What are the Economic Characteristics of Fish Farming Ponds in Southern Sidi-Salem District (Kafr El-Sheik Governorate)?

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Abstract: The study explores socio economic characteristics for fish farming sector in southern Sidi Salem district, Kafr El-Sheik governorate and access the factors affecting net farm income. To reach the paper's goal, a questionnaire was designed to collect primary data for study analysis. The results show that net farm income was significantly influenced by level of productivity, feed cost, labor cost, fixed cost farm area, and grower's age. The most common problems face fish growers (according to its relative frequency) are; the high feed cost, high cost of fry, quality of fry, diversity of fish species, unavailability of fuel in addition to its high prices, increasing land rent by either government or private sector, fish prices fluctuations, lack of capital and finance supplied by Principal bank of Development and Agricultural Credit, lack of security due to relatively short lease contracts, using drainage water and lack of export channels.
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1.Introduction

The fishery sector plays a key role in food security, not only for subsistence and small-scale fishers who rely directly on fishery for food, incomes and services, but also for consumers who profit from an excellent source of affordable high-quality animal protein. In 2009, fish accounted for 15.7 percent of the global population's intake of animal protein and 6.1 percent of all protein consumed. Globally, fish provides more than 1.5 billion people with almost 20 percent of their average per capita intake of animal protein, and 3.0 billion people with 15 percent of such protein (FAO, 2010).

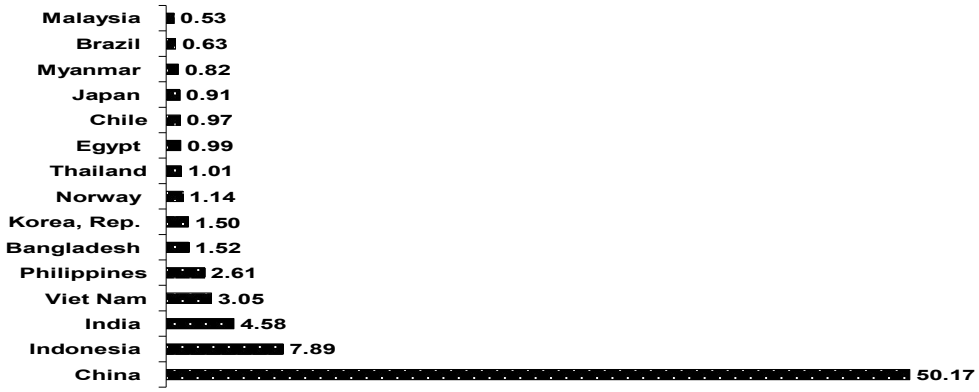
Global markets for fish and fishery products are expanding, representing a growing source of foreign currency earnings for many developing countries. In 2008, world exports of fish and fishery products reached about US $102 billion, recording an increment of 9% compared to 2007. Despite a dip in 2009 (when food prices soared), data for 2010 indicate that fish trade recovered - and the long-term forecast remains positive, with a growing share of fish production entering international markets(FAO, 2010).

Owing to Macfadyen *et al.* (2011) and (2012), aquaculture is the fastest growing animal food-producing sector in the world, and continues to outpace population growth, with per capita supply from aquaculture increasing from 0.7 kg in 1970 to 7.8 kg in 2008, an average annual growth rate of 6.6 percent. It has already overtaken capture fisheries as the main source of food fish. While aquaculture production (excluding aquatic plants) was less than 1 million ton per year in the early 1950s, production in 2008 was 52.5 million ton, with a value of US$98.4 billion.

Figure 1 shows the world ranking for top aquaculture producers in 2011. It depicts that China is ranked the first (about 50 million ton), followed by Indonesia (7.9 million ton), India (4.6 million ton), Viet Nam (3 million ton), Philippines (2.6 million ton), Bangladesh and Korea Republic (1.5 million ton on average). Then comes Norway, Thailand, Egypt, Chile and Japan (1 million ton on average), Myanmar (0.8 million ton) and finally Brazil and Malaysia (0.58 million ton on average).

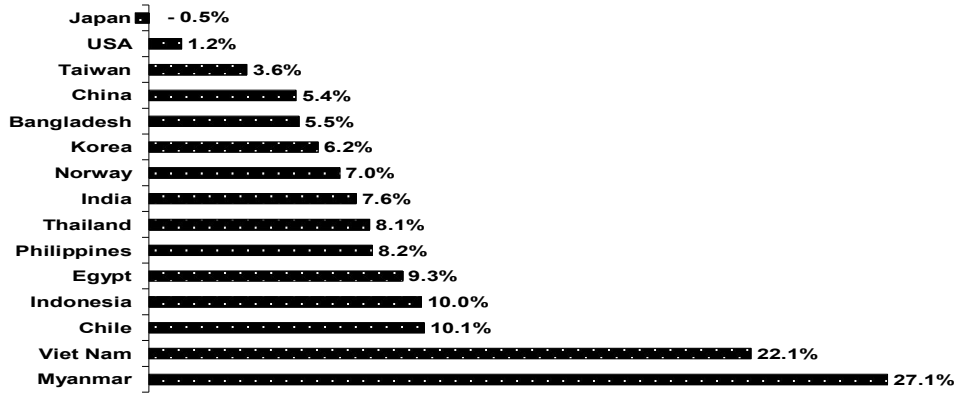
Moreover, Figure 1A shows that all top 15 aquaculture producers (except for Japan) achieved positive annual growth rate through out the period 2000-2010. Myanmar reached the highest annual growth rate (27%) followed by Viet Nam (22.1%), Chile and Indonesia (10% on average). Then Egypt comes the fifth (9.3%) followed by Philippines and Thailand (8%) , India and Norway (7.3% on average), Korea (6.2%), Bangladesh and China (5.3% on average), Taiwan (3.6%), United States of America (1.2%) and finally, Japan reached a negative annual growth rate estimated at – 0.5%

The paper is structured as follows. The next section briefly discusses the aim of the paper. Data collection is the subject of part three. The forth section is devoted to give a background on fish farming in Egypt. Methodology is the main topic for section five. The sixth section discusses the estimated results. Section seven addresses the main difficulties reported by fish farmers. The eighth and last section is devoted to conclusion.



Source: FAO Fish Stat 2013

Figure (1): Production For Top 15 Aquaculture Producers In 2011 (Million Ton)



Source: FAO online statistics

Figure (1A): Average Annual Rate of Growth For Top 15 Aquaculture Producers during the period (2000-2010)

2.Aim of the Paper

The objective of this paper is to explore socio-economic factors for sampled fish farms and determine factors influencing net farm income. In addition, to address the difficulties facing such sector and finally to introduce some suggestions to enhance and encourage the fish farming sector. However, Kafr El sheik governorate is selected for this study relying on the fact that it is considered one of the main and important fish farming producing areas all over Egypt.

3.Data

Primary data was mainly collected from southern Sidi Salem district using a questionnaire. Due to cost limitations, only eighty-five questionnaires (In case of applying Krejcie model for determining, the sample size needed to be representative of a given population of 704 fish farms, the result would be 248 sample. A close result could also be obtained if the technique of sample size calculator is to be applied.) were administered during June and July 2013. However, seventy-five copies of the returned questionnaire were found useful and there after utilized to extract data for analysis. It is worth mentioning that production and financial data collected is limited to pond farming. However, data was collected on respondent's socio-economic variables such as age, educational level, fish farming experience, cost of feed, farm area and operational costs. Moreover, quantities and unit prices of output were also obtained for the determination of net farm income.

Secondary sources of data were mainly obtained from Central Agency for Public Mobilization and Statistics (CAMPS), FAO Fisheries statistics, general authority for fish resources development (GAFRD} publications and the world fish center. However, the majority of interviewed fish farms found that they produce and sell a mix of fish species, dominated by tilapia (90%), in addition to 7.5% for mullet, 2% for catfish, and 0.5% for carp.

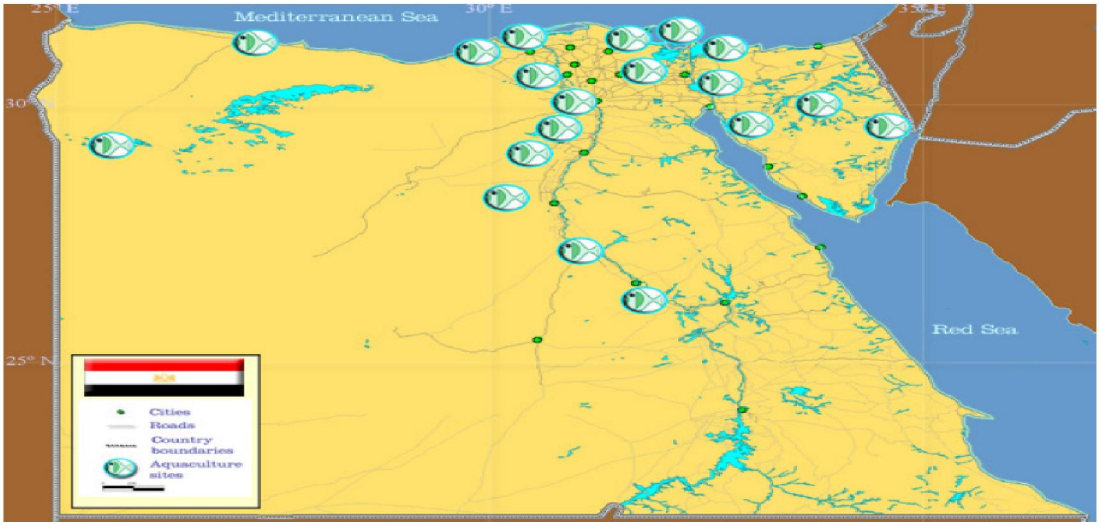
4.Fish Farming in Egypt

4.1 A General Overview

Egypt's aquaculture production (1379 thousand ton in 2012) representing a total market value of US$ 1,746 million is by far the highest of any African country that ranked the 11th in terms of global production. The aquaculture sector makes a significant contribution to income, employment creation and food security in the country, all of which are national priority areas given low per capita income levels, rising population (Egypt recorded the 15th largest population in the world (84.6 million in 2010), the largest population in the Arab region, and the third largest population in Africa, growing at a constant rate of about 1.48 million per year, Macfadyen, 2011) worsening food security indicators, and official unemployment levels that have remained at around 10% for the last ten years.

The main sources of fish production in Egypt are marine fisheries, inland fisheries in lakes, lagoons, the Nile River, irrigation and drainage canals, and aquaculture. In 2010, pond culture farms (occupying 382 thousand feddan) produced about 84.75% of total aquaculture production, whereas cage culture (9.64%), rice field culture (5.34%) and only 0.26% was produced from intensive culture (10-12 kg/m3). Moreover, aquaculture production is strongly concentrated in low-lying land around the northern lakes (Manzala, Brulous, Edko and Maryout). According to official statistics, tilapia accounted for 55.5% by volume of aquaculture production in 2010, mullets 29.9%, carp 10.5%, African catfish 2.5%, and European seabass and gilthead seabream 1.5%. However, fish ponds accounts for 85% of the total Egyptian aquaculture production.

Except for a very limited number of isolated instances, most aquaculture activities are located in the Nile Delta Region and concentrated mainly in the Northern Lakes areas. Aquaculture is practiced using a variety of systems with varying levels of technology. So far the majority of farmed fish are either freshwater species or those that can grow in brackish water. The production of fish and crustaceans in marine water is still in its early stages and its development is still influenced by technical and economical problems.



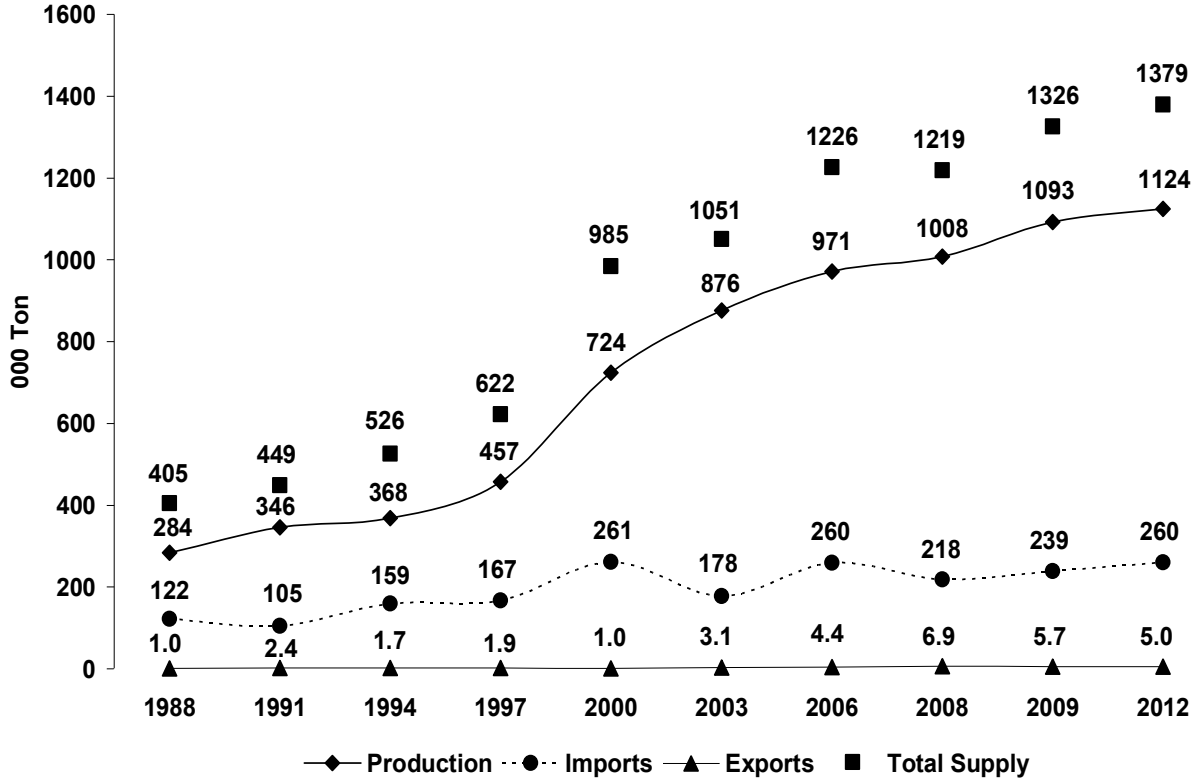
Source: Naziri (2011)
Figure (2): Main Aquaculture cites In Egypt

Naziri, (2011) argued that, aquaculture in Egypt exhibits a strongly seasonal pattern, due to seasonal temperature variations affecting fish growth and survival (e.g., tilapia), and due to the reliance on wild fry for marine species, which are available only on a seasonal basis (e.g., mullet). Accordingly, most of the annual production from farms arrives on the market within a short period. Most fish produced in Egypt are landed, distributed and consumed in fresh form. The processing industry is still in its infant phase

Figure (3) depicts that in spite of the significant and historic growth in production that increased from 284 thousand ton in 1988 to 876 thousand ton in 2003 and further to 1124 thousand ton in 2012, Egypt is not self sufficient and it is a net importer of fish products.

Throughout the period 1988 to 2000, fish imports increased by 114% (increasing from 122 thousand ton in 1988 to about 261 thousand ton in 200). Meanwhile, imports figures show its stability around 321 thousand ton (on average) during the period 2003-2012. This is presumably due to the fast growth in local production as discussed earlier.

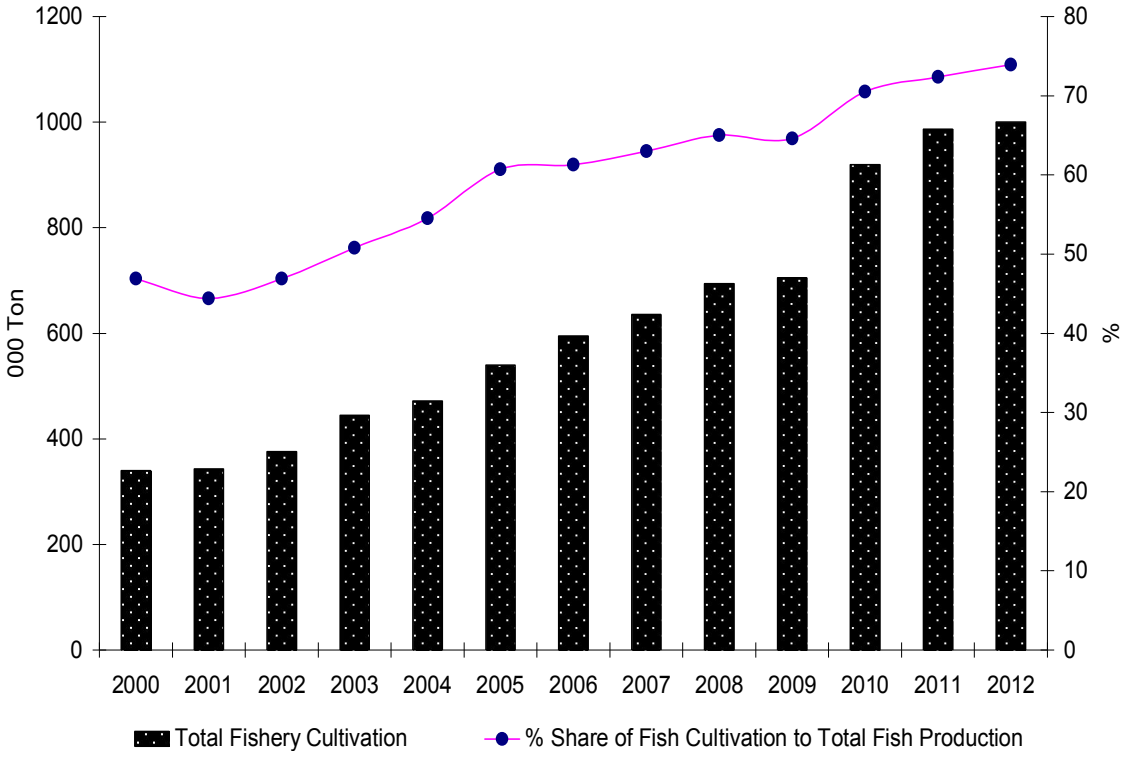
Consequently, the total supply of fish has doubled throughout the period 1988-2000 to about 985 thousand ton, and increased further to 1379 thousand ton in 2012. This strong growth reflected in annual per capita consumption during the same period: from 8.5 to 17 kg.



Source: compiled from MALR fishery statistics and CAMPS online statistics
Figure (3): Production , Imports, Exports and Total Supply of Fish Production during the period 1988- 2012

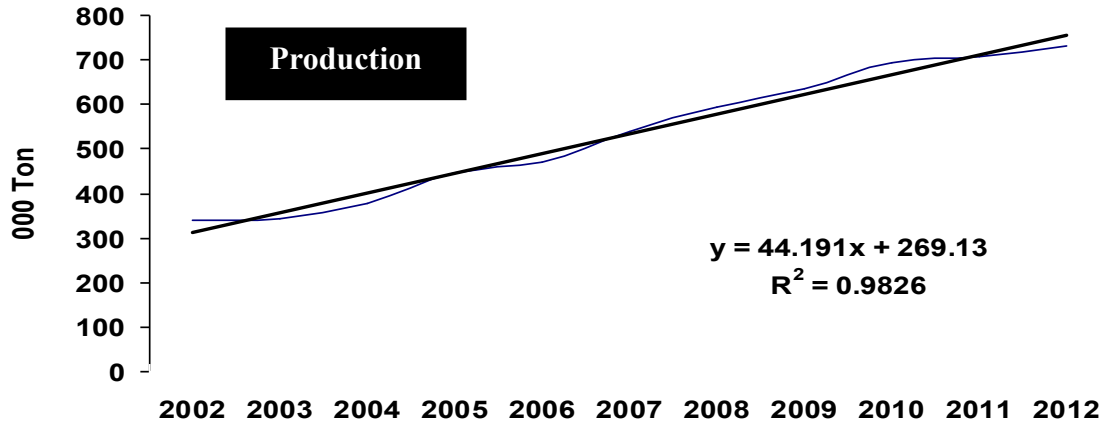
Figure 4 shows that the total fishery cultivation in Egypt has increased in general throughout the period 2000-2012. It increased from 340 thousand ton in 2000 to about 540 thousand ton in 2005 and further to 920 thousand ton and 987 thousand ton in 2011 and 2012 respectively.

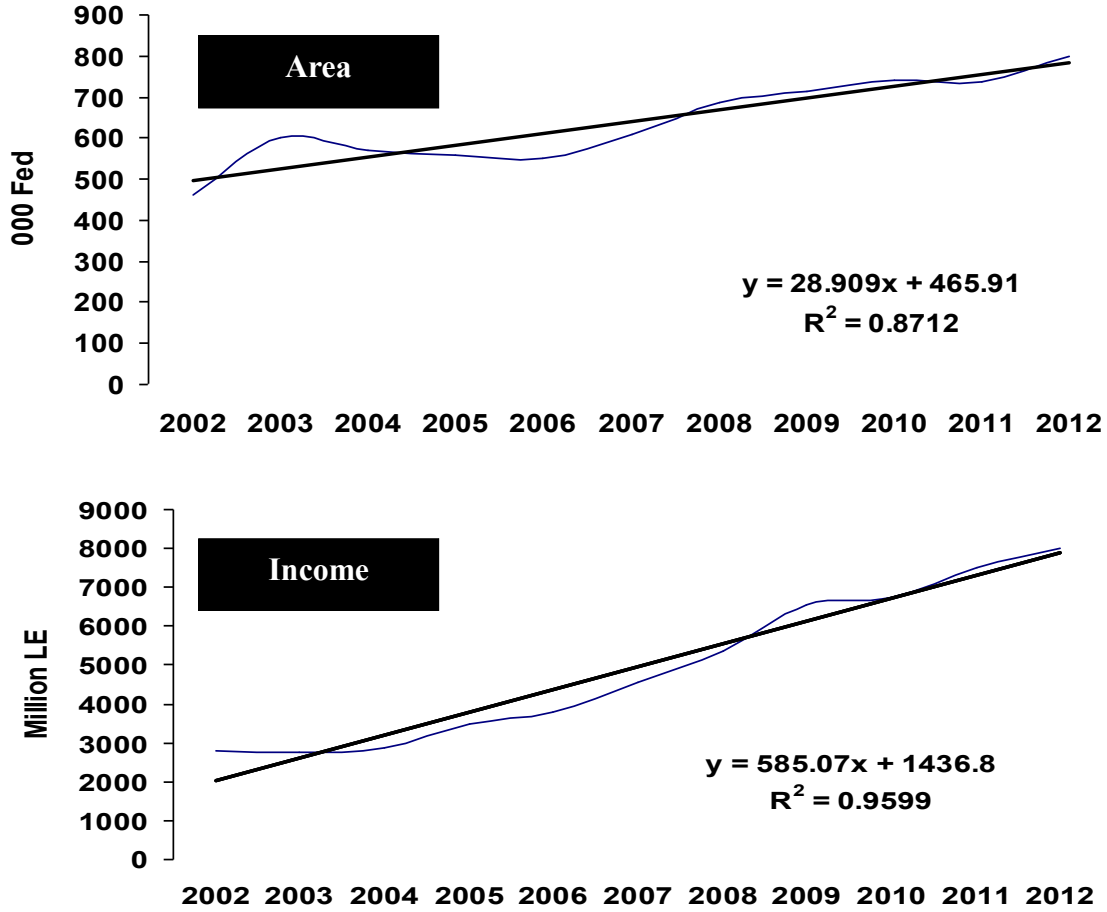
Moreover, this dramatic increase in total fishery cultivation mirrors the increment in the share of fish cultivation to total fish production. Table 4 depicts that this share has increased from 47% in 2000 to about 71% in 2005 and further to 73% in 2012.



Source: CAMPS online statistics
Figure (4): Total Fishery Cultivation and Percentage Share of Cultivation to Total Fish Production through out the period 2000-2010

Figure 5 and Table 1 indicate that fish cultivation production and area in Egypt has increased over the available set of data. For example, fish cultivation production has nearly doubled over the period 2002-2012, in which, increased from 343 thousand ton in 2002 to about 540 thousand ton in 2006 and further to 694 and 730 ton in 2010 and 2012 respectively, with an annual growth rate of 8.6%. Similarly, fish cultivated area nearly doubled from about 463 thousand feddan in 2001 to about 799 in 2011. Notably, all coefficients are statistically significant at the 1 % level of significance.





Source: author calculations (*MicroFit 4* computer results)
Figure (5): Fish Cultivation Production, Area and Income during the period 2002-2012

Table (1): Trends of Fish Cultivation Production, Area and Income in Egypt through the period 2002-2012

Coefficients			*SE*	*T ratio*	*P value*	*F (Calculated)*
Production	**α**	**296.13****	**1.96**	**22.57**	**0.000**	**509.55****
	β	**44.19****	**13.28**	**20.27**	**0.000**	
	R^2	**0.98**				
Area	**α**	**465.91****	**25.13**	**18.54**	**0.000**	**60.87****
	β	**28.91****	**3.71**	**7.80**	**0.000**	
	R^2	**0.87**				
Income	**α**	**1436.8****	**270.5**	**5.3**	**0.000**	**215.2****
	β	**585.1****	**39.89**	**14.7**	**0.000**	
	R^2	**0.95**				

Source: Calculated from MALR Fishery Statistics

4.2 Fish Production Systems Operating in Egypt.

As cited by Naziri (2011) and Rothuis (2013), it is possible to identify the following operation systems:

- *Traditional extensive farming system*:

It is characterized by low level of intervention, limited use of inputs, low capital investment and poor management. These farms were constructed by reinforcing embankments of natural enclosures, like lagoons, rivers and lakes. The size of these enclosures (hosha) varies from 2 to 50 feddan. Fish (mainly tilapia) are trapped in the hosha and rely on natural food. The net yield from these systems is low and varies from 100 to 300 Kg/feddan. This practice has recently been prohibited, because of the destructive effects on lake fisheries and the environment. However, hosha culture is still illegally practiced in

some areas and the production from these systems is generally not captured in aquaculture production statistics (El-Sayed, 2007).

- ***Semi-intensive fish culture in earthen ponds*:**

It is, by far, the most important farming system in Egypt. Semi-intensive pond aquaculture is the basic system used in the country and about 89% of aquaculture production is obtained from these systems. Most of the farms are located in the northern and eastern parts of the Nile Delta where they utilize both brackish and freshwater. Fishponds vary in size from 1 to 25 feddan. Poly-culture is the most common type of production but monoculture of Nile tilapia is also practiced in many areas. The stocking densities, energy input, level of management as well as the size and type of infrastructure vary greatly among different farms (El-Sayed, 2007). Annual production in semi-intensive systems varies from 2 to 10 ton/feddan (7-12 months). A typically farming cycle starts in January; meanwhile, the grow-out ponds are stocked in March-April and harvested from September – November.

It is worthwhile mentioning that in the semi-intensive systems about 80% of the land is actually occupied by the ponds, the rest being taken by canals and roads. In the case of production in tanks, only half of the area is occupied by the tanks themselves, while the remaining area is taken by roads and space among the tanks (usually they have a round shape).

- ***Intensive cage culture*:**

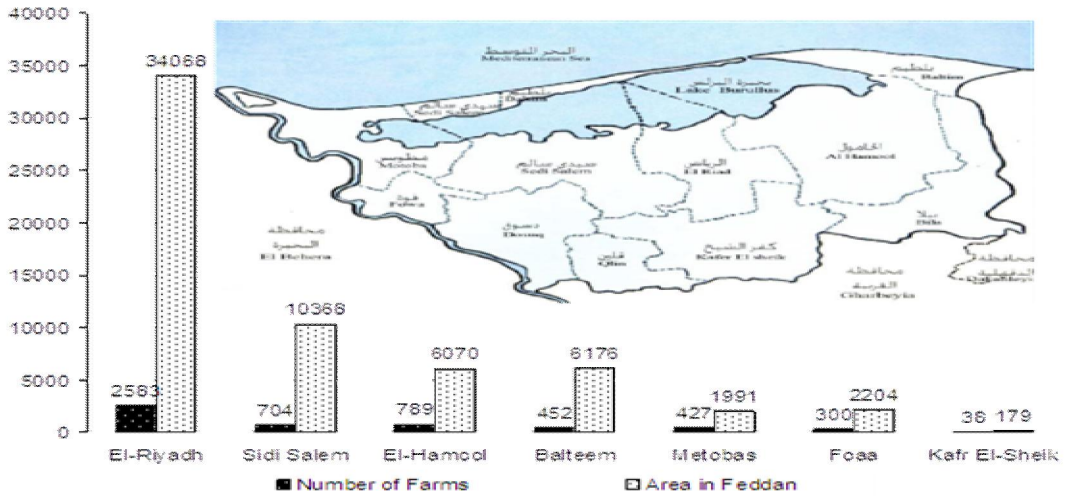
It is rapidly developing and now contributes to around 10% of total aquaculture production. Nile tilapia is the principal cage culture species. The sizes of the cages vary from small cages of around 32 m^3 to larger cages of around 600 m^3. Smaller cages (2–4 m^3) suspended in drainage canals are also used in rural areas. The yield varies between 5 to 25 Kg/m^3 (El-Sayed, 2007).

- ***Intensive pond culture*:**

It is another rapidly developing sector during the last ten years. Concrete tanks are used within integrated aquaculture and desert agriculture systems. This type of production is gaining an increasing acceptance as a result of the high rate of return on the utilization of water. The total number of registered farms is currently 530 with an annual production of 6,300 ton, 0.9% of total production (FAO, 2010) Nile tilapia (mainly monosex) is the major cultured species. Annual production ranges from 4 to 6 ton/feddan

4.3 Study Area: Kafr El-Sheik

Kafr El-Sheikh governorate is located in the Delta Region that encompasses Gharbeyia, Behera, Dakhleyia and Damiett governorates. It composes of 10 main districts, where fish farming sector is considered one of the main sectors that dominates the economic activity. Table (6) shows the numbers and areas of (licensed) fish farms in Kafr El-Sheikh governorate. It depicts that, El-Riyadh district is ranked the first (interms of Farm numbers and areas devoted to fish farming) followed by Sidi Salem , El Hamool, Balteem, Metobas Foa and Kafr El Sheikh.



Source: Compiled from Kafr El Sheik official website

Figure (6): Numbers and Area of Fish Farms in Kafr El-Sheik Districts

5.Methodology

In line with El-Naggar (2005), Adewuyi (2010), Ugwumba *et al.* (2010), Ugwumba (2011), Dagtekin *et al.* (2012) ,Ele *et al.* (2013) and Olaoye *et al.* (2013), the multiple regressions were used to determine the influence of the socio-economic factors

on net farm income. The paper applied three functional forms on the data (linear, semi-log and double log). However, a stepwise regression analysis was applied and the results indicate that the linear form was found to fit the data best. Thus, the regression model could be represented as:

$NFI = \alpha + \beta_1 Prod + \beta_2 Area + \beta_3 Feed\ Cost + \beta_4 Labor\ Cost + \beta_5 Fixed\ Cost + \beta_6 Education + \beta_7 Age + e$

Where:

NFI = Net Farm Income (in LE)

Prod = Production of Fish (in ton)

Area = Area of Fish Farm (in feddan)

Feed Cost = Feed Cost (in LE)

Fixed Cost = Fixed Cost (including government licenses, repair and maintenance costs and rents paid for land) in LE

Labor Cost = Labor Cost (in LE)

Age =Age of Fish Farmer (in years)

Education = Educational Level (Dummy: literate = 1, Illiterate = 0)

However, the paper expects that the above-mentioned variables may influence the net farm income as follows:

- Higher levels of production (yield) is expected to have positive effect on net farm income
- The impact of area is expected to be dubious. In other words, it could be expected to have a positive or negative effect on net farm income. the greater the farm fish area the more likely to benefit more from scale of economies, thus, a positive impact on net farm income. On the other hand, in case of the lack of a good management it might have no effect on net farm income.
- Feed, labor and fixed costs are expected to have negative effect on net farm income. Simply, fish farms with higher costs would result lower net farm income assuming the dominance of the same production technologies and practices among fish farms
- Producer's age could be expected to have a positive effect on the level of net farm income, assuming that older farmers are likely to earn more experience and consequently more farm income than the younger ones. In other words, the less experienced farmers are likely to have less net farm income.
- Education is expected to have positive effect on the level of net farm income. That is, the educated farmers are associated with higher values for maximizing net farm income.

6.Results

6.1 Socio-Economic Statistics of Respondents

Table (2) shows the Min, Max, mean and standard deviation estimates for the survey's socio-economic statistics. It depicts that (on average); a typical fish grower aged about 45 years and gained about 20 years of experience in fish farming enterprising. Cultivated around 23 feddan and spent a mean value of 30643 LE/Fed, 691 LE/Fed and 5297 LE/Fed for feed cost, labor cost and others cost (including fertilizer, power, transport, ice, sales commission paid to traders/wholesalers) respectively. Moreover, each grower produced (on average) about 3.66 ton/fed and yielded an average net income around 7995 LE/Fed. Finally, the sample revealed that the literacy rate is about 44%.

Table (2): Basic Socio Economic Statistics of Fish Farm Growers and Production in -Sidi Salem- Kafe El Sheik Governorate in 2013 (n=75)

Variable	Min	Max	Mean	±SD
Production (Kg/Fed)	3600.00	3800.00	3662.67	56.41
Farm Area (Fed)	15.00	30.00	22.64	4.34
Age (Years)	33.00	65.00	44.60	9.41
Experience (Years)	15.00	30.00	19.67	6.24
Education	**Illiteracy rate:56%**			
Variable Cost (LE/Fed)	29700.00	35000.00	30642.99	1234.35
Feed Cost (LE/Fed)	23917.38	28185.47	24655.07	994.02
Labor Cost (LE/Fed)	650.00	700.00	691.07	17.83
Others (LE/Fed)	5121.00	6115.00	5296.85	234.96
Fixed Costs(LE/Fed)	2350.00	2500.00	2410.00	56.95
Average Total Costs (LE/Fed)	32050.00	27500.00	33052.99	1280.71
Average Total Revenue (LE/Fed)	40320.00	42560.00	41021.87	631.78
Average Net Income (LE/Fed)	2820.00	10510.00	7995.83	1763.06

Source: Field Survey

6.2 Main Findings

The multivariate analysis tool of the multiple regression model was employed to assess the factors affecting net farm income gained by fish farmers. Table 3 shows the regression output of seven explanatory variables that included in the model (i.e., production, area, feed cost, labor cost, fixed cost, education and age). The results depict that six coefficients out of seven had significant influence on

net farm income, while education has positive but insignificant impact on net farm income.

The coefficient of determination R^2 value of 0.98 implies that about 98% of the variation in net farm income earned by fish farmers was influenced by variations in production, area, feed cost, labor cost, fixed cost, education and age. This result is confirmed by the significant F-statistic value of 854 implying that the model variables exerted joint significant impact on net income. Moreover, the Durbin-Watson value of 1.96 (approximately around 2) indicates the absence of multicollinearity.

The coefficients of feed cost, fixed cost and labor cost are negative and statistically significant at 1% for feed and fixed costs and at 5% for labor cost. This means that such coefficients are negatively correlated with net profit implying that farmers who adopt systems and practices that reduce feed, fixed and labor costs will make more profit.

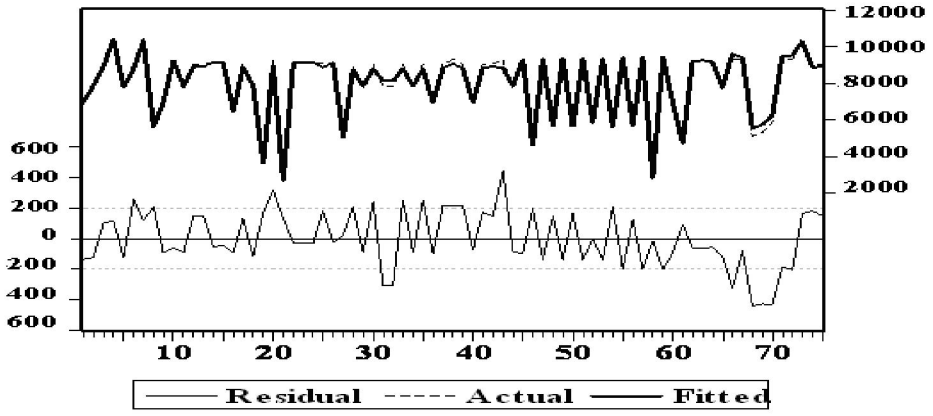
The coefficients of production, area and age are positively signed as expected, and statistically significant at 1% for production and 5% for both area and age. This implies that farmers who achieves higher productivity and farm more areas are likely to gain higher net income. Moreover, the results indicate that older farmers are more likely to attain more years of experience (than younger ones); consequently, they would be able to combine many viable enterprises that tend to be more efficient in production and thus will realize more income.

On the other hand, dummy coefficient for education is insignificant; however, it is positive signed (correlated to net income), implying that educated farmers are more likely to reach higher income.

As a matter of completeness, Figure 6 shows the plot of actual and fitted values for net income regression model. It illustrates that the applied model well fits the data.

Table (3): The Impact of Model Variables on Net Farm Income

Coefficients		*SE*	*T - ratio*	*P - value*	*F (Calculated)*
α	33044.31**	3085.23	10.71	0.000	853.74**
β_1 *(Prod)*	5.33**	0.67	7.97	0.000	
B_2 *(Area)*	19.81*	9.96	1.99	0.051	
β_3 *(Feed Cost)*	- 1.23**	0.04	- 31.08	0.000	
B_4 *(Labor Cost)*	- 3.64*	1.63	- 2.23	0.029	
β_5 *(Fixed Cost)*	- 5.10**	0.92	- 5.53	0.000	
β_6 *(Education)*	32.10	61.04	0.526	0.601	
β_7 *(Age)*	1.99*	2.88	0.693	0.051	
R^2	0.989				
$\overline{R}^2$	0.988				** = significant at 1% * = significant at 5%
Durbin-Watson	2.10				



NET INCOME = 33044.36 + 5.33*PROD + 19.81*AREA + 1.99*AGE + 32.10*EDU - 1.23*FEEDCOST - 3.64*LABORCOST - 5.10*FIXEDCOST

Figure (6): Actual and Fitted Values for Estimated Model

The correlation matrix presented in Table 4 portrays the relative relationship of each of explanatory variables to the level of net income. The implication of this is to provide the farmers in farm budget planning and determine variables that do not

influence the level of potential income of a fish farm activity.

The results reveal that, there is significant positive correlation (at 1%) between productivity and area with level of net income accounting 0.68 and 0.76 respectively. Whereas, high negative significant (at 1%) correlation with feed and fixed costs. However, these results mirrors the earlier results obtained from the regression model.

Table (4): The Impact of Model Variables on Net Farm Income

Correlation Matrix	Net Income	Production	Area	Age	Education	Feed cost	Labor cost	Fixed cost
Net Income	**1**							
Production	**0.68**$^{(**)}$	**1**						
	0.000							
Area	**0.76**$^{(**)}$	**0.76**$^{(**)}$	**1**					
	0.000	***0.000***						
Age	**0.46**$^{(**)}$	**0.41**$^{(**)}$	**0.53**$^{(**)}$	**1**				
	0.000	***0.000***	***0.000***					
Education	**0.45**$^{(**)}$	**0.52**$^{(**)}$	**0.42**$^{(**)}$	**0.28**$^{(*)}$	**1**			
	0.000	***0.000***	***0.000***	***0.014***				
Feed cost	**-0.96**$^{(**)}$	**-0.49**$^{(**)}$	**-0.57**$^{(**)}$	**-0.37**$^{(**)}$	**-0.36**$^{(**)}$	**1**		
	0.000	***0.000***	***0.000***	***0.001***	***0.002***			
Labor cost	**-0.45**$^{(**)}$	**-0.34**$^{(**)}$	**-0.53**$^{(**)}$	**-0.27**$^{(*)}$	**-0.14**	**0.34**$^{(**)}$	**1**	
	0.000	***0.003***	***0.000***	***0.019***	***0.237***	***0.003***		
Fixed cost	**-0.90**$^{(**)}$	**-0.66**$^{(**)}$	**-0.74**$^{(**)}$	**-0.48**$^{(**)}$	**-0.48**$^{(**)}$	**0.81**$^{(**)}$	**0.54**$^{(**)}$	**1**
	0.000	***0.000***	***0.000***	***0.000***	***0.000***	***0.000***	***0.000***	

Source: MicroFit results.

7.Main Difficulties and problems addressed by fish growers in study area

7.1 Addressed Difficulties

Table (5) reports problems observed in sampled fish farms in terms of frequency and probability. In other words, the frequency column indicates the replicate of the existence of the corresponding problem across interviewed farmers. The total of such a replicate may be defined, statistically speaking, as the sample space (all possible outcomes of the random experiment). If we divide the replicate of each problem by the sample space, we can get the probability of the existence of each problem, which may be statistically called the relative frequency or the probability distribution of the problem under consideration.

The results presented in Table (5) depict that, the most common problems that face fish growers is the high feed cost where its relative frequency accounts for 16%. Next are problems related to high cost of fry, quality of fry issues and diversity of fish species (13% each). Whereas, the relative frequency for difficulties concerning unavailability of fuel in addition to its high prices account to about 12%. Moreover, problems related to increasing land rent by either government or private sector and fish prices fluctuations (10% each), the lack of capital and finance supplied by Principal bank of Development and Agricultural Credit (8%). Lack of security for relatively short lease contract, using drainage water and lack of export channels represented about 6%.

Table 5: Frequency and Probability Distribution of Problems in Study Sample

	Problem	*Frequency*	Relative Frequency (Probability)
1	**Factors of Production Issues**		
1.1	Lack of Capital supplied by PBDAC	32	**0.08**
1.2	High Cost of Feed	62	**0.16**
1.3	Unavailability and High Costs of Fuel	45	**0.12**
1.4	High Costs of Fry	49	**0.13**
1.5	Quality of Fry and diversity of fish species	52	**0.13**
1.5	Water Issues	22	**0.06**
1.6	Escalating Land Rent	38	**0.10**
1.7	Lack of being Secured due to short lease contracts	29	**0.07**
2	**Marketing Issues**		
2.1	Prices Fluctuations and Weakness	38	**0.10**
2.2	Lack of Export Channels	36	**0.06**
	Total	**389**	**1.00**

Source: Questioner analysis results and author own calculations

7.2 Main Challenges Facing Fish Farming Sector

In line with recommendations argued by Van Der Heijden (2012), the paper focuses on the following tasks.

- The cost of fish production is relatively low in Egypt compared to other competitor producers [for more details see Macfadyen *et al.* (2011) pp. 38]. However, export potential is very low. This performance is hampered by lack of product traceability, lack of conformation to food safety regulations, in addition to, lack of knowledge of foreign buyer and consumer demands.
- Except for freshwater species hatcheries, fish growers are not allowed to use fresh irrigation water. Alternatively, fish farmers are allowed to use the water in the drainage canal but this carries the risk of being contaminated with agricultural chemicals and domestic pollution. Thus, farmed fish exports to certain markets (for example, the EU) are impossible due to the use of drainage water. Moreover, land use legislation and lease terms should be reviewed, in other words, fisher men who see their fishing ground diminish opposes the proliferation of illegal ponds along the shore and other lakes.
- Fish feed prices that account for 75% to 85% of variable costs have risen during the past 7 years to about 200% to 250%., this trend reduces growers profitability.
- Poor quality of fish fingerlings and lack of available land for expansion are other important obstacles facing fish farming in Egypt. Fish growers also suffers difficulty concerning capital access. Banks consider the sector high-risk and very few loans are provided to fish farmers. Consequently, fish feed producers/traders and fish traders are in short of capital or credit.
- Fish prices fluctuations, in addition to the declining of fish prices by the end of the year affects the profitability for fish farmers (most fish farmers harvest in November – December to avoid stocked ponds and the risk of mass mortality in the cold winter season).
- Egyptian fish producers face escalating competition from imported, frozen fish fillets from Asia.

8.Conclusion

Egyptian aquaculture is a remarkable success story. Its fish farms now account for at least 65% of the country's fish production and three-quarters of African aquaculture production. Per capita fish consumption in the country has risen to at least 17.4 kg per year and fish is the most affordable animal protein source .However, Semi-intensive fish culture in earthen ponds is, by far, the most important farming system in study area

A typical fish grower aged about 45 years and gained about 20 years of experience in fish farming enterprising. Cultivated around 23 feddan and spent a mean value of 30643 LE/Fed, 691 LE/Fed and 5297 LE/Fed for feed cost, labor cost and others cost (including fertilizer, power, transport, ice, sales commission paid to traders/wholesalers) respectively. Moreover, each grower produced (on average) about 3.66 ton/fed and yielded an average net income around 7995 LE/Fed. Finally, the sample revealed that the literacy rate is about 44%.

It is hypothesized that farm net income of the survey farmers was influenced by certain variables including production, area, feed cost, labor cost, fixed cost, education and age. These variables were analyzed using the multiple regression method to find their effects on net farm income. The results depict that, except for education variable, all other independent variables were statistically significant at either 1% or 5% level of significance.

Moreover, the observed main problem facing fish farmers is the high feed cost reaching a relative frequency of 16%. Next, high cost of fry, quality of fry issues and diversity of fish species (13% each). Followed by, unavailability of fuel, in addition to, its high prices (12%). Then, problems related to increasing land rent by either government or private sector and fish prices fluctuations (10% each), the lack of capital and finance supplied by government (8%). Finally, lack of security for relatively short lease contract, using drainage water and lack of export channels represented about 6%.

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