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Economic and Social Importance of Expanding the Production and Processing of Catfish in Egypt

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Abstract: A lot of countries, especially the so-called developing, countries including Egypt, suffer from a food gap between the amount of food available and the demand of food in general and animal protein particular in since the latter is the most essential for body health and growth. A lot of effort is done to solve this problem Researchers tried to help in solving the problem of animal-protein food availability, especially fish foods after the emergence of Bird Flu, Swine Flue and mad cow disease in the animal production sector. They focused on finding species of fish that have high rate of growth, adaptive with the Egyptian environment, easy to produce, with prices suitable for low-income families, common to consumers and can be fully utilized in various forms of meals. Those advantages were found in catfish. The present study showed the lack of interest in that type of fish in the Egyptian fish sector despite the fact that it is away from seasonal production, has low prices and some merits that help in the ease of its catching and production. In addition, it provides the possibility for poor families to make tiny-sized projects in agricultural areas. Its meat can be used to Process a variety of foods to suit the different tastes of customers. Consequently, the study was concerned with presenting all of these advantages in order to focus the interest in producing and farming catfish.

Key words: Catfish production % Seasonality % Prices % Catfish farming % Investment economic analytical % rearing method

INTRODUCTION

Catfish has significant importance in many countries including the United States of America. Restaurants compete over the various meals composed of catfish and that led to an increase in areas of farming of this kind of fish [1]. Moreover, sat fish are spread all over the world and they are produced from natural fisheries. They are located in the Ocean areas (Indian and Pacific) in Cambodia, Thailand and India. It is also located and farmed in Syria, Middle and Far East, Africa as well as in Latin and North America [2].

There are many reasons behind the increasing interest in farming that kind of fish, including its high growth rate, enduring difficult environmental conditions, consumers attraction since it is always consumed fresh [3]. Moreover, catfish meat can be used to produce various kinds of meals that satisfy the different tastes including the Egyptian taste, such as hamburger, Finger pieces of meat with a tremendous taste [4].

Catfish are a diverse group of bony fish and they are present in Aisia, India, Africa and some Middle East countries. Lazera type exists in all parts of the Nile and it is spread in water sewerage in Egypt There are other kinds of catfish that are used in fisheries such as *Clarias macroeeph*, which has very good and desirable taste and *Clarias chus*, which has rapid growth [5].

It is very often that catfish are cultured with Tilapia since it can young Tilapia and limit its abundance in the farm. Also, catfish give high rate of production when fed in basins. Production of one hectar farm (4.471 Feddan) reached 98 thousand tons in Thailand when using artificial nutrition [1].

Catfish have high resistance against diseases despite of the existence of some peaceful parasites on their bodies. Different kinds of catfish can be raised in hot and dry areas with great success. The evidence is the plentful production of Chad Lake, which is a dry and hot area western Africa [6].

Tracing the economic importance of catfish in Egypt in the period between 1998-2007 indicated that the average production is about 34 thousand tons and the best producing years were 2003 and 2004 with a production of 43 thousand tons each. The least producing

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years were 1998 and 1999 as the production was 22 thousand tons. The average relative importance of production in connection to the Egyptian fish production was 4.2% in the mentioned period. Average price for one kilo was 4.46 L.E. with a range of 3.04-5.49 and this price is suitable for low-income families in Egypt [7].

The National Institute of oceanography and Fisheris (NIOF), Egypt has conducted good studies to spread the thinking of catfish farming as one of small projects among rural families in order to increase income and to increase productivity [3]. The Institute's lab has manufactured the meat of that fish into salted, dried and smoking, hamburger and the reactions of consumers were good [4].

Due to current problems arising from raising animals for protein production (Swine Flu, Bird Flu and Mad Cows Disease), the interest was focused on fish to fill this gap. For that reason, researchers have had great interest in finding kinds of fish with high growth rate and suitable to be farmed and produced under the Egyptian environment. The researchers did not find any fish species suitable than catfish as its meat can produce various kinds of meals that can satisfy the various tastes of consumers in Egypt, in addition to the fact that their prices suit the low-income families. The objectives of this study were concerned with the following:

- Importance during the Period 1998 to 2007.
- Calculating the seasonality of catfish production during the period from 2003 to 2007.
- Investigating of annual prices and their seasonality for catfish during the period from 2003 to 2007.
- Identifying advantages of different studying methods to raise catfish.
- Studying the economics of catfish farming.
- Identifying different methods for processing catfish meat.

MATERIALS AND METHODS

As for the methodology of the study, it depended on the economic analytical descriptive and statistical approach using media and concluding the seasonality factor through dividing the lowest medium by the highest one [4]. Moreover, the relative importance of production sources was extracted.

RESULTS

Catfish Production: Table 1 indicates the Egyptian fish production from the Egyptian natural fisheries, including fish farming, including catfish production from different sources of production and the importance of catfish during the period 1998-2007. Data show that fish production from natural fisheries were fluctuating over the years from 372 thousand tons in 2007 (Minimum) to 431 thousand tons in 2003 (Maximum). This fluctuation was also applied to catfish production from natural resources as production waved between 22 thousand tons in 1998 to 43 thousand tons in 2003 then it went down to 36 thousand tons in 2007.

Fish farming in general was marked with continuous increase as it reached 140 thousand tons in 1998 and it continued to rise to reach 445 thousand tons in 2003 then 636 thousand tons in 2007. However, catfish production had a production revolution in 2005 as it reached 10 thousand tons than 460 tons in 2004. After that rise, it kept going down in the years 2006 and 2007 as it reached 6 and 5.3 thousand tons respectively.

Relative importance of total fish farming in the last three years is 1.9, 1.0 and 0.8% respectively. It is clear that catfish production was suffering from fluctuation and non-continuality and that indicates the lack of interest in the production of catfish from the part of investors in the field of fish farming.

Seasonality of Catfish Production During the Period 2003-2007: Table 2, indicates the seasonality and monthly production of catfish in some of lakes and Nile fisheries during the period from 2003 to 2007, it also, shows the seasonality of catfish production in some Egyptian lake fisheries (Mariuot-Edko-Borollus-Depressions of Elrayan Valley) and Nile fisheries. The data show variations of catfish production among the fisheries as the fisheries Elrayan Valley reached 2.95 whereas it was lower in Edko reaching 2.1, then Borollus with 1.48 and Mariout with 1.2. The lowest production came from Nile fisheries with seasonality coefficient of 1.14. It is clear that the seasonality almost doesn't exist as the highest quarter production mean was 1288 tons and the lowest was 1126 tons and the difference between the two numbers is not so great one.

Once it has been clear that the lowest seasonality's coefficient belongs to the river Nile, this helps to conclude that there is almost no seasonality for catfish production because the production of the Nile fisheries is higher than other fisheries as the production of such fisheries reached 36, 37 and 42% of the total catfish production during the years 2005, 2006 and 2007 respectively.

Table 1: Investigating of Egyptian Fish Production and the production from natural fisheries, farming and production of catfish from various sources and its relative importance in the period 1998 to 2007

	Source											
				Catfish Production								
				(4) Natural Fisheries								
				Lakes		Nile and Its Branches		(5)Fish Farming		(6)Different Sources	
Year	(1) Egyptian Fish Production (Thousand Tons)	(2) Production of Natural Egyptian Fisheries (Thousand Tons)	(3) Production and Farming of Egyptian Fish (Thousand Tons)	(TT)	***%	(TT)	#%	(TT)	*%	(TT)	**%
1998	546	406	140	10	2.5	12	2.8	197	0.1	22	4
1999	649	423	226	11	2.5	11	2.6	170	0.1	22	3.3
2000	724	384	340	17	4.4	14	3.8	654	0.2	32	4.4
2001	772	429	343	16	3.8	23	5.4	656	0.2	40	5.2
2002	801	425	376	14	3.2	25	6.0	228	0.1	40	4.9
2003	876	431	445	18	4.2	25	5.8	232	0.1	43	4.9
2004	865	393	472	14	3.5	13	3.3	460	0.1	27	3.2
2005	889	349	540	12	3.5	13	3.8	10180	1.9	36	4.0
2006	971	376	595	21	5.6	16	4.1	6057	1.0	43	4.0
2007	1008	372	636	16	4.0	15	4.0	5286	0.8	36	3.6
Medium	810	399	411	15	37.2	17	41.6	2412	0.5	34	4.2

-Calculated by the researchers as: (1=2+3), (6=4+5)

* The relative importance of lakes fish production.

** The relative importance of fish production of the Nile and its branches.

*** The relative importance of fish farming production.

The relative importance of the Egyptian fish production.

Source: [7]

Table 2: Seasonality of monthly production mediums of catfish in some of lake and Nile fisheries during the period from 2003 to 2007

	Fisheries				
	Egyptian Lake Fisheries				River Nile and
Months	Mariout	Edko	El/Borollus	Depressions of Elrayan Valley 1 and 3	Its Branches
January	189.2	23.8	204.40	5.80	118.80
February	160.4	16.6	392.20	5.80	1136.30
March	156.2	14.0	390.20	5.20	1123.30
Medium	168.6	18.1	328.90	5.60	1149.20
April	168.8	12.4	369.80	7.40	1181.80
May	176.4	10.2	387.40	4.00	1346.80
June	192.4	11.2	448.20	1.80	1334.80
Medium	179.2	11.3	401.80	4.40	1287.80
July	158.0	10.4	482.40	0.20	1252.80
August	170.8	9.0	353.60	1.20	1193.00
September	184.0	6.8	482.20	4.20	1176.00
Medium	170.9	8.7	439.40	1.90	1207.30
October	156.8	9.2	493.20	2.80	1179.30
November	163.2	10.4	447.60	5.40	1161.50
December	124.4	9.8	517.80	5.60	1037.00
Medium	148.3	9.8	486.20	4.60	1125.90
Seasonality Coefficient	1.2	2.1	1.48	2.95	1.14

$$\text{Seasonality Coefficient} = \frac{\text{Highest Quarter Medium}}{\text{Lowest Quarter Medium}}$$

-Calculated by the researchers.

Sources:[7]

Table 3: Development and Seasonality of Catfish Prices during the Period from 2003 to 2007

	Years						
Months	2003	2004	2005	2006	2007	Medium	Average Quarterly Medium
January	4.00	4.58	4.44	5.71	5.16	4.78	4.96
February	3.95	4.80	4.68	5.71	5.38	4.90	
March	4.16	4.82	4.98	5.71	6.27	5.19	
April	4.3	5.06	5.42	5.29	6.40	5.29	5.16
May	4.86	4.73	5.58	5.29	5.60	5.21	
June	4.44	4.85	5.50	5.29	5.09	4.98	
July	4.50	4.53	5.45	5.34	4.80	4.92	4.94
August	4.47	4.63	5.40	5.52	4.78	4.96	
September	4.48	4.56	5.11	5.50	4.98	4.93	
October	4.42	4.90	5.22	5.64	5.47	5.13	5.24
November	4.72	5.30	5.48	5.57	5.72	5.36	
December	4.30	5.37	5.48	5.33	5.61	5.22	
month Medium	4.38	4.84	5.23	5.49	5.44		

$$\text{-Seasonality Coefficient} = \frac{\text{Highest Average of Quarterly Mediuns}}{\text{Lowest Average of Quarterly Mediuns}}$$

-Calculated by the researchers.

Sources: [7]

In addition to what have been mentioned above, catfish is marked by the possibility of being farmed. This is a vital element that helps a lot to make it available all over the years and provides the possibility for transforming industries which are very important for encouraging investors to invest in this field that hasn't been stepped into up till now.

Seasonality of Catfish Prices During the Period from 2003 to 2007: From table 3, concerning the seasonality of catfish prices during the period from 2003 to 2007, it is apparent that the average monthly prices took an ascending trend since 2003 as it reached 4.38 E.P/Kg till 5.49 E.P/Kg in 2006. It then decreased to 5.44 E.p in 2007. These increases are acceptable. If we calculate the percentage of inflation, we would find that it reached 5% per year as an increase in prices. Prices average was supposed to be 5.44 E.p/Kg in 2007 and it is very close to the actual price in the same year. This is an important point for feasibility studies and for encouraging investment to enter a productive activity safely and with little risk.

The other important point is the seasonality of prices. From table (3), we can find that the average quarterly prices during the period (2003-2007) is similar to the other mediums in the same period: 4.96 E.p/Kg in the first quarter; 5.16 E.p/Kg in the second quarter; 4.94 E.p/Kg in the third quarter; 5.24 E.p/Kg in the fourth quarter. The seasonality coefficient reached 1.06, which refers to stability of prices and non-conformity to different seasons. This can encourage investment in the production and manufacture of catfish in different ways.

Identifying Advantages of Different Studying Methods to Raise Catfish: In addition to above mentioned existence of catfish in natural fisheries, relative importance of its production from such fisheries, low seasonal factor for its production which explains availability of fish production all year round, there is also potential for farming such fish which should be stressed for benefiting from advantages of such fish with higher growth rate than other fish. Catfish farming is carried out in two types; semi-intensive farming and intensive farming.

First type deals farming takes 25 weeks expected production of feddan after nearing cycle which is 25 weeks for catfish (1400-1600 kg) with average weight of one catfish (185-225 gram) and for tilapia (600-700 kg) with average weight of one fish (80-125 gram).

Second type of farming is condensed system where storage density is high and natural food in basin doesn't suffice to cover nutritional fish requirements. That is why catfish rely in this system on local artificial feeding requiring thereby making a balanced provender.

There are some important observations for following rearing basins where they should be observed daily early in the morning concentrating on survival larvae and

Table 4: The feasibility about two farming methods (semi-intensive, intensive)

	Semi intensive		Intensive	
Item/ method	Number	Value E.P.	Number	Value E.P.
Infants/ catfish	9000 units	900	30000	30000
Tilapia	6000 units	300	-	-
Fodder	3.3 ton	7920	5.7 ton	13706
Other expenses*	-	1500	-	3000
	total	10620	Total	19706
One cycle revenue for 25 weeks	Catfish 1500 kg			
Tilapia 650 kg	Tilapia 650 kg	9000	Catfish 5.4 ton	32400
	Total	13225		
Net income for half year cycle		2605		12694

Calculation according to field follow up of researchers.

* Other expenses (feddan rent, fertilizer,)

Table 5: Percentage of nutrition components of some catfish meat products

Nutrition component\ product	Fillet	Smoked	Burger	Balls
Protein %	17.5	17	18	20
Fat %	1.45	4	15	5
Energy Kcal/loog	83.05	257	257	145
Carbohydrates	-	-	25	5

oxygen rate in water specially in first week after putting infants in basins where they breathe oxygen in water during this age stage.

There after infants can breathe from air after completing air breathing organs under scale cover and hence oxygen shortage or bad water don't affect them and hence follow up of basins would be easy[8]. Follow up can be maintained by placing small quantity of fodder before set date for providing fodder so as to supervise catfish. It will be seen that stronger catfish compete at basin's surface to get food.

As for fishing stage, for basins not provided with grouping basins there is difficulty in catching catfish with net because they bury themselves in mud. That is why basin shall be died gradually to make fishing possible by first day light. Expected production after 25 weeks is: Farming period 5.4ton/ feddan with average weight of one catfish (200/250) grams.

Studying the Economics of Catfish Farming: We shall deal briefly with catfish farming projects and their feasibility for semi-intensive and intensive methods. We shall propose a home. Project for producing catfish.

Feasibility for both types shall be based on unit with area of one feddan (Hectare = 2.471 feddans). It is a unit that can be repeated with some feasibility for each unit. Referring to above mentioned item about two farming methods (semi-intensive, intensive) feasibility can be shown as follows:

It is shown from intensive farming feasibility that it is better than semi intensive one, but it requires available technical and material aspects by farmer which is found by some but not by all.

Two farming cycles can be performed per year for more economic output. More than one unit (feddan) can be operated by one farmer, thereby increasing.

As for proposal of NIOF it is shown as follows:

Project Description: There is no doubt that there are land spaces surrounding farmers and fishermen houses which are not exploited. There are also spaces inside their houses projects rely on using such spaces to add to family income and benefiting from woman capacity in rearing a new type which is rearing fish and exploiting open unexploited spaces around house or inside it. This would raise income and social standard of living of such families.

Project rearing catfish in such spaces by the two methods either by expecting one or both of them.

First Rearing Method: Rearing catfish in a pool outside house and using discharge water for plantation because it is fertilizer for plants.

Second Rearing Method: Rearing catfish in plastic barrels taking care to change water at equal rates for providing and withdrawing water due to small volume of rearing place.

Technical description of first method of rearing and its feasibility:

A water pond is made outside house with a depth of 75 cm and raising filling on sides of ditch with height of 75 cm making height of ditch from bottom till top filling 150 cm with technical observation to make irrigation and discharge alternatively to minimize costs. Pond can be surrounded with metal or fishing wiring pending pond area 10 x 10 meters.

Feasibility of Fish Farming of Cat Fish in Ponds Outside House:

Fixed Capital:	
Digging and levelling earth.	500 L.E
Irrigation and discharge pipes.	500 L.E
Protection wiring	1000 L.E

	2000 L.E

Variable Capital: Larvae (1500 unit/ m^3) 150 L.E. feeding with food remains from house non productive small fish.

Production: Production cycle 9 methods till catfish size reaches 350 gram.
Production = 1500 x 350 = 525 kg.
Production value = 525 x 6 = 3150 L.E
Installment and annual interest = 570 L.E
Variable costs = 150 L.E
Net annual income = 2430 L.E.

One production unit can be repeated for one household. House farming feasibility for catfish in plastic barrels.

Fixed Capital:

Equipped plastic barrel	80 L.E
Irrigation and discharge network	40 L.E
Changing capital: infants (20 infant barrel)	2 L.E

Feeding: Household and Food remains Small non economic fish

Production: Production cycle: 9 months till one catfish becomes 350 gm.
Barrel production = 20 x 350 = 7 kg
Barrel production value = 7 x 6 = 42 L.E
Installment and annual interest for barrel unit = 24 L.E
Changing costs = 2 L.E
Net income = 16 L.E./ barrel

One production unit is a barrel which can be repeated for one household according to available space and work ability of family.

Rearing period can be shortened from nine to six months to benefit from executing two cycles in one year for more production and income.

Identifying Different Methods for Processing Catfish Meat: many tests and experiments proved excellence of catfish meat and possibility of use in multiple meat production NIOF performed many tests and experiments through fish Processing lab for using catfish meat as it is possible to peel off skin, clean it and get net filet pieces to be packed in covered dishes, cooled or frozen and sold to consumer at a good price, with reasonable profit margin for producer. Such meat shall be ready for frying, grilling, etc.

Catfish formers can be directed to execute such projects to raise farming feasibility of this to a large and attractive extent.

Processing other products from this fish meat is possible as smoked, burger, dried or salted.

It is clear from above that this fish meat enjoys certain traits not found in other types of fish. Following table shows percentage of nutrition components of some catfish meat products according to Inland water branch and fishing farms workshop at NIOF in Egypt.

Although percentage of meat in catfish reaches 50% of its weight, selling price after processing is much better than selling it fresh. This point should be taken into consideration by cat fish farmers when investing in fish farming.

There is also possibility of benefiting from 50% of non eaten portion when changing it to material fit for protein component of fish fodder, leading to increasing feasibility of farming such fish and lowering price of fodder.

DISCUSSION

Results of the present study ascertained that catfish is adapted to grow well in Egyptian capture northern lakes and Nile fisheries. The Catch was fluctuating during the period of study. Farming Catfish in Egyptian waters assists greatly in maintaining and stabilizing of catfish power supply in the markets all the year round. Fish Farming production in general was marketed with continuous increase as it reached 63, 1% of the total Egyptian fish production. Calculating seasonal index of catfish production from Egyptian capture fisheries in

2003-2007 period [7] revealed almost the non-existence of seasonality changes. This resulted in stabilizing average selling prices of catfish from about 4.94 L.E to 5.24 L.E per kilo in the mentioned period. Such low price of catfish is acceptable to a large sector of low-income inhabitants which dominate in the country. This encourages as well processing catfish into different products. Lack of scientific data on seasonality and price stability of catfish production in Egyptian markets disencourage investor to farm or process catfish.

It is found that intensive farming was more feasible and better than semi-intensive farming.Farming catfish as home and family projects particularly in poor families help to raise income and to raise social standard [3]. There are great possibility for processing Catfish meat which has extremely good taste. It can be marketed on a large scale. Results of the study suggested more attention to increase production of Catfish and processing from each of economic and social points of view

In conclusion, the study yielded many results and recommendations that can be presented as follow:

- The necessity for increasing the interest in producing and farming catfish because of the current low production of such useful species of fish.
- Production of catfish is not seasonal and its prices are modest and that encourages investment in processing the meat of catfish.
- Catfish is considered one of the most important fish that can be farmed in the Egyptian environment in regard to water conditions.
- Variety of the methods of farming catfish goes along with the financial capacity of many farmers. In addition, it provides the possibility for poor families to start very small projects.
- Projects of farming catfish are characterized by their economical and encouraging value.
- Eatable and non-eatable parts of catfish can be used for many industries.
- Directing the scientific research toward the importance of catfish and working on.

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