish farms is washed up, these farms should turn into agriculture.

# Dealing with the limitation of natural resources (water & land)

Adopting any of the following scenarios:

Intensification of farming practices as long as economically feasible.

Wiser use of natural resources through integration and rotation.

Introducing and promoting new initiatives such as aquaponic.

Focus on means for the utilization of under-utilized water resources especially marine or brackish water.

# Water scarcity and aquaculture: Intensification

Intensification trend is widely adopted under the limitation of land/water



# Water scarcity and aquaculture: Integration with rice and other crops

## Rice-fish culture



A large size national program supported by the government with a total production of about 15,000 tons of common carp

Common carp fingerlings are provided at no cost

## Integration with agriculture



The integration with horticulture is in practice (banana, guava, mango)

Also with vegetable & alfalfa

Reduced chemical fertilization & enhance product quality

# Water scarcity and aquaculture: Rotation with strategic crops (wheat & alfalfa)

Promoting integration and rotation (e.g. wheat and alfalfa)

Began shy but now expanding (win-win situation)

Still relatively insecure according to Law 124

No available figures about its size –

**Positive indications**



Added value to fish farming water is a fact –  
quantifying that still based on field  
observations



# Water scarcity and aquaculture: Use of under-utilized brackish water

## **Not commonly practiced**

Accidentally explored (olive farm)

## **A promising source subject to:**

Sustainability of water resources:

Seems abundant (solid information)

Availability of key infrastructure (especially roads and power)

Soil structure in the location

Longer lease term & reasonable fees



# Aquaponics



Start at experimental level

Great chance for dissemination

Greater potential whenever  
water gets scarce

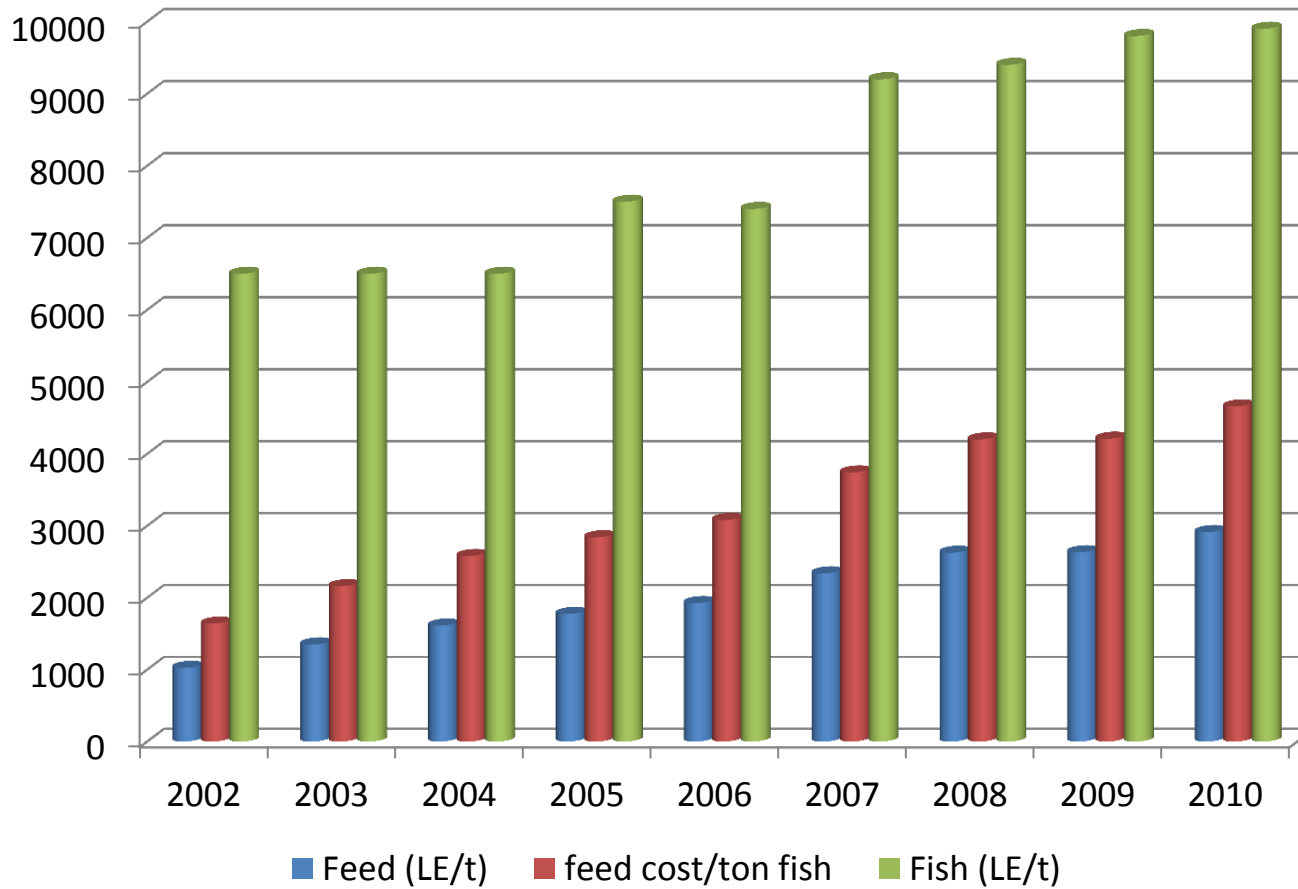


Example of tested crops

Screening will be based on production  
economics



# Farm economics – High cost of feed



Most feed ingredients are imported and so influenced by the foreign exchange

Over 9-year period:  
Feed prices increased by 284%  
while fish prices increased by 152%

# How could farmers survived the high feed cost?

- Accepting lower profits compared to before
- Increase the productivity/unit area
- Enhance the utilization of feed
  - Better feed quality of better water stability
  - Reduce feed wastes (quality, feeders)
  - Reliance of natural food for sufficient time before administering commercial feed
  - Attempting to introduce non-feed consuming species such as silver carp (did not work as hoped)
  - Improving tilapia marketing and revenue (live fish marketing)
- Not much to do except waiting for the best which could be a function of others (price increase of red meat; bird flu)
- Attempting to use non-conventional ingredients was not practical

# Production basket: Expanding the basket

A growing interest in the farming of some native species (e.g. African catfish and Nile perch).

The availability of Nile perch seed and the low marketability of African catfish represent a major constrain.

Expanding production basket could be partially addressed through processing and added value products.



Hatchery technology has not developed yet

Seed production is now possible;  
Catfish is not enjoying enough  
consumer acceptance



# Production basket: Promoting marine aquaculture (1)



Present production of marine species is far below potential.

The competition among various sectors (e.g. tourism) represents a main obstacle hindering the development of marine aquaculture.

Most of marine fish could be marked locally especially some importation takes place (e.g. shrimp).

Ability to export should consider international competition



# Production basket: Promoting marine aquaculture (2)

Existing marine aquaculture initiatives is sufficient to start with especially hatcheries and feed mills

Adequately trained human resources are available to start with

Land-based farms on brackish & marine water is a promising once technically and economically justified

Off-shore cages is getting more attention in the present and is now in the piloting phase



# Capacity building

Training is a regular component in governmental programs (in-country and overseas)

Private programs supported the training of different stakeholder categories (farmers, officials, processors)

Training for producers tried to live the development and difficulties of the sector

Training the trainers was found very effective (governmental & academic staff)





# Credit lines & soft loans

Multi Sector Support Programme (MSSP), (1996-2004) was initiated by the Ministry of Agriculture and was funded by the European Commission (EC).

The program was designed to provide soft loans with interest rates considerably lower than the commercial interest rates to four agricultural sectors including aquaculture.

Technical assistance was provided to ensure successful implementation of credits.

Soft loans are also provided by the Social Fund for Development (SFD)



Upon the completion of MSSP, the program has undergone some modifications and merging resulting in ASDP, ARDF and finally ADP programme.

However, providing soft developmental loans continue to be the key activity of the program.

# Governing regulations

## **Laws, decrees and regulations to address:**

Water and land use

Establishing and licensing of a fish farm/hatchery

Law of Environment (discharge of effluents)

Introduction of non-native species

Use of veterinary drugs and chemicals (banning some chemicals such as sex reversal hormone and antibiotics)

Feed manufacturing and additives

# Fish introduction

Several species were introduced for aquaculture and are well established:

- Common carp
- Silver carp
- Grass carp
- Bighead carp



## For biological control

- Mosquito fish for malaria control
- Black carp for bilharzia (research)

## For aquaculture

- Freshwater prawn (experienced marketing difficulty)

## Wrong aquaculture choice

- Red swamp crayfish

# Egyptian Aquaculture outlook (1)

The target production of 1.5 million by 2017 seems achievable earlier

No matter how production diversification is required, tilapia will continue to be the leading species

Economic intensification will not be optional

Various models of integration at different scales are expected to spread out

As competition gets stronger, quality issue of fish products should be more important

# Egyptian Aquaculture outlook (2)

About a million tons of feed will be needed by 2017

A part of the feed should target marine fish and shrimp

The local market will remain the focus of fish production with some exports of species and types where relative advantage exists

Practice the farming of bivalve and oyster even for export

Research should be working closely with production systems

Extension serve should be actively engaged with producers and researchers and carried out by well trained staff