

## Comparing The Productive and Economic Efficiency of Some Freshwater Fish Farms in El Sharkia, Ismailia, and Kafr El Sheikh

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### Abstract

This research aimed to study the efficiency of freshwater fish farms among three governorates: El Sharkia, Ismailia, and Kafr El Sheikh during the period 2015 and 2016. Data of productive and economic parameters of 64 freshwater fish farms were investigated through farm records in addition to research questionnaire. One-way ANOVA procedure was fitted. All statistical analyses were carried out by SPSS for windows. The current study showed that farm locality has a notable effect on the productive and economic parameters of freshwater fish farms. Regarding total fish production, Kafr El Sheikh governorate had the highest quantity of fish production, while El Sharkia was the lowest. From the results of analysis of locality effect on economic efficiency parameters (TC, TR and NP (EGP)/kg), it was concluded that although El Sharkia governorate had the highest value of total cost (16.34 EGP) and Kafr El Sheikh governorate had the lowest one (13.12 EGP), the highest profit recorded was in El Sharkia governorate (9.01 EGP). It is strongly recommended to encourage the government to invest more in aquaculture production in studied areas as the aquaculture was reported to be a profitable business in these.

**Keywords:** Aquaculture, fish, economics, efficiency

### Introduction

The increasing population in Egypt is one of the most important contemporary problems, especially with the widening gap between local food production and consumption. Such increase has negative effects on economic development and on provision of food for the poor in terms of quantity, quality and prices.

Developing plans aimed at narrowing this gap by increasing food supply in general and animal protein in particular. The fish sector is considered the promising sectors for food security and economic development of Egypt (*Soliman and Yacout, 2016*). Egypt is currently facing significant constraints in fisheries production with high prices

of wild fish which necessitate growth in aquaculture sector.

A high increase in aquaculture production was observed during the last 10 years. In 2015, aquaculture production had reached 1174831 tones representing a 3.32 % increase than 2014. On the other hand fish production income represented 9.07% of the total agricultural income which was 20298 million Egyptian Pounds (EGP) (*GAFRD, 2017*). Despite the increase in aquaculture production, many constraints exist for its full exploitation such as random place of ponds, poor design, high rent of land, fry shortage, high cost of feed, and management problems (*GAFRD, 2009*). Thus the aim of this study is to economically evaluate some freshwater fish farms in Egypt by evaluating production costs and revenues received.

### Materials and Methods

Data of 64 freshwater fish farms raising tilapia (*Oreochromis niloticus*), mullet (*Mugil cephalus*), and topbar (*Liza ramada*) were collected during 2015 and 2016 from 3 Governorates: El Sharkia, Ismailia, and Kafr El Sheikh. Data were obtained from farm records in addition to a designed research questionnaire. The analysis was done for the production inputs including the amount of feed consumed, prices of feed, labour costs, fingerlings cost, mortality rate and total production (kg); also for costs parameters including total variable cost (TVC),

total fixed cost (TFC), and total cost (TC). The returns parameters include total return (TR) calculated by multiplying quantity produced (kg) × price/kg. The net profit (NP) was calculated by subtracting TC from TR. Analysis of variance was done to fulfill the equation:  $V_{ijk} = \mu + S_i + L_j + e_{ijk}$  ( $V_{ijk}$  = An observed value,  $\mu$  = overall mean,  $S_i$  = Effect due to the  $I^{\text{th}}$  year (2015, 2016),  $L_j$  = Effect due to the  $J^{\text{th}}$  locations (El Sharkia, Ismailia, Kafr El-sheikh),  $e_{ijk}$  = error). Efficiency measures of cost and return parameters per each feddan, live kg, and per 1000 fingerlings were calculated according to (*Mandour, 2013*).

### Results and Discussion

#### 1-Effect on pond size, total farm area (feddan), rent per feddan (EGP):

Data recorded in Table (1) showed the pond size, total farm area, rent per feddan, and total rent. The pond area was not-significantly different ( $P > 0.05$ ) among governorates but was significantly different ( $P < 0.05$ ) through the study period. The highest mean value for pond area was found in EL Sharkia (5.30 feddan), while the lowest value was found in Ismailia (4.29 feddan). Also, found that the highest mean value was in 2015 (6.64 feddan) compared to 2016 (4.63 feddan). In regards to the total farm area, there was significant difference ( $P < 0.05$ ) among governorates, also between years. The highest mean value was found in Kafr El Sheikh (66.67 feddan), while

the lowest value was found in El Sharkia (37.42 feddan), also the highest mean value was found in 2015 (85.71 feddan), while the lowest value was found in 2016 (42.43 feddan).

Regarding to rent per feddan, No-significant difference ( $P>0.05$ ) was found for the rent per feddan between years, but was significantly different ( $P<0.05$ ) among governorates and also among years. The highest mean value in Kafr El- Sheikh (6416.67 EGP), while the lowest value found in Ismailia (2647.06 EGP), the highest value recorded at 2015 (3928.57 EGP), also the lowest value recorded at 2016 (3568.42 EGP). This agreed with (*GAFRD, 2017*) who stated that Kafr El-sheikh has more production than other governorates which might be attributed to large areas used for aquaculture production. Also, agreed with *Hafsa et al. (2012)* who stated that increasing of pond size will increase fish production. Also, with *Aly (2006)* who showed that economic and productive efficiency of fish farms are affected by pond size and farm location.

## **2- Effect on stocking density/feddan and total number of fingerlings stocked among governorates and years**

Data recorded in Table (2) showed the differences in stocking density of tilapia fingerlings was non-significantly different through the study period where the highest value recorded at 2015 (11285), also the

lowest value recorded at 2016 (10403); but significantly differed ( $P<0.05$ ) among governorates. Tilapia fingerlings number/feddan was highest in Kafr El- Sheikh (14166), while the lowest value found in El Sharkia (9428). Mullet fingerlings stocking density was non-significantly different through the study period where the highest value recorded at 2015 (871), also the lowest value recorded at 2016 (857); but significantly differed ( $P<0.05$ ) among governorates. The highest mean value in El Sharkia (1032), while the lowest value found in Kafr El Sheikh (633). In regards to topar fingerlings number/feddan, it was evident that there was no significant difference ( $P>0.05$ ) among governorates or years. The highest mean value was in El Sharkia (1900), while the lowest value found in Ismailia (1470). The highest value recorded at 2016 (1754), also the lowest value recorded at 2015 (1428). A significant difference ( $P<0.05$ ) of total fishes stocked ( $\times 10^3$ ) through the study period and localities, as Kafr El Sheikh has the highest stocking density 1108.58 compared to Ismailia and El Sahrkia Governorate (710.05 and 487.55; respectively. Stocking density had decreased in 2016 to reach 596.50 compared to 2015 (1205.42). This might be due to differences in farmers' experience. This agreed with *Bhujel (2014)* who reported that farmer's experience effect on number of fish stocked and species cultured.

Also, with *Alam et al. (2012)* who reported variation in production practices among farmers.

### **3-Effect on price (EGP)/1000 fingerlings of fish stocked:**

Results in Table (3) showed a significant difference ( $P < 0.05$ ) of the price/1000 fingerlings stocked through the study period and among localities. The price of 1000 tilapia fingerlings was found to be highest in El Sharkia (141.28), while the lowest value found in Kafr El Sheikh (82.50), the highest value recorded at 2016 (121.57 EGP), also the lowest value recorded at 2015 (106.42 EGP). This might be attributed the increase of fingerlings supply results in lowering the price; as there are many hatcheries in Kafr El Sheikh. As for mullet fingerlings, the highest mean value was in Kafr El Sheikh (2708.33 EGP), while the lowest value found in El Sharkia (1871.42 EGP). The highest value recorded at 2016 (2229.82 EGP), also the lowest value recorded at 2015 (1628.5 EGP). The price of topar fingerlings was of highest mean value in Ismailia (1223.52 EGP), while the lowest value was in El Sharkia (574.28 EGP), the highest value was at 2016 (859.64 EGP), and the lowest value recorded at 2015 (571.42 EGP). Total fingerlings cost (EGP) showed no significant difference among governorates and years. The highest mean value in Kafr El Sheikh (259370), while the lowest value found in El Sharkia (215277), the highest value recorded at 2015 (264214), also the lowest value

recorded at 2016 (224932). Such variations might be attributed to differences in demand, supply, or size. This agreed with *Bhujel (2014)* who reported that bigger size of fish is more expensive than smaller size. Results agreed with *Aamer (1986)* who found that major part of production cost was fry cost representing 31% from TC and 63.5 % from TVC.

### **4-Effect on cost of fuel and transportation:**

Data at Table (4) showed the effect on cost of fuel and transportation (EGP) which differed significantly ( $P < 0.05$ ) among governorates and years. The highest mean value for fuel cost in Kafr El Sheikh (47816.6), while the lowest value found in Ismailia (19970.5), the highest value recorded at 2015 (43571.4), also the lowest value recorded at 2016 (26242.1). The highest mean value for transportation was in El Sharkia (11411.4), while the lowest value found in Ismailia (1341.2), the highest value recorded at 2015 (15000), also the lowest value recorded at 2016 (7753.5). Results agreed with *Macfadyen et al. (2011)* who reported certain portion of total production costs is constituted by fuel and power. Also, all processes of aquaculture systems demand both fuel and power (*Samuel-Fitwi et al. 2013*). *The CAPMAS (2014)* reported that energy consumption increased by 25.9% due to increased aquaculture production from 2008 till 2011.

### **5-Effect on total cost of feed:**

Data showed at Table (5) the effect on total feed (tons) and total cost of feed (EGP), which differed significantly among governorates and years. The highest mean value of total feed consumed was in Kafr El Sheikh (397.71 tons), while the lowest value found in El Sharkia (187.91 tons), and the highest value recorded at 2015 (438.86 tons), also the lowest value recorded at 2016 (220.69 tons). And also data showed total cost of feed where the highest mean value in Kafr El Sheikh (3287479 EGP), while the lowest value found in El Sharkia (1442697 EGP), the highest value recorded at 2015 (3232285 EGP), also the lowest value recorded at 2016 (1805469 EGP). The results were similar to those of *Sikiru et al. (2009)*, they estimated feed cost as the main component in fish production. *Macfadyen et al. (2011)*; *Rothuis et al. (2013)*; and *El-Sayed (2014)* found that rapid increase in the cost of fish feed was one of the main constraints faced by the fish feed industry and farmers. Also, *Craig and Helfrich (2009)* added that from 40-50% of total cost of fish production represented feed cost.

#### **6-Effect on labour cost:**

Data showed at Table (6) the significant effect ( $P < 0.05$ ) of governorate and year on labour costs (EGP) for all species. The highest mean value in Kafr El Sheikh (95940 EGP), while the lowest value found in El Sharkia (67691 EGP), the highest value recorded at 2015

(107077 EGP), also the lowest value recorded at 2016 (71006 EGP). Results agreed with *Macfadyen et al. (2011)* reported that labor costs represented about 8 % of the operational costs. Also agreed with *Bhujel (2014)* who stated that labour cost is important factor that affect profit of fish farms.

#### **7-Effect on cost parameters:**

From the data in Table (7), it was evident that there were significantly different ( $P < 0.05$ ) in cost parameters: total fixed cost (TFC), total variable cost (TVC) and total cost (TC) among governorates and between years. TFC had the highest mean value in Kafr El Sheikh (528708 EGP), while the lowest value found in El Sharkia (172483 EGP), the highest value recorded at 2015 (496347 EGP), also the lowest value recorded at 2016 (220612 EGP). Also for TVC found the highest mean value in Kafr El Sheikh (3720502 EGP), while the lowest value found in El Sharkia (1727182 EGP), the highest value recorded at 2015 (3640605 EGP), also the lowest value recorded at 2016 (2108333 EGP). Finally for TC, the highest mean value in Kafr El Sheikh (4249210 EGP), while the lowest value found in El Sharkia (1899666 EGP), the highest value recorded at 2015 (4136953 EGP), also the lowest value recorded at 2016 (2328946 EGP). The TC was more in 2015 compared to 2016 (2328946 EGP). Results also indicated that Kafr el-sheikh has the highest total cost. These results are

parallel to those of *Aly (2006)* who reported significant differences of Governorates on different costs. *El-Naggar et al. (2006)* found that an average farmer incurred a total sum of 316051LE as operational costs (OC) per feddan in season 2004-2005 in Behera governorate.

#### **8-Effect on mortality percentage:**

Data showed at Table (8) represented the mortality % which was non-significant ( $P>0.05$ ) among different localities and years. The highest mean value in Ismailia (7.65%), while the lowest value found in El Sharkia (6.86%), the highest value recorded at 2015 (9.0%), also the lowest value recorded at 2016 (6.96%). Results are in line with *Yosra (2008)* who found that disease incidence and consequently mortality differ among different areas and localities. *Eissa et al. (2013)* reported that fish ectoparasites caused serious diseases and high mortalities in fingerlings under stress condition.

#### **9-Effect on total production (kg):**

Data of Table (9) showed the effect on tilapia, mullet, and topar production (kg). It was evident that there was significant difference ( $P<0.05$ ) in total weight sold of tilapia. For mullet, it differed significantly among years. As for topar, it differed significantly among governorates. The highest production of tilapia sold in Kafr El Sheihk (295075 kg), while the lowest value found in El Sharkia (94848 kg), the highest value recorded at 2015 (293614 kg), also the lowest value recorded at 2016 (136139 kg). For

mullet sold, the highest mean value in El Sharkia (14754 kg), while the lowest value found in Ismailia (10332 kg), the highest value recorded at 2015 (19195 kg), also the lowest value recorded at 2016 (11831 kg). Also for topar sold found the highest mean value in El Sharkia (28276 kg), while the lowest value found in Ismailia (17041 kg), the highest value recorded at 2015 (29220 kg), also the lowest value recorded at 2016 (21935 kg).

Finally for total weight of all fish sold found the highest mean value in Kafr El Sheihk (325770 kg), while the lowest value found in El Sharkia (126648 kg), the highest value recorded at 2015 (333681 kg), also the lowest value recorded at 2016 (165371 kg). This agreed with *Craig and Helfrich (2009)*, they concluded that final fish weight sold will vary depending on multiple factors including environmental conditions and therefore localities. Also, *El-Naggar et al. (2006)* reported that an average quantity of fish produced in kilogramme is about 2635 per feddan in season 2004-2005 in Behera governorate.

#### **10-Effect on TR and NP (EGP):**

Data at Table (10) showed that total return (TR) and net profit (NP) (EGP) differed significantly ( $P<0.05$ ) among the different localities and years; but NP showed significant difference ( $P<0.05$ ) among localities. The TR found the highest mean value in Kafr El Sheihk (6519045 EGP), while the lowest value found in El Sharkia (3178739 EGP), the highest

value recorded at 2015 (6118785 EGP), also the lowest value recorded at 2016 (3933946 EGP). The NP found the highest mean value in Kafr El Sheikh (2269835 EGP), while the lowest value found in El Sharkia (1279072 EGP), the highest value recorded at 2015 (1981832 EGP), also the lowest value recorded at 2016 (1605000 EGP). These results had agreed with *Azazy (2003)* reporting significant differences ( $P < 0.05$ ) among areas based on species reared. Also, *Macfadyen et al. (2011)* reported that Kafer El Sheikh, Behera, Sharkia, and Fayoum are considered the major governorates in aquaculture sector in Egypt.

#### **11-Effect on TC, TR and NP (EGP)/fed:**

Data at Table (11) showed that TC/ feddan and TR / feddan differed significantly ( $P < 0.05$ ) among the different localities, years; as for the net profit/feddan (NP/Fed) (EGP) it was non-significantly different ( $P > 0.05$ ) among different governorates; but significantly different among years. The highest mean value of TC/Fed was in Kafr El Sheikh (62725.8 EGP), while the lowest value found in Ismailia (45976.2 EGP), the highest value recorded at 2016 (54625.3 EGP), also the lowest value recorded at 2015 (43205.9 EGP).

Also for TR/Fed, the highest mean value in Kafr El Sheikh (96871.2 EGP), while the lowest value found in Ismailia (77161.4 EGP), the

highest value recorded at 2016 (89118.6 EGP), also the lowest value recorded at 2015 (60307.2 EGP). Finally for NP/Fed found the highest mean value in Kafr El Sheikh (34145.4 EGP), while the lowest value found in Ismailia (31185.2 EGP), the highest value recorded at 2016 (33813.2 EGP), also the lowest value recorded at 2015 (17614.7 EGP). The results agreed with *GAFRD (2017)* reporting that Kafr El-Sheikh Governorate is considered a good example for fish production and intensification where its production constituted about 29% of the total fish production in Egypt. Also agreed with *Al-Faitiany et al. (2006)* who found that fixed cost at private farms were 189.4 pounds/ feddan, while at cages were 865.9 pounds/feddan and representing 11.9 % and 19.4 % from total cost; respectively, and the rent of lands constituted the major part of the fixed cost representing 73.7 %, while the nets represented 48.7 % at cages.

#### **12-Effect on TC, TR and NP (EGP) /1000 fingerlings**

Data at Table (12) showed the effect on TC and TR (EGP) per 1000 fingerlings which differed significantly ( $P < 0.05$ ) among the different localities, years; as for the NP/1000 fingerlings (EGP) it was non-significantly different ( $P > 0.05$ ) among different governorates; but significantly different among years.

The highest mean value of TC/1000 was in El Sharkia (4383.4 EGP), while the lowest value found in Kafr

El Sheikh (3881.7 EGP), the highest value recorded at 2016 (4284.8 EGP), also the lowest value recorded at 2015 (3118.2 EGP). Also for TR/1000 fingerlings, it was found that the highest mean value in El Sharkia (6811.1 EGP), while the lowest value found in Kafr El Sheikh (6013.3 EGP), the highest value recorded at 2016 (6806.4 EGP), also the lowest value recorded at 2015 (4291.8 EGP). Finally for NP/1000 fingerlings found the highest mean value in Ismailia (2435.7 EGP), while the lowest value found in Kafr El Sheikh (2131.4 EGP), the highest value recorded at 2016 (2521.6 EGP), also the lowest value recorded at 2015 (1173.9 EGP). This agreed with *Aamer (1986)* who found that increasing the production of farm will decrease the costs per ton produced.

### 13-Effect on TC, TR and NP (EGP)/kg

Data at Table (13) showed the effect on TC, TR, and NP (EGP) per kg body weight which differed significantly ( $P < 0.05$ ) among the different localities and years. The highest mean value of TC / Kg in El Sharkia (16.34 EGP), while the

lowest value found in Kafr El Sheikh (13.12 EGP), the highest value recorded at 2016 (15.53 EGP), also the lowest value recorded at 2015 (11.56 EGP).

And also for TR/Kg found the highest mean value in El Sherkia (25.35 EGP), while the lowest value found in Kafr El Sheikh (20.28 EGP), the highest value recorded at 2016 (24.58 EGP), also the lowest value recorded at 2015 (15.93 EGP). *El-Naggat et al. (2006)* stated that in season 2004-2005, the average fish sales value (revenue) was 18869 LE per feddan in Behera governorate.

Finally, for NP/kg found the highest mean value in El Sharkia (9.01 EGP), while the lowest value found in Kafr El Sheikh (7.16 EGP), the highest value recorded at 2016 (9.06 EGP), also the lowest value recorded at 2015 (4.37 EGP) and the highest mean value found in El Sharkia and Ismailia the same (9.34 EGP) at 2016, and the lowest value found in Ismailia (2.67 EGP) at 2015. This is parallel with *Trimpey and Engle (2005)* who reported increased size of the farm and increased the market price will increase net revenue.

**Table 1:** Means  $\pm$  SE of pond size, total farm area, and rent / feddan among governorates and years

	Effects	No.	Pond size	Total farm area	Rent
Governorate	El Sharkia	35	5.30 <sup>A</sup> $\pm$ 0.46	37.42 <sup>B</sup> $\pm$ 5.64	3111.42 <sup>B</sup> $\pm$ 401.11
	Ismailia	17	4.29 <sup>A</sup> $\pm$ 0.36	53.47 <sup>AB</sup> $\pm$ 9.77	2647.06 <sup>B</sup> $\pm$ 436.56
	Kafr El-Sheikh	12	4.33 <sup>A</sup> $\pm$ 0.28	66.67 <sup>A</sup> $\pm$ 15.95	6416.67 <sup>A</sup> $\pm$ 583.12
Year	2015	7	6.64 <sup>A</sup> $\pm$ 1.63	85.71 <sup>A</sup> $\pm$ 27.66	3928.57 <sup>A</sup> $\pm$ 941.13
	2016	57	4.63 <sup>B</sup> $\pm$ 0.23	42.43 <sup>B</sup> $\pm$ 4.41	3568.42 <sup>A</sup> $\pm$ 340.0
	Overall	64	4.85 $\pm$ 0.28	47.17 $\pm$ 5.13	3607.8 $\pm$ 317.7

Capital letters: Means within the same column carrying different letters are significantly different at ( $P < 0.05$ ).



**Table 2:** Means ± SE of stocking density/feddan and total number of fingerlings among governorates and years

	Effects	No.	Tilapia ( <i>Oreochromis niloticus</i> )	Mullet ( <i>Mugil cephalus</i> )	Topar ( <i>Liza ramada</i> )	Total No. (× 10 <sup>3</sup> )
Governorate	El Sharkia	35	9428 <sup>B</sup> ± 645	1032 <sup>A</sup> ± 177	1900 <sup>A</sup> ± 293	487.55 <sup>B</sup> ± 73.19
	Ismailia	17	10117 <sup>B</sup> ± 726	658 <sup>A</sup> ± 146	1470 <sup>A</sup> ± 90	710.05 <sup>B</sup> ± 154.98
	Kafr El-sheikh	12	14166 <sup>A</sup> ± 705	633 <sup>A</sup> ± 124	1541 <sup>A</sup> ± 143	1108.58 <sup>A</sup> ± 268.46
Year	2015	7	11285 <sup>A</sup> ± 836	871 <sup>A</sup> ± 363	1428 <sup>A</sup> ± 639	1205.42 <sup>A</sup> ± 413.87
	2016	57	10403 <sup>A</sup> ± 523	857 <sup>A</sup> ± 114	1754 <sup>A</sup> ± 170	596.50 <sup>B</sup> ± 71.65
	<b>Overall</b>	<b>64</b>	<b>10500 ± 475</b>	<b>858 ± 108</b>	<b>1718 ± 165</b>	<b>663.10 ± 80.12</b>

Capital letters: Means within the same column carrying different letters are significantly different at (P < 0.05).

**Table 3:** Means ± SE of price (EGP)/1000 fingerlings among governorates and years

	Effects	No.	Tilapia ( <i>Oreochromis niloticus</i> )	Mullet ( <i>Mugil cephalus</i> )	Topar ( <i>Liza ramada</i> )	Fingerlings cost
Governorate	El Sharkia	35	141.28 <sup>A</sup> ± 10.64	1871.42 <sup>B</sup> ± 158.71	574.28 <sup>B</sup> ± 78.26	215277 <sup>A</sup> ± 45990
	Ismailia	17	102.35 <sup>AB</sup> ± 14.30	2382.35 <sup>A</sup> ± 80.52	1223.52 <sup>A</sup> ± 32.74	236675 <sup>A</sup> ± 46711
	Kafr Elsheikh	12	82.50 <sup>B</sup> ± 19.91	2708.33 <sup>A</sup> ± 96.41	1008.33 <sup>A</sup> ± 56.86	259370 <sup>A</sup> ± 50225
Year	2015	7	106.42 <sup>B</sup> ± 18.52	1628.57 <sup>B</sup> ± 188.60	571.42 <sup>B</sup> ± 151.94	264214 <sup>A</sup> ± 78385
	2016	57	121.57 <sup>A</sup> ± 9.13	2229.82 <sup>A</sup> ± 107.02	859.64 <sup>A</sup> ± 60.92	224932 <sup>A</sup> ± 28921
	<b>Overall</b>	<b>64</b>	<b>119.92 ± 8.37</b>	<b>2164.06 ± 100.05</b>	<b>828.12 ± 57.50</b>	<b>229228 ± 26992</b>

Capital letters: Means within the same column carrying different letters are significantly different at (P < 0.05).

**Table 4:** Means ± SE of fuel and transportation costs among governorates and years

	Effects	No.	Fuel	Transportation
Governorate	El Sharkia	35	25357.1 <sup>B</sup> ± 2634.1	11411.4 <sup>A</sup> ± 1588.2
	Ismailia	17	19970.5 <sup>B</sup> ± 3204.8	1341.2 <sup>B</sup> ± 299.5
	Kafr El-sheikh	12	47816.6 <sup>A</sup> ± 7220.1	10395.8 <sup>A</sup> ± 1896.3
Year	2015	7	43571.4 <sup>A</sup> ± 10505.9	15000 <sup>A</sup> ± 4710.5
	2016	57	26242.1 <sup>B</sup> ± 2339.9	7753.5 <sup>B</sup> ± 1040.1
	<b>Overall</b>	<b>64</b>	<b>28137.5 ± 2438.9</b>	<b>8546.1 ± 1081.2</b>

Capital letters: Means within the same column carrying different letters are significantly different at (P < 0.05).

**Table 5:** Means  $\pm$ SE of total feed (tons) and feed cost among governorates and years

Effects		No.	Total feed (Ton)	Feed cost (EGP)
Governorate	El Sharkia	35	187.91 <sup>B</sup> $\pm$ 26.87	1442697 <sup>B</sup> $\pm$ 200870
	Ismailia	17	253.06 <sup>B</sup> $\pm$ 51.66	2093741 <sup>B</sup> $\pm$ 447385
	Kafr El-sheikh	12	397.71 <sup>A</sup> $\pm$ 106.23	3287479 <sup>A</sup> $\pm$ 887933
Year	2015	7	438.86 <sup>A</sup> $\pm$ 157.61	3232285 <sup>A</sup> $\pm$ 325945
	2016	57	220.69 <sup>B</sup> $\pm$ 25.83	1805469 <sup>B</sup> $\pm$ 217080
<b>Overall</b>		<b>64</b>	<b>244.55 <math>\pm</math> 29.37</b>	<b>1961527 <math>\pm</math> 242622</b>

Capital letters: Means within the same column carrying different letters are significantly different at ( $P < 0.05$ ).

**Table 6:** Means  $\pm$  SE of total labour cost (EGP) among governorates and years.

Effects		No	Total labor cost
Governorate	El Sharkia	35	67691 <sup>B</sup> $\pm$ 5430
	Ismailia	17	75083 <sup>AB</sup> $\pm$ 1158
	Kafr El-sheikh	12	95940 <sup>A</sup> $\pm$ 16132
Year	2015	7	107077 <sup>A</sup> $\pm$ 27685
	2016	57	71006 <sup>B</sup> $\pm$ 4775
<b>Overall</b>		<b>64</b>	<b>74951 <math>\pm</math> 5296</b>

Capital letters: Means within the same column carrying different letters are significantly different at ( $P < 0.05$ ).

**Table 7:** Means  $\pm$  SE of cost parameters (TFC, TVC and TC (EGP) among governorates and years

Effects		No.	TFC	TVC	TC
Governorate	El Sharkia	35	172483 <sup>B</sup> $\pm$ 25536	1727182 <sup>B</sup> $\pm$ 235717	1899666 <sup>B</sup> $\pm$ 254931
	Ismailia	17	215760 <sup>B</sup> $\pm$ 43029	2385988 <sup>B</sup> $\pm$ 496701	2601748 <sup>B</sup> $\pm$ 526251
	Kafr Elsheikh	12	528708 <sup>A</sup> $\pm$ 124920	3720502 <sup>A</sup> $\pm$ 956995	4249210 <sup>A</sup> $\pm$ 1007806
Year	2015	7	496347 <sup>A</sup> $\pm$ 194879	3640605 <sup>A</sup> $\pm$ 1045781	4136953 <sup>A</sup> $\pm$ 1063636
	2016	57	220612 <sup>B</sup> $\pm$ 27606	2108333 <sup>B</sup> $\pm$ 242347	2328946 <sup>B</sup> $\pm$ 264136
<b>Overall</b>		<b>64</b>	<b>250771 <math>\pm</math> 33414</b>	<b>2275925 <math>\pm</math> 268142</b>	<b>2526696 <math>\pm</math> 296951</b>

Capital letters: Means within the same column carrying different letters are significantly different at ( $P < 0.05$ ).

**Table 8:** Means ± SE of % of mortality among governorates and years

Effects		No. of farms	% mort
Governorate	El Sharkia	35	6.86 <sup>A</sup> ± 0.93
	Ismailia	17	7.65 <sup>A</sup> ± 0.62
	Kafr El-sheikh	12	7.50 <sup>A</sup> ± 1.45
Year	2015	7	9.0 <sup>A</sup> ± 1.81
	2016	57	6.96 <sup>B</sup> ± 0.82
<b>Overall</b>		<b>64</b>	<b>7.19 ± 0.75</b>

Capital letters: Means within the same column carrying different letters are significantly different at (P < 0.05).

**Table 9:** Means ± SE of tilapia, mullet, topar and Total production (kg) among governorates and years

Effects		No.	Tilapia (kg)	Mullet (kg)	Topar (kg)	Total wt (kg)
Governorate	El Sharkia	35	94848 <sup>C</sup> ±13900	14754 <sup>A</sup> ±3098	28276 <sup>A</sup> ±5141	126648 <sup>B</sup> ±17960
	Ismailia	17	173802 <sup>B</sup> ± 4120	10332 <sup>A</sup> ±2607	17041 <sup>B</sup> ±3065	201176 <sup>B</sup> ±44842
	Kafr Elsheikh	12	295075 <sup>A</sup> ± 7315	10945 <sup>A</sup> ±2421	19750 <sup>B</sup> ±2379	325770 <sup>A</sup> ±32587
Year	2015	7	293614 <sup>A</sup> ±17246	19195 <sup>A</sup> ±6740	29220 <sup>A</sup> ±2748	333681 <sup>A</sup> ±60169
	2016	57	136139 <sup>B</sup> ±18705	11831 <sup>B</sup> ±1841	21935 <sup>A</sup> ±2791	165371 <sup>B</sup> ±20673
<b>Overall</b>		<b>64</b>	<b>153363 ± 21413</b>	<b>12705 ±1739</b>	<b>22635 ± 2400</b>	<b>183780 ±12318</b>

Capital letters: Means within the same column carrying different letters are significantly different at (P < 0.05).

**Table 10:** Means±SE of TR and NP (EGP) among different governorates and years

Effects		No.	TR (EGP)	NP (EGP)
Governorate	El Sharkia	35	3178739 <sup>B</sup> ± 247653	1279072 <sup>B</sup> ± 119643
	Ismailia	17	4563647 <sup>AB</sup> ± 920192	1961898 <sup>A</sup> ± 117895
	Kafr El-sheikh	12	6519045 <sup>A</sup> ± 689512	2269835 <sup>A</sup> ± 136586
Year	2015	7	6118785 <sup>A</sup> ± 845108	1981832 <sup>A</sup> ± 1088334
	2016	57	3933946 <sup>B</sup> ± 458785	1605000 <sup>A</sup> ± 2105544
<b>Overall</b>		<b>64</b>	<b>4172913 ± 298408</b>	<b>1646216 ± 218300</b>

Capital letters: Means within the same column carrying different letters are significantly different at (P < 0.05).

**Table 11:** Means ± SE of TC, TR and NP (EGP)/fed among governorates and years

Effects		No.	TC/fed	TR/fed	NP/fed
Governorate	El Sharkia	35	51392.7 <sup>B</sup> ±2267.4	83128.9 <sup>AB</sup> ±6991.2	31736.2 <sup>A</sup> ± 5006.2
	Ismailia	17	45976.2 <sup>C</sup> ±2016.3	77161.4 <sup>B</sup> ±8716.3	31185.2 <sup>A</sup> ± 6241.3
	Kafr El-sheikh	12	62725.8 <sup>A</sup> ±2264.5	96871.2 <sup>A</sup> ±8968.3	34145.4 <sup>A</sup> ± 6422.3
Year	2015	7	43205.9 <sup>B</sup> ±4191.2	60307.2 <sup>B</sup> ±8913.5	17614.7 <sup>B</sup> ± 6382.5
	2016	57	54625.3 <sup>A</sup> ±1614.6	89118.6 <sup>A</sup> ±3434.1	33813.2 <sup>A</sup> ± 2459.1
<b>Overall</b>		<b>64</b>	<b>52078.9 ±1568.4</b>	<b>84120.5 ± 3130.6</b>	<b>32041.5 ± 2111.3</b>

Capital letters: Means within the same column carrying different letters are significantly different at (P < 0.05).

**Table 12:** Means±SE of TC, TR and NP (EGP) / 1000 fingerlings among governorates and years

Effects		No.	TC/1000	TR/1000	NP/1000
Governorate	El Sharkia	35	4383.4 <sup>A</sup> ±279.3	6811.1 <sup>A</sup> ± 253.3	2427.6 <sup>A</sup> ± 277.1
	Ismailia	17	3885.8 <sup>B</sup> ±348.2	6321.4 <sup>AB</sup> ±315.8	2435.7 <sup>A</sup> ± 345.4
	Kafr El-sheikh	12	3881.7 <sup>B</sup> ±358.2	6013.3 <sup>B</sup> ± 325.2	2131.4 <sup>A</sup> ± 355.5
Year	2015	7	3118.2 <sup>B</sup> ±356.1	4291.8 <sup>B</sup> ± 323.4	1173.9 <sup>B</sup> ± 353.5
	2016	57	4284.8 <sup>A</sup> ±137.2	6806.4 <sup>A</sup> ± 124.5	2521.6 <sup>A</sup> ± 136.2
<b>Overall</b>		<b>64</b>	<b>4157.2 ±124.9</b>	<b>6531.5 ± 148.6</b>	<b>2374.2 ± 123.8</b>

Capital letters: Means within the same column carrying different letters are significantly different at ( $P < 0.05$ ).

**Table 13:** Means ± SE of TC, TR and NP (EGP)/kg among governorates and years

Effects		No.	TC/kg	TR/kg	NP/kg
Governorate	El Sharkia	35	16.34 <sup>A</sup> ± 1.11	25.35 <sup>A</sup> ± 1.06	9.01 <sup>A</sup> ± 0.98
	Ismailia	17	13.91 <sup>AB</sup> ±1.39	22.47 <sup>B</sup> ± 1.32	8.56 <sup>A</sup> ± 1.23
	Kafr El-sheikh	12	13.12 <sup>B</sup> ± 1.43	20.28 <sup>B</sup> ± 1.36	7.16 <sup>B</sup> ± 1.26
Year	2015	7	11.56 <sup>B</sup> ± 1.42	15.93 <sup>B</sup> ± 1.35	4.37 <sup>B</sup> ± 1.25
	2016	57	15.53 <sup>A</sup> ± 0.55	24.58 <sup>A</sup> ± 0.53	9.06 <sup>A</sup> ± 0.48
<b>Overall</b>		<b>64</b>	<b>15.09 ± 0.06</b>	<b>23.63 ± 0.59</b>	<b>8.54 ± 0.44</b>

Capital letters: Means within the same column carrying different letters are significantly different at ( $P < 0.05$ ).

### Conclusion:

The current study showed that fish farm locality has a notable effect on the productive and economic parameters of fish farms. Regarding total fish production, Kafr El Sheikh governorate had the highest amount of fish production, while El Sharkia was the lowest. From the results of analysis of locality effect on economic parameters (TC, TR and NP (EGP)/ kg), it is concluded that although El Sharkia governorate had the highest value of total cost (16.34 EGP) and Kafr El Sheikh governorate had the lowest one (13.12 EGP), the highest profit recorded was in El Sharkia governorate (9.01 EGP). One possible explanation to this, is the higher selling price / kg in El Sharkia governorate.

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### مقارنة الكفاءة الانتاجية والاقتصادية لبعض مزارع أسماك المياه العذبة بمحافظة الشرقية ، و كفر الشيخ

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المعمل المركزي لبحوث الثروة السمكية، العباسية ، الشرقية ، مصر

يعتبر الاستزراع السمكي احد الادوات التي تستخدمها الحكومة لتوفير الاحتياجات من البروتين للاجيال الحالية و القادمة. وقد استهدف هذا البحث دراسة كفاءة الاستزراع السمكي في المياه العذبة في ثلاث محافظات : الشرقية , الاسماعيلية , كفر الشيخ خلال الفترة من 2015 الى 2016. تم تجميع البيانات الاقتصادية و الانتاجية من السجلات الخاصة بعدد 64 مزرعة اسماك بالاضافة الى استبيان بحثي. تم تطبيق اختبار تحليل التباين احادي الاتجاه. تم عمل التحليلات الاحصائية باستخدام برنامج SPSS . اظهرت الدراسة ان موقع المزرعة له تاثير واضح على المقاييس الانتاجية و الاقتصادية لمزارع الاسماك في المياه العذبة. بالنسبة لانتاج الاسماك الاجمالي كانت محافظة كفر الشيخ هي الاعلى في الانتاج وكانت محافظة الشرقية هي الاقل. بالنسبة لتاثير موقع المزرعة على مقاييس الكفاءة الاقتصادية (التكاليف الكلية، العائد الكلي، صافي الربح لكل كجم ) ، اظهرت الدراسة ان محافظة الشرقية كانت الاعلى في صافي الربح لكل كجم (9.1 جنيه مصري) على الرغم من انها كانت الاعلى في التكاليف الكلية لكل كجم (16.34 جنيه مصري). من الممكن تفسير ذلك باعتبار ان محافظة الشرقية كان لديها اعلى سعر بيع لكل كجم من بين المحافظات محل الدراسة. في ضوء هذه الدراسة يجب على الحكومة تشجيع الاستثمار في الاستزراع السمكي في المحافظات محل الدراسة حيث وجد ان الاستزراع السمكي في المياه العذبة في هذه المحافظات من المشروعات المربحة.