

## **An Economic Study of Fish Production in Egypt**

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### **ABSTRACT**

The sector of fish wealth has contributed in the national agricultural income by about 11.1 billion pounds that is equivalent to 7.5% of the national agricultural income while the necessary expenses for fish production in the same year is about 935 million pounds that is equivalent to 2.6% of the necessary expenses of agricultural production. Therefore, the net contribution of fish wealth in the national agricultural income is about 8.9 % in spite of the variety of fish wealth in Egypt, seas, lakes, fresh water and fish aquaculture. The results have reached that fisheries in general have increased during the study period, 1995- 2011, but this increase does not suit the huge area of fisheries which is about 82.7% of the area of Egyptian fisheries while production does not exceed 14% of the total production of Egyptian fisheries and their annual growth rate is about 13.4%. For the northern lakes, the study has shown that there is a general increase in the area of northern lakes and this increase, is estimated at about 12% of the area, while the production represents about 72.9% of the total production of Egyptian lakes. The results show that most of the production of coastal lowlands comes from Bardaweel Lake and its production represents about 95% of the total fish production which is also characterized by a high growth rate estimated at about 6.7% in the Egyptian lakes, while relative importance of navigation in Port Fouaad very low and the area of inland lakes represents about 10.3% of the area of Egyptian fisheries and production represents about 4.4 of the Egyptian fisheries production during the period 2004-2011. The lake of High Dam is considered one of the most important inland lakes as it contributes by about 69.8% of the average production of inland lakes during the study period. The area of the Nile represents about 1.4 of the total area of Egyptian fisheries by production average of about 82.1 thousand tons which represents about 12% of the general average and with an annual growth rate of about 27.9%. Aquaculture in Egypt has achieved a big jump in the total production of different fisheries at an increasing rate in spite of the low production of some fisheries and the deterioration of others as the average annual production of aquaculture is estimated by about 284 thousand tons, representing about 42.1% of the overall average for the total production of different fisheries with an annual growth rate estimated at about 19.2% during the study period 1995-2011). Despite the relative stability in the fishing area and the low fish production from natural fisheries, the local production of fish recently increased significantly and this increase is due to aquaculture , which is a large proportion of local production , but in spite of this large increase, local production still does not meet the needs of consumption and consequently there has been a food gap of fish and although there is no significant increase in the volume of imports, rate of self-sufficiency has increased from 74.3 % in 1995 to about 88.2 % in 2012 and the amount of exports increased by about 7.2 thousand tons in 2012 the amount of imports also increased by about 257 thousand tons in 2012, and the average share of individual from fish has been decreased to about 15.7 kg / capita / year in 2012.

### **Key words:**

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### **Introduction**

The sector of fish wealth in Egypt is considered a main factor of food security and social and economic development as it contributes in providing animal protein as fish is considered one of its most important sources as other sources of protein like red meat have many obstacles before its development. Therefore, development of fish production is one of the objectives and a main factor of development process as the policies of developing it affects restoring the balance between the growth rates of fish production and rates of population growth in order to raise fish production rates from different sources in order to meet the needs of consumption and contribute in food security.

### **Study Problem:**

The productive activity of fish is considered one of the economic activities that depend mainly on the amount and type of fish resources that are available, as amount and type of the output of the fish are determined according to the availability of these resources. Despite the availability of these resources and the diversity of sources of fish production in Egypt and the wide areas of these fisheries, which are about 13.6 million feddans, the relative contributions to the sources of fish wealth are different. Despite the increase in fish production

recently, there is a big drop in producing some sources of fish wealth due to many environmental variables and the various factors which the study discuss , in an attempt to overcome them .

#### Study Objectives:

The study aims at the following:

- 1 - Studying main economic factors determining the production of the Egyptian fisheries during the period (2004-2011).
- 2 - Estimating the proportion of self-sufficiency and value of food gap of fish during the period. (1995-2012)
- 3 - Studying economic factors determining the consumption of fish in Egypt during the same period.

#### Study Method & Data Sources:

The descriptive economic analysis and quantitative economic analysis of the variables under study have been used by using some statistical and standard economic models including direction models such as Growth Model, and estimating the relative importance of fishing area of production and of feddan productivity.

The study relied on secondary statistical data published during the period (1995 - 2011) and issued by the General Authority for Fish Wealth Development (fish production statistics) and the National Institute of Oceanography and Fisheries and references and some websites on the Internet.

#### Research Results:

##### First: Economic Importance of Fisheries Production:

Fisheries include both fisheries of Mediterranean Sea and of the Red Sea, Table ( 1) shows that the area of fisheries is estimated at about 11.2 million feddans representing about 82.3 % of the total area of Egyptian fisheries and the annual average of fisheries production is estimated at about 139.6 thousand tons, representing about 14.1 % of the total annual average of the Egyptian fisheries production, and by productivity average of about 12.1 kg per feddan during the period (2004-2011). Studying the development of fisheries production during the period (1995 to 2011), has showed that fisheries production increased by annual growth rate that is not significant, of about 1.2 percent annually during the study period.

**Table 1:** Main Economic Factors of Egyptian Fisheries average period (2004-2011).

Fisheries Statement	Area ( in Thousand Feddan)	% of the total area of Egyptian Fisheries	Average Production in Ton	% of Average Production of Egyptian Fisheries	Average Production of Feddan in Kg
Fisheries	-	-	-	-	-
Mediterranean	6800	49.95	90947	9015	13.37
Red Sea	4400	32.32	48213	4.85	10.95
Total	11200	82.27	139160	14.01	-
Northern Lakes	-	-	-	-	-
Manzala	120	1.1	47118	4.7	392.6
Brolos	103	0.76	53691	5.4	521.2
Edco	14	0.13	6574	0.66	469.5
Mariot	15	0.11	4384	0.44	292.2
Total	252	2.1	111767	11.25	-
Coastal lowlands	-	-	-	-	-
Bardaweel	160	1.7	5475	0.55	34.2
Port foudaad Navigation	7	0.05	1095	0.11	156.4
Total	167	1.22	6570	0.66	-
Inland lakes	-	-	-	-	-
Karoun	53	0.39	3287	0.33	62.01
Rayyan	35	0.25	2191	0.27	62.6
High Dam	1250	9.18	30681	3.08	24.54
Morra & Tamsah	59.8	0.44	4383	0.44	73.29
Toshka spillway	1.05	0.007	2849	0.28	2713.3
Total	1398.8	10.28	43391	4.36	-
Inland water	-	-	-	-	-
River Nile and its branches	187	1.37	82180	8.27	439.5
Aquaculture	376.9	2.76	610330	61.4	1619.3
Total	563.9	4.3	692510	69.72	-
Total Egyptian Fisheries	13581.7	100	993398	100	-

Source: - collected and counted from data of the Ministry of Agriculture and Land Reclamation - General Authority for Fish Wealth Development, bulletin of fish production statistics – different versions.

(\*) Central Agency for Public Mobilization and Statistics - the study of fish wealth during the period (1998-2011) in April 2012.

Studying the economic factors determining fisheries production indicates that fish production of fisheries is determined by a group of factors, most importantly:

- (1) Fish Production per year yt-
- (2) Number of Automatic Boats X1.
- (3) Number of Non-motorized Boats X2.
- (4) Number of Fishermen X3.
- (5) Technological development expressed by numbers 1,2,3, ..... n (x4) and to conduct multiple phases regression analysis of variables determining fish production from fisheries in the logarithmic-linear form, it is clear the preference of logarithmic model in representing the data used in the estimate during the period (1995 - 2011) and could be expressed by equation (1):

$$\text{Equation (1)} \quad \text{Log } Y_1 = 9.91 + 0.181 \text{ Log } X_2$$

$$\begin{matrix} & (20.62) & (3.74) \\ R = 0.54 & F = 13.99 & D.W = 1.95 \end{matrix}$$

It is clear from the estimated model that the most important variables determining fisheries production is the variable (X2) of fishermen number as it turns out that the amount (10%) in the number of fishermen leads to change in the same direction for fisheries production rate of 1.81%. The significance of this estimate has been proven at the level of probability 1% and as well coefficient of determination is estimated at about 0.54, which means that the variable of fishermen numbers explain about 54% of the changes that occurred in the fish production of fisheries during the study period.

*Second: - The economic importance of the production of the northern lakes:*

It is shown in Table (1) that the northern lakes include all of Manzala, Brolos, Edco and Mariot, the area of the northern lakes is estimated at about 252 thousand feddans which represents 2.1% of the total area of fisheries, while the average of annual production during the period (2004 -2011) is estimated at about 111.7 thousand tons representing about 11.3 of the average of total fisheries production in Egypt.

Manzala Lake is estimated at about 120 thousand feddans which represents about 1.1% of the area of Egyptian fisheries, with an average production of about 47.11 thousand tons, representing about 4.7% of the average production of Egyptian fisheries and an average productivity estimated at about 392 kg / feddan, and the area of Brolos Lake is estimated at about 103 thousand feddans representing approximately 0.8% of the total area of Egyptian fisheries. The average production is estimated at about 53.6 thousand tons, representing about 5.4% of the total production of Egyptian fisheries and average productivity is estimated at about 521 kg / feddan during the period 2004-2011. As it is shown in Table (1), the area of Edco Lake is estimated at about 14 thousand feddans representing about 0.13% of the total area of Egyptian fisheries and average production is estimated at about 6.5 thousand tons representing about 0.66% of the total production of Egyptian fisheries and the average productivity is estimated at about 469.5 kg / feddan during the period 2004 -2011. The area of Mariot Lake is estimated at about 15 thousand feddans and the average production is estimated at about 4.4 thousand tons representing about 0.4% of the total production of Egyptian fisheries and the average productivity is estimated at about 292 kg / feddan during the same period. Studying the economic factors determining fish production of Egyptian lakes, made it clear that production is determined by a combination of factors, most importantly:

- 1) Number of Sailboats X 1.            (2) Number of Fishermen X2.
- (3) Technological development in fishing activity and it is expressed in numbers 1,2,3, ..... n (x3) and to conduct multiple phases regression analysis of variables determining fish production of fisheries in the logarithmic-linear picture made it clear the preference of logarithmic model in representing the data used in the estimate during the period (1995 - 2011) and could be expressed by equation (2):

$$\text{Equation (2): } \text{Log } Y_1 = 8.456 + 0.213 \text{ Log } X_1 + 0.15 X_2$$

$$\begin{matrix} & (6.255) & (2.297) & (2.618) \\ R = 0.31 & F = 3.896 & D.W = 1.374 \end{matrix}$$

It is clear from the estimated model that the most important variables determining fish production from the Egyptian lakes is the variable number of sailboats (X1), and the variable of numbers of fishermen ( X2), as it turns out that the change of (10%) in the number of fishermen and the number of sailboats leads to the change in the same direction in fish production from the Egyptian lakes of 1.6% and 2.1%, respectively. The significance

of this estimate has been proven at the level of probability 1% and the coefficient of determination is estimated at about 0.31, which means that a variable of number of fishermen and the number of boats explains about 31% of the changes that occurred in fish production from the Egyptian lakes during the study period.

The estimated directional relations in equation (3) Table (2) also indicates that the annual growth rate for total fish production from fisheries is estimated at about 13.4% during the study period. It is clear from previous results that the production of the Mediterranean Sea has increased with an annual growth rate of about 1.7%, while production of the Red Sea has declined lately and the annual rate of change is decreasing, while the total fisheries have increased during the study period with an annual growth rate estimated at about 13.4 %.

Table 2: The estimated directional relations for the development of fish production of the different fisheries in Egypt during the period (1995 – 2011).

Egyptian Fisheries	Equations General Direction	F	R <sup>2</sup>	Annual Growth Rate%
Mediterranean Sea	$\hat{Y} = 108 + 0.027 X_t$ (1.907)*	0.22	0.233	1.7
Red Sea	$\hat{Y} = 11.056 - 0.010 X_t$ (- 688)*	0.62	.038	-29
Total Fisheries	$\hat{Y} = 11.616 + 0.0116 X_t$ (1.14)*	0.214	.098	13.4
Aquaculture	$\hat{Y} = 11.099 + 0.192 X_t$ (9.17)**	0.23	.8751	66
Nile River	$\hat{Y} = 4.139 + 0.0399 X_t$ (3.03)*	0.79	.433	27.9
Mariot Lake	$\hat{Y} = 8.397 + 0.012 X_t$ (1.11)*	0.19	.0923	2.1
Edco Lake	$\hat{Y} = 9.29 - 0.24 X_t$ (-2.3)*	0.6	.312	-3.1
Brolos Lake	$\hat{Y} = 10.99 + 0.007 X_t$ (- 2.33)*	0.9	.312	4.2
Manzala Lake	$\hat{Y} = 11.21 - 0.0339 X_t$ (-2.8)*	0.74	.399	6.1
Total Northern Lakes	$\hat{Y} = 11.91 - 0.019 X_t$ (-3.3)*	0.03	.479	7.1
Port fouaad Lake	$\hat{Y} = 5.027 + 0.0091 X_t$ (0.43)	0.89	.015	4.3
Bardaweel Lake	$\hat{Y} = 7.504 + 0.067 X_t$ (4.56)**	0.44	.635	6.7
Total Coastal Lowlands	$\hat{Y} = 7.586 + 0.643 X_t$ (4.5)**	0.54	.657	1.4
Morra and Temsah Lake	$\hat{Y} = 8.791 - 0.021 X_t$ (-1.2)*	0.8	.330	- 4.9
Qaroun Lake	$\hat{Y} = 6.845 + 0.077 X_t$ (1.98)*	3.907	.566	2.3
Rayyan Lake	$\hat{Y} = 6.7941 + 0.039 X_t$ (1.22)*	1.501	.334	1.8
Water in New Valley	$\hat{Y} = 1.829 + .331 X_t$ (2.45)**	6.009	.661	3.5
High Dam Lake	$\hat{Y} = 9.793 + 0.239 X_t$ (0.72)*	0.523	.148	7.8
Toshka spillway	$\hat{Y} = 7.084 + 0.0689 X_t$ (2.69) **	7.23	.707	2.1
Total Inland Lakes	$\hat{Y} = 10.86 - .0241 X_t$ (-1.78)*	3.169	.208	-5.7
Total Egyptian Lakes	$\hat{Y} = 12.22 - 0.019 X_t$ (-3.8) **	14.46	.546	-1.1
Self Sufficiency	$\hat{Y} = 10.99 + 0.029 X_t$ (3.14) *	9.151	0.554	3.4
The size of the food gap fish	$\hat{y} = 6.7933 + 0.049 X_t$ (-3.54) *	16.01	0.509	2.9
Egyptian exports of fish	$\hat{y} = 11.161 + 0.254 X_t$ (6.22) **	82.11	0.857	6.1
Egyptian imports of fish	$\hat{y} = 6.991 + 0.032 X_t$ (1.22) *	1.661	0.442	1.4
Local production of fish	$\hat{Y} = 5.883 + 1.056 X_t$ (2.5) **	2.901	0.563	9.8
Available for consumption	$\hat{y} = 4.891 + 1.54 X_t$ (2.82) **	2.455	1.563	3.17
Average per capita	$\hat{y} = 2.391 + 0.042 X_t$ (1.29) *	1.801	0.905	-2.7

Numbers between brackets below the equation indicate counted value (v).

Xt: refers to the time factor, where t = 1, 2, 3, ..... 17

\* Significant at the level of 5% \*\* significant at the level of 1%

Source: counted and collected from the table (1, 2, 3, 4, 5, 7) in the study.

From previous results we can say that these fisheries, which are estimated at about 82% of the area of Egyptian fisheries, that its production does not exceed about 14% of the total production of Egyptian fisheries as shown by Table (1) therefore we must take into account the need for the development of these natural resources by many ways such as to maintain natural resources from urban and industrial pollution, stop offending fishing and prevent fishing in a fish spawning, taking into account the integration of operations of economic development and environmental changes, not to have risks, damages and increasing pressures on fish resources leading to weakening of their productive capacity and we should maintain the fish resources through:

- (1) Not to exploit these resources more than its productive capacity, by estimating fish stocks to determine the optimal use of resources.
- (2) Reducing the pressure on natural fisheries through the development of aquaculture in its different types.

#### *The development of fish production from northern lakes:*

It is clear from Table (3) that the average fish production from the northern lakes during the study period (1995-2011) amounted to about 126.6 thousand tons, representing approximately 72.96 % of the general annual average of Egypt's lakes between a minimum of about 106.10 thousand tons in 2007, and a maximum of about 152.1 thousand tons in 1998, and with a decreasing annual rate of change estimated at about 1.9% as shown in Table (2), while the annual average of production of Mariot Lake is estimated at about 5.5 thousand tons, representing about 4.35 of the general annual average for all lakes and between a minimum of about 3.5 thousand tons in 1995 and a maximum reached about 6.4 thousand tons in 2000, as shown by Table (3) and with an annual growth rate estimated at about 2.1% as shown in Table (1).

The annual average of Edco Lake is estimated at about 7.9 thousand tons representing about 6.3 % of the average annual total of Egypt's Northern Lakes during the period 1995-2011 . This is between a minimum of about 5.9 thousand feddans in 2008 and a maximum total of about 10.9 thousand tons in 2001, as shown in Table (3) and with a decreasing growth rate estimated at about 3.1% as shown in Table (1) and the annual average production of fish from Brolos Lake amounted to about 57.6 thousand tons, representing about 45.8 % of the general annual average of Northern lakes and between a minimum of about 51.8 thousand tons in 2000, and a maximum of about 59.8 thousand tons in 2002, as shown in Table ( 3) and with increasing annual rate of change which is not significant statistically, estimated at about 4.2% as shown in Table No. 2.

**Table 3:** The development of the total fish production of the Northern Lakes and their relative importance to the total Egyptian lakes during the period (1995 - 2011).

Years	Mariot	Edco	Brolos	Manzala	Total Northern Lakes	Total Egyptian Lakes	Relative Importance
1995	3466	8209	59193	5900	130468	186483	69.9
1996	3976	10125	59351	52505	125957	176529	71.4
1997	4489	10784	58746	63098	137117	195632	70.1
1998	4500	10300	59000	78300	152100	212900	71.4
1999	5232	9494	55300	65000	135029	186338	72.5
2000	6378	8922	51768	74132	141200	173149	81.5
2001	6200	10910	59200	68400	144710	185591	78.0
2002	5303	10336	59785	58400	133824	171810	78.0
2003	4861	10230	55500	65015	135606	195128	69.5
2004	5024	9056	55000	632772	132852	177099	75.0
2005	5292	9619	53909	39857	108677	158297	68.7
2006	5211	8986	52956	41193	108346	151312	71.6
2007	4413	6645	58291	36783	106132	144033	73.7
2008	4352	5891	52260	46457	108960	157884	69.0
2009	5292	9619	53909	39857	108677	154252	70.45
2010	5919	6493	59517	61075	133004	175656	75.71
2011	6117	6399	60629	63265	136410	184335	74.01
Average Period	5558.7	7940.37	57625.51	55558.39	126683.05	172706.91	72.96
% of General Average	4.35	6.26	45.85	43.54	100		

Source: - collected and counted from data of Ministry of Agriculture and Land Reclamation, the General Authority for Fish Wealth Development, bulletin of fish production statistics – different versions.

Central Agency for Public Mobilization and Statistics - the study of fish wealth during the period (1998 -2011), in April 2011.

#### *Third: - The economic importance of fish production of coastal lowlands:*

Coastal lowlands include Bardaweel Lake and navigation of Port Fouaad, Table (1) declares that the area of coastal lowlands is estimated at about 167 thousand feddans representing about 1.2% of the total area of

Egyptian fisheries, with an average production estimated at about 6.5 thousand tons, representing about 0.66% of the average total of Egyptian fisheries production and average productivity estimated at about 80.3 kg / feddan during the period 2004-2011.

*Fourth: - The economic importance of the production of fish from inland lakes:*

Inland lakes include Qaroun Lake, Rayyan, the High Dam, Morra and Tamsah, Toshka spillway and water in the New Valley.

It is clear from Table (1) that the area of inland lakes is estimated at about 1.4 million feddans representing about 10.3 % of the total area of Egyptian fisheries with an average production of about 43.3 thousand tons, representing about 4.4 % of the average production of Egyptian fisheries during the period ( 2004-2011). The area of Qaroun Lake is estimated at about 53 thousand feddans representing about 0.4% of the area of Egyptian fisheries and with an average production of about 3.2% tons representing about 0.33% of the average production of Egyptian fisheries and an average productivity of about 62 kg / feddan during the period (2004 - 2011), while the area of Rayyan Lake is estimated at about 35 thousand feddans representing about 0.3% of the area of Egyptian fisheries with an average production of about 2.2 thousand tons representing about 0.2 % of the average production of Egyptian fisheries with average productivity of about 62.6 kg / feddan during the period (2004 -2011 ).

The area of the High Dam Lake is estimated at about 1.3 million feddans representing about 9.2% of the total area of Egyptian fisheries and with an average productivity of about 24.5 kg / feddan during the same period , while the area of the Morra and Tamsah lake is estimated at about 60 thousand feddans representing about 0.44% of the area of Egyptian fisheries. The average production was estimated at about 4.4 thousand tons representing about 0.44 of the production of Egyptian fisheries and with an average estimated at about 73.3 kg / feddan during the same period. The area of Toshka Spillway is estimated at about 1.1 thousand feddans representing about 0.07% of the area of Egyptian fisheries with an average production that is estimated at about 2.8 thousand tons representing about 0.28% of the average production of Egyptian fisheries and with average productivity of about 2.7 thousand kg / feddan during the period (2004-2011).

It is clear from Table (5) that the average production of inland lakes during the period (1995-2011) has reached about 43.33 thousand feddans, between a minimum amounted to about 28.5 thousand tons in 2000, and a maximum of about 58.7 thousand tons in 1998, and the decreasing annual rate of change that is not significant statistically is estimated at about 2.4% per year as shown in Table No. 2.

**Table 5:** The development of the total fish production of inland lakes during the period (1995-2011) Amount in Tons.

Years	Morra & Tamsah	Qaroun	Rayyan	Water in the New Valley	Naser	Toshka Spillway	Total Inland Lakes	Total Egyptian Lakes	Relative Importance
1995	1500	703	611	0	50930	0	53744	186483	28.8
1996	1789	848	702	0	45401	0	48740	176529	28.6
1997	1722	906	876	0	52627	0	56131	195632	28.7
1998	2800	1000	1100	0	53800	0	58700	212900	27.6
1999	2821	1513	1654	0	41304	0	47292	186338	25.4
2000	5786	1819	1876	015	16812	2200	28508	173149	16.5
2001	5444	1396	861	200	28153	1519	37573	18559	20.2
2002	5669	1925	1231	0	23371	2500	34696	171810	20.2
2003	5879	2452	1313	0	41315	5078	56037	195128	28.7
2004	5307	2682	1271	0	24998	7562	41820	177099	23.6
2005	6289	3037	1992	0	30571	4045	45934	158297	29
2006	6162	1648	1691	479	25817	2931	38728	151312	25.6
2007	4788	3072	2126	482	19592	2791	32851	144033	22.7
2008	4473	3184	2055	403	29713	3184	43012	157884	27.2
2009	4383	3287	2191	788	30681	2849	44179	154252	28.6
2010	3966	3903	2494	1060	27418	2483	41324	175656	23.5
2011	4197	4025	2599	1471	28392	2591	43275	184335	23.5
Average Period	4215.5	3346.2	2166.69	940.44	30272.7	3373.7	43333.1		
% of General Average	9.73	7.72	5.0	0.22	69.85	7.68	100		

Source: - collected and counted from data from the Ministry of Agriculture and Land Reclamation, the General Authority for Fish Wealth Development, statistics bulletin of fish production – different versions.

Central Agency for Public Mobilization and Statistics - the study of fish wealth during the period (1998 -2011), in April 2012.

The average annual production of both Morra and Tamsah, Karoun, Rayyan Lakes, water of the New Valley, the High dam Lake (Naser) and Toshka Spillway is estimated at about 4.2,3.3,2.2,0.9,30.2 and 3.4, thousand tons, respectively, which represents about 9.7%, 7.7 % 0.5%, 0.22%, 69.9% and 7.6%, respectively, and the rate of change is decreasing not statistically significant at the Morra and Tamsah Lake as shown in Table

(2). It could be argued that the High Dam Lake, despite the many problems in it, it contributes by about 69.9% of the total inland lakes, followed by Morra and Tamsah, Toshka spillway, Karoun, Rayyan, and finally the water in the New Valley.

*Fifth: The development of fish production of inland waters:*

It is shown in Table (1) that the area of fisheries of the Nile River and its branches is estimated at about 187 thousand feddans representing about 1.37% of the total area of Egyptian fisheries, with an average production of about 82.18 thousand tons representing about 8.3% of the average total production of Egyptian fisheries with an average productivity of about 439.5 kg / feddan during the period (2004-2011).

It is clear from Table (6) that the average annual production of the Nile River of fish during the period (1995-2011) amounted to about 102.9 thousand tons, representing about 31.9% of the general annual average of total production of Egyptian fisheries between a minimum of about 57.9 thousand tons in 1995 and a maximum of about 131.1 thousand tons in 2011 and it can be seen from the results that the High Dam Lake, despite the many problems of it, it contributes by about 69.9% of the total production of inland lakes, followed by Morra and Tamsah Lake, Qaroun, Toshka spillway, Rayyan, and finally water in new Valley by about 9.7%, 7.7%, 7.6% 0.5% and 0.22%, respectively. The estimated directional relationship in Table (2) indicates that the annual growth rate of the Nile River is estimated at about 27.9% during the period (1995-2011), and studying the results proves that despite the relative stability of the area of the Nile, the production decreased in the last years,. The relative importance of production in the period (2001-2003) has been about 15%, but during the period (2004-2008) it became about 10% reflecting the obvious decline in production, as well as feddan productivity that has decreased obviously due to the stability of area and the decreasing production.

*Sixth: the economic importance of the production of fish farms:*

Because of rise of risk element and uncertainty in natural fisheries and because fish has a special nature ( the speed of transition and movement ) as well as the inability to control the feed and items in estimating the quantity that can be caught, all of this stuff has encouraged the trend to aquaculture where they can largely control the amount, type and size of the output by the intervention of the human element . Aquaculture is considered one of recent activities as its obvious contribution to production has begun in the late eighties and early nineties and that was because of varied graded degrees of experimental levels of pilot did not reach the level of trade, then they turned into contributions that represent a large proportion of the total fish output, exceeding 60% currently.

**Table 6:** The development of the total fish production in tons and the most important varieties of the Nile River during the period (1995-2011).

Years	Basaria	Bolti	Baiad	Chilan	Karamit	Keshr Biad	Mabrouk	Total *	% of the Total Production of Egyptian Lakes
1995	908	21914	5390	1799	10755	840	349	57873	31.03
1996	875	25504	5826	1715	11310	795	434	64403	36.47
1997	935	26402	273	5902	12317	787	3603	65535	33.49
1998	3559	26566	201	5723	11613	1223	218	68252	32.05
1999	1058	27260	5665	1777	10951	1248	1592	6398	0.30
2000	1731	30885	8395	2563	14486	1671	11142	80321	3.43
2001	3657	32955	15472	3923	23215	3745	14550	109887	63.46
2002	4843	33854	19026	5494	25439	4265	16480	120852	65.4
2003	4305	28881	16437	5985	25158	7481	18054	1183	0.8
2004	2036	36290	10228	1843	12992	8453	23712	105	0.05
2005	1745	27874	790	1454	13422	2917	22317	83803	5.42
2006	4205	34187	11952	2038	15532	5939	19435	104976	52.9
2007	6881	30198	6668	1843	15295	4536	21629	9771	0.67
2008	4431	24256	5647	1903	14685	3982	16911	79688	5.04
2009	5046	46546	7468	1887	26779	3686	19135	10732	71.7
2010	5661	68736	9289	1871	38873	3391	21360	119181	67.8
2011	5753	72514	8643	1770	29199	3455	22980	131141	71.14
Average Period	4213.6	45835	8349.5	2167.1	27590.7	3362.7	16669.1	102922	31.85
% of General Average	4.1	41.51	7.11	2.11	24.80	5.32	15.05	100	

\* The total fish production of the Nile River includes other varieties in addition to the mentioned varieties including (Olney, Boriy, Hachan Lobace) representing 15.05% of production, and the total fisheries production of fish has reached about 1,304,794 tons.

Source: - collected and counted from data from the Ministry of Agriculture and Land Reclamation - General Authority for Fish Wealth Development, statistics bulletin of fish production – different versions.

It is shown in Table (1) that the area of fish farms is estimated at about 377 thousand feddans representing about 2.8% of the total area of Egyptian fisheries, and the annual average production of fish from aquaculture is

estimated by about 610.3 thousand tons, representing 61.4% of the annual average of total production of Egyptian fisheries, with average productivity of about 1619.3 kg / feddan during the same period.

It is shown from Table (7) that the annual average production of fish farms during the study period (1995-2011) was estimated at 584.1 thousand tons, representing about 42% of the general average of the total fish production of the total local production of Egyptian fisheries, between a minimum of about 61.8 thousand tons in 1995 and a maximum of about 878 thousand tons in 2011 as it is referred to by the estimated directional relationship.

It is shown in Table (2) that the annual growth rate for aquaculture is estimated at about 66 % during the study period and because the production of fish farms can be controlled in terms of varieties, nutrition and sizes as well as breeding of some species in a manner of intensive farming. Aquaculture in Egypt has achieved a big rise in production that increased total fish production of the different fisheries at an increasing rate, in spite of the low production of some natural fisheries and deterioration of others. However, some of the negatives of aquaculture should be taken into consideration because of its importance and because of its negative impact on the environment and also on consumers and the negatives are:

- (1) Use of hormones and growth promoters to change sex and increase the efficiency of growth.
- (2) The water is the limit of environmental determinants, it can be difficult to take into account the required rates to change the water and thus increase the waste solid materials in the water and lack of oxygen.
- (3) Extensive use of feed to increase production, which increases the organic element in the water, reduces the quality and leads to increase nitrogen and phosphorus. Thus, the country must be directed to aquaculture because it became the target because of its great importance, including the production of fish free of contaminants and growth factors that affect human health.

**Table 7:** The development of the total production of fish farms in tons and their relative importance during the period (1995-2011).

Years	Total Production of Aquaculture	% of the Total Local Production
1995	61815	15.18
1996	75837	17.57
1997	73454	17.08
1998	139389	25.55
1999	226276	34.87
2000	340093	46.97
2001	432863	56.07
2002	376296	46.98
2003	445181	50.82
2004	471535	54.51
2005	539747	60.71
2006	595029	61.28
2007	635517	63.05
2008	693815	64.96
2009	712227	64.99
2010	819585	72.01
2011	878431	74.40
Average Period	584094.9	42.12

Source: - collected and counted from data from the Ministry of Agriculture and Land Reclamation - General Authority for Fish Wealth Development, statistics bulletin of fish production – different versions

#### *Sixth: The food gap and the self-sufficiency rate of Fish:*

It is shown from Table (8) that the local production of fish has increased from about 407 thousand tons in 1995 to about 1.22 million tons in 2012 with an annual average during the study period that is estimated at about 107.4 thousand tons, and with an annual growth rate that is significant statistically of about 9.8% of the annual average as shown in Table (2), while imports declined from about 141.7 thousand tons in 1995 to about 137 thousand tons in 2008 and have increased to about 257 thousand tons in 2012 with an annual average of about 228.52 thousand tons, and it is shown in Table (2) that the annual growth rate that is not significant statistically is estimated at 1.4% table (8) indicates that the Egyptian exports of fish increased from about 0.9 thousand tons in 1995 to about 7.2 thousand tons in 2012 with an annual average during the study period that is estimated at about 5.2% and with an annual growth rate that is significant statistically, of about 6.1% of the average annual as shown by table (2), while the amount available for consumption has increased obviously from 548 thousand tons in 1995 to about 1.4 million tons in 2012, while the average per capita of fish increased from about 9 kg per capita / year in 1995 to about 16.6 kg per capita / year in 2009, and decreased to about 15.7 kg per capita / year in 2012. It is shown from Table (2) that the annual growth rate that is significant statistically amounted to about 2.7%. It is clear from Table (8) the decline of the size of the food gap of fish during the study period from about 140.8 thousand tons in 1995 to about 129.7 thousand tons in 2008 and it has increased to about 163.8 in 2012 with an annual average during the study period of about 169.2 thousand tons and an annual growth rate that is not significant statistically of about 2.8% as shown by the table (2).



**Table 8:** The development of production, available for consumption, the rate of self-sufficiency and the average per capita of fish during the period (1995-2012).

Years	Local Production (In Thousand Ton)1	Imports (In Thousand Ton)2	Exports (In Thousand Ton)3	Available for Consumption (In Thousand Ton)4	Population (In Thousand People)	Self-sufficiency Rate 1/4	Average Per Capita	% Gap to Consumption (In Thousand Ton)1-4
1995	407.1	141.7	0.93	547.9	60236	74.3	9.1	140.8
1996	431.6	144.1	0.58	575.2	59313	75.1	9.7	143.2
1997	430.1	107.4	2.23	635.2	60702	67.7	10.5	205.1
1998	545.6	176.3	2.14	719.7	61341	75.8	11.6	174.2
1999	649.0	193.2	0.69	841.4	62639	77.1	13.3	192.5
2000	724.0	214.6	0.96	935.7	6976	77.2	14.5	211.7
2001	772.0	261.4	1.22	1031.3	65336	74.8	15.8	259.3
2002	801.1	154.4	2.6	953.2	66668	84.1	14.3	152.2
2003	876.0	163.0	3.1	1035.9	67976	84.6	15.2	159.9
2004	865.0	221.0	1.9	1083.9	69330	79.8	15.6	218.9
2005	889.0	188.5	5.1	1072.4	69997	82.9	15.3	183.4
2006	971.0	208.0	4.0	1174.4	70653	82.7	16.6	203.4
2007	1008.0	259.0	4.4	1262.5	74357	79.8	16.9	254.5
2008	1068.0	137.0	6.7	1197.7	75097	89.1	15.9	129.7
2009	1092.5	220.0	4.2	1251.9	79225	86.7	16.6	159.4
2010	1130.6	230.0	5.5	1365.1	82050	86.6	15.5	174.5
2011	1181.1	245.0	6.8	1342.1	85760	88.1	15.6	161.0
2012	1221.3	257.0	7.2	1385.1	87560	88.2	15.7	163.8
Average Period	1074.20	228.52	5.26	1243.50	80170.7	85.70	15.51	169.29

Source: - Collected and counted from data of the Ministry of Agriculture and Land Reclamation - General Authority for Developing Fish Wealth, statistics bulletin of fish production – different versions. - Central Agency for Public Mobilization and Statistics - the study of fish wealth during the period (1998-2012) - April 2013.

Self-sufficiency rate = the amount of local production / amount available for consumption 1/4.

It is clear from the results that, despite the relative stability of the areas of fisheries and low fish production from natural fisheries, fish production has recently increased markedly, this increase is due to aquaculture, which accounts for about 60-65% of the local production. Despite this increase, the local production still does not meet the needs of consumption and consequently there has been a food gap of fish, but the rate of self-sufficiency has increased despite the lack of substantial increase in the imports in terms ranged between 74.3%, 89.1% during the study period, while the value of export quantity has increased and the average consumption per capita has declined from about 16.6 kg per capita / year in 2009 to about 15.7 kg per capita / year in 2012 and self-sufficiency in fish in Egypt can be achieved through directing attention to aquaculture in Alajonat and Khairan at Mediterranean Sea and the Red Sea, and there are successful experiences for the cultivation of Al - lot and Keshr -El Biad in the Mediterranean Sea, west of Alexandria and in the Governorates of Kafr El-Sheikh and Damietta.

#### Abstract:

The sector of fish wealth in Egypt is considered a main factor of food security , social and economic development as it contributes in providing animal protein as red meat have many different obstacles before its development.

The sector of fish wealth has contributed in the national agricultural income by about 11.1 billion pounds that is equivalent to 7.5% of the national agricultural income while the necessary expenses for fish production in the same year is about 935 million pounds that is equivalent to 2.6% of the necessary expenses of agricultural production. Therefore, the net contribution of fish wealth in the national agricultural income is about 8.9 % , in spite of the variety of fish wealth in Egypt, seas, lakes, fresh water and fish aquaculture. However, the different pressures for the provision of animal protein, including fish should not be a justification for a production policy that is not accepted environmentally which leads to the over-exploitation of fish resources and thus weakens their production capacity in some cases. The results have reached that fisheries in general have increased during the study period, 1995- 2011, but this increase does not suit the huge area of fisheries which is about 82.7% of the area of Egyptian fisheries while production does not exceed 14% of the total production of Egyptian fisheries and their annual growth rate is about 13.4%. For the northern lakes, the study has shown that there is a general increase in the area of northern lakes and this increase, is estimated at about 12% of the area, while the production represents about 72.9% of the total production of Egyptian lakes during the study period. There was a remarkable increase in the average feddan productivity despite the low area of the northern lakes, as well as excessive fishing effort and widespread pollution in lakes. The results show that most of the production of coastal lowlands comes from Bardaweel Lake and its production represents about 95% of the total fish production which is also characterized by a high growth rate estimated at about 6.7% in the Egyptian lakes, while relative importance of navigation in Port fuaad very low and the area of inland lakes represents about

10.3% of the area of Egyptian fisheries and production represents about 4.4 of the Egyptian fisheries production during the period 2004-2011. The lake of High Dam is considered one of the most important inland lakes as it contributes by about 69.8% of the average production of inland lakes during the study period. The area of the Nile represents about 1.4 of the total area of Egyptian fisheries by production average of about 82.1 thousand tons which represents about 12% of the general average and with an annual growth rate of about 27.9%. Because the production of fish farms can be controlled in terms of varieties, nutrition and sizes, along with breeding some varieties by intensive farming systems, aquaculture has achieved in Egypt a big jump in the total production of the different fisheries at an increasing rate despite the decline in production of some fisheries and the deterioration of others as the average of annual production is estimated of about thousand tons 284 from farming representing about 42.1% of the general average for the total production of the different fisheries with an annual growth rate estimated at about 19.2% during the study period (1995-2011).

Finally, despite the relative stability of the areas of fisheries and low fish production from natural fisheries, fish production has recently increased markedly and the increase is due to aquaculture, which accounts for a great percentage of the local production. Despite this increase, the local production still does not meet the needs of consumption and consequently there has been a food gap of fish, but the rate of self-sufficiency has increased, despite the lack of substantial increase in the imports, in terms ranged between 74.3% in 1995 and 88.2% in 2012, while the value of export quantity has increased by about 257 thousand tons in 2012 and the average consumption per capita of fish has declined to about 15.7 kg per capita / year in 2012.

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