Profitability Analysis of *Argyrosomus regius* Farming in the Earthern Ponds at the Western Region of Port Said, Egypt

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ABSTRACT

Fish farms located in the western region of Port Said (About 2579 feddans) provide the greater part of marine aquaculture production in Egypt. Almost all farms of this area are extensive polyculture earthern ponds, using fry exclusively from wild sources. The two species of mullet, bouri (*Mugil cephalus*) and tobar (*Mugil capito*), account for the majority of their output followed by meagre meagre (*Argyrosomus regius*), in addition to other species such as seabass (*Dicentrarchus labrax*) and gilthead seabream (*Sparus aurata*). This study aimed to examine the economic potential of these farms using structured questionnaire. Data was collected from randomly selected 10 fish farmers during the period from March to October 2011. The collected data was analyzed using descriptive statistics, budgetary techniques and correlation analysis. The descriptive analysis showed that majority of farmers had either no schooling (40.0%) or medium schooling (40%). Almost all farmers (90%) feed their fish once daily. The majority finances their fish production through personal savings (70%). Profitability analysis revealed that the cost of feeds accounted for the largest proportion (68%) of the total cost of fish production followed by cost of fixed input and variable coast (12%), then fingerlings (7%) and labour (1%). Significant relationship was observed between fish production and labour, education status and ratio of used ponds. The results showed that fish production in the study area is economically rewarding and profitable.

Keywords: Economic efficiency, *Argyrosomus regius*, earthern fish pond, Port Said.

INTRODUCTION

the Egyptian Mediterranean coast, Port Said is considered as one of the most productive fishing ground. About 25% of the total fish production in the Egyptian Mediterranean sector comes from Port Said. Port Said derives its fish production from four main resources; Mediterranean Sea, Lake Manzala, Port Fouad Lake and aquaculture with main annual fish production of about 8000, 1500, 170 and 15000 ton, respectively (GAFRD;

1999:2006). It is obvious that fish production of aquaculture sector (represented by licensed fish farms) exceeds that of fisheries by about one and half times.

The licensed fish farms in the western region of Port Said are about 2579 feddans (127 fish farms). They licensed as marine water fish farms and lie between the old way of Damietta and the new highway. These farms are rented from GAFRD by the inhabitants of three villages namely from the east to the west: El-Garabaa, El-Manasra and El-Dieba. The total area of these villages is about 10 km with population of about 40-50 thousands, all of them live on the fish and about 10000 fish farmers work in these fish farms. Many illegal or non-licensed fish farms exceed this area were established to the south of Lake Manzala and around Bahr El-Baqar drain (about 11 thousands feddans). Also the agricultural land which lie south of Port Said are used as fish farms.

Almost all farms of this area are extensive polyculture ponds, using fry exclusively from wild sources. The main farmed species are: meagre (*Argyrosomus regius*), two species of mullet, bouri (*Mugil cephalus*) and tobar (*Mugil capito*), seabass (*Dicentrarchus labrax*) and gilthead seabream (*Sparus aurata*). This area provides the greater part of marine aquaculture production in Egypt. The two species of mullet account for the majority of output followed by meagre.

Around 420 hectares of earthen ponds in the Dibah Triangle Zone (Damietta and Port Said Governorates) are cultured with meagre each year, as capture based aquaculture, with a potential production of around 3000 ton/year, and an average production of 5–7 ton/ha/year. The culture is based on the collection of wild finfish fry and juveniles along the Nile delta, which represents the reproduction and nursery area in the eastern Mediterranean (El-Hehyawi, 1974). Between 2 to 5 million fry and fingerlings catch per year were estimated by Sadek et al. (2009).

This survey will describe the socioeconomic status of fish farmers in western region of Port Said, examine the determinants of fish output in the surveyed area and determine the profitability of fish farming. The purpose of the present survey is to help improve the exploitation and investment of this area by enhancing its production. This study will assess the overall potential of marine water fish farms, define what is needed to achieve development of their productivity, and identify any barriers toward this goal by:

1. Identify the main challenges and obstacles facing fish farmers and suggest practical solution for them.

2. Address the major benefits and opportunities that can be realized as marine fish farms grow in this region.

3. Clarify the importance of these fish farms as an important source of valuable marine species fishes.

4. Address the need for a scientific approach to handle the development and improvement of fish farms along with fish farmers.

Address needs for public education and technical assistance/information needs of aquaculture.

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MATERIALS AND METHODS

This survey was carried out in farms located at the western region of Port Said during the period from March to October 2011, using primary and secondary data. The main way for collecting the primary data was structured questionnaire. The questionnaire was prepared to evaluate the level knowledge of fish farmers in fish production and determine its relationship to some independent variables related to them at the study area and the most problem that face them. Information was collected on fish farming and socio-economic characteristics of fish farmers through personal interview. A total sample of 10 fish farmers was randomly selected. The primary data were complemented with secondary data from publications, past literature and Central Bank of Egypt.

1.   ***The Construction of Questionnaire***

The questionnaire constructed for this survey covered the following elements:

1.1.   *Socio-economic characteristics*
- Age, marital state and household size
- Education
- Farming experience
- Training

1.2.   *Farm information*

- Possession of the farm
- Farm size
- Number of constructed ponds and number of used one

1.3. *Fish production information*

- Fry source , costs and quantities
- Feeding source , costs and quantities
- Pond aeration
- Labor
- Fish production

2.   Analysis of Results

2.1 Descriptive statistics

Descriptive statistics done by using mean, frequency and percentages to identify Socio-economic characteristics of the respondents in the study area viz; age, educational level, farm size etc., and the problems affecting the fish farming in the area.

2.2 Budgetary technique

The budgetary technique which involves the cost and return analysis was used to determine the profitability of fish farming in the study area. The model specification is given as:

$$\Pi = TR-TC \dots\dots\dots\dots\dots\dots\text{Equation 1}$$

$$TR = PQ \dots\dots\dots\dots\dots \text{Equation 2}$$

Where: Π = Total Profit
    TR = Total Revenue
    TC = Total Cost
    P = Unit price of output
    Q = Total quantity of output

2.3 The statistical analysis

Pearson Product Multiple correlation analysis (R^2), were conducted on the obtained data from the questionnaire to determine the influence of socioeconomic factors on the fish output level using SPSS program.

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3. *Research hypothesis*

H_0: There is no significant relationship between level knowledge of fish farmers and the production, educational level, age, pond size, years of experience and amount of available knowledge.

H_1: There is a significant relationship between the quantity of fish produced and the production, educational level, age, pond size, years of experience and amount of available knowledge.

RESULTS AND DISCUSSION

1. *Descriptive Analysis*

Evidence from the descriptive analysis of socio-economic characteristics of respondents in the study area (Table 1) shows that fish farmers whose ages ranged from 30 to 50 years represented the majority (70.0 %) with average age of 45 years. Thus, the most farmers fall in the economically active group (20–50 years). The implication of this is that, most farmers are still in their active age and therefore, there is tendency for more productivity in fish farming in the study area. The result of the marital status shows that 100% of the fish farmers were married.

The distribution of the household size indicates that the household size ranged from 2 to 5. This figure is expected to enhance the use of more family labor in the fish farming operations, thereby leading to reduction in the use of hired labor among in the study area.

Concerning the education and training, all farmers except one, had no

formal training in addition to poor educational status for the majority of them (40.0% had no schooling and 40% had medium schooling). These results indicate the difficulty in the adoption of new technology/innovation by the farmers which lead to reducing the expected productivity of fish farming in the area.

All farms have been rented from the General Authority for Fish Resources Development (GAFRD). This might have impact on the level of efficiency and the level of dedication to farm profitability, based on the fear of uncertainty by the government policy on the Usage of the land viz, revocation, review of land rent fee, tax imposition on the rented land.

While the average farm size was found to be 16.5 feddan, the majority of fish farm sizes fall within 1-10 feddans (40%). The average size therefore suggests good economic returns to the farmers if efficiently used.

All fish farmer obtain their fingerlings from fry dealer, while 90% purchased the feeds and 10% used purchased food and household wastes the descriptive analysis also indicates that most fish farmers (90%) feed their fish once daily to achieve high yield.

The majority finances their fish production through personal savings (70%). while some with (20%) used personal savings and credit facilities. The availability of credit facility to farmers is expected to boost fish productivity if it is utilized judiciously

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Table 1: Socio-economic characteristics of farmers in the western region of Port Said

Parameters	Range / Classification	Frequency	Percent (%)	Cumulative percentage
Age of respondents	30-40	3	30	30
	40-50	4	40	70
	50-60	3	30	100
Marital status	Single	0	0	0
	Married	10	100	100
Education	No schooling	4	40	40
	Medium school	4	40	80
	High school	2	20	100
Training	No training.	9	90	90
	Private training.	1	10	100
Farm Size (feddan)	1-10	4	30	40
	11-20	3	30	70
	21-30	3	30	100
Number of ponds	1-5	2	20	20
	5-10	0	0	20
	10-15	5	50	70
	15-20	3	30	100
Fry source	Fry dealer	10	100	100
	Private Hatcheries	0	0	100
Ratio of used ponds	50-25	3	30	30
	75-50	4	40	70
	100-75	3	30	100
Feeding source	purchased	9	90	90
	household wastes	1	10	100
Feeding times (days)	Once	9	90	90
	twice	1	10	100
Pond aeration	Solar machine	10	100	100
	Electricity machine	0	0	100
Labor	No labor	6	60	60
	2	2	20	80
	4	2	20	100
Feddand production (ton)	1-1.5	1	10	10
	1.5- 2	7	70	80
	2-2.5	2	20	100

2. *Profitability Analysis*

The study examines the profitability of fish production in the study area. To determine the profit level, attempts were made to estimate the cost and return from fish farming (Table 2). The input used, cost, yield or output data generated from the farmers were used to undertake the cost and return analysis for assessing the profitability of fish production in the study area.

The result reveals that the cost of feeds accounted for the largest proportion (68%) of the total cost of fish production. This is followed by cost of fixed input and variable coast (12%). Then fingerlings (7%) and labour (1%). This clearly shows that large amount of money is spent by fish farmers in the study area for purchase feeds. The fixed cost of production consists of cost of fixed assets such as pump, and pond rented which accounted for 12% of total production cost.

This result is consistent with the finding of Ashaolu et al. (2006) from their studies on profitability on fish farming. The rate of return per capital invested (RORCI) is the ratio of profit to total cost of production. It indicates what is earned by the business by capital outlay (Awotide and Adejobi, 2007). The result revealed that the average RORCI of 117% is greater than the prevailing bank lending rate, 8% implying that fish farming in the study area is profitable (Table 2). If a farmer takes loan from the bank to finance fish farming, he will get profit after paying back the loan at the prevailing interest rate.

Table 2: *Average cost and return of fish production*

Item (Annual)	Cost (LE)	% of total coast
Feeds	290909.1	68
Fingerlings	29090.9	7
Labour	3109.1	1
Total variable cost	50937.3	12
Fixed inputs	49382.7	12
Total cost	229138.0	
Total returns	490000.0	
Profit	260862.0	
ROI bank	8%	
ROIC	117.3%	

3. Multiple Regression Result

The correlation analysis was carried out to examine the determinants of factors effecting fish output in the study area. The correlation result revealed that fish output is significantly determined by labour used, education status and ratio of used ponds (Table 3). The coefficients are in line with a priori expectation. Hence, the more the amount expended on labour, education and ratio of used ponds, the more the amount that will be realized from fish farms in the survey area. The result is consistent with the finding of**.**

The result equally suggests the need for fish farmers to enhance more of these inputs (labour used, education status and ratio of used ponds) to increase their revenue from fish production. Similarly, policies that will ensure availability of these inputs to fish farmers at affordable price should be put in this place. The positive relationship between labours used in pond indicates that with increase in the labour used in pond, more fish will be produced. Based on the significance of labour used at 0.01 level, the null hypothesis that the fish output is not affected by the quantity of labour used is rejected and the alternative is accepted (Table 3).

CONCLUSION AND RECOMMENDATIONS

This recommendations flow directly from the challenges and critical factors that farmers facing in the survey area, which indicate that fish production is economically rewarding and profitable despite problems and challenges. It is available and attractive to who want to invest in this area and also improving the standard of living of the people.

All farmers use natural food in feeding *Argyrosomus reguis* which is not available all the year also its price ranked the most value in farm coast. All fingerlings were from illegal source which dependent on wild resources and may bring a lot of diseases to the farm.

The shortage of labour number is come from using their children as labour in the farm which indicates most people who work in this region have been doing this from their childhood.

Appropriate training programme on fish production and culture techniques should be organized for fish farmers and labour in the study area for improve their skills and uses of new technology which may be possible to expand aquaculture production.

Table 3: *The correlation analysis of survey parameters in western region of Port Said*

Correlations

		age	study	Fsize	Ratio	labour	production
age	Pearson Correlation	1	-.463	.192	.024	-.108	-.348
	Sig. (2-tailed)		.178	.596	.947	.766	.325
	N	10	10	10	10	10	10
study	Pearson Correlation	-.463	1	-.164	.523	.702[*]	.678[*]
	Sig. (2-tailed)	.178		.650	.121	.024	.031
	N	10	10	10	10	10	10
Fsize	Pearson Correlation	.192	-.164	1	.261	.319	.308
	Sig. (2-tailed)	.596	.650		.467	.369	.386
	N	10	10	10	10	10	10
Ratio	Pearson Correlation	.024	.523	.261	1	.828[**]	.747[*]
	Sig. (2-tailed)	.947	.121	.467		.003	.013
	N	10	10	10	10	10	10
labour	Pearson Correlation	-.108	.702[*]	.319	.828[**]	1	.794[**]
	Sig. (2-tailed)	.766	.024	.369	.003		.006
	N	10	10	10	10	10	10
production	Pearson Correlation	-.348	.678[*]	.308	.747[*]	.794[**]	1
	Sig. (2-tailed)	.325	.031	.386	.013	.006	
	N	10	10	10	10	10	10

[*]. Correlation is significant at the 0.05 level (2-tailed).

[**]. Correlation is significant at the 0.01 level (2-tailed).

Many farms are not on the electricity grid, and are prevented from installing electricity on rented land. This means that their power costs are increased through the need to use generators for the considerable amounts of power needed to pump water. Furthermore, fuel used to power water pumps is considered expensive by farmers, and is periodically unavailable in some locations, consideration could also be given to the introduction of alternative power sources such as wind and solar power, and as such sources could generate efficiencies over both powers from the electricity grid and from generators.

It is recommended that the General Authority for Fish Resources Development (GAFRD) that own land which they rent to fish farms, consider increasing the duration of their lease periods so as to provide greater security to fish farmers.

Therefore, government participation in fish farming should be encouraged in the area extension services so that new techniques would be adopted in the area to boost the quantity of fish available for consumption from *Argyrosomus reguis*. Finally with respect to benchmarking, this survey data may be helpful in the monitoring, evaluation and development of the surveyed area.

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تحليل الربحية الانتاجية لسمك اللوت المستزرع فى الاحواض الترابية بمنطقة غرب بورسعيد ،مصر.

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أجريت هذه الدراسة في المنطقة الغربية من بورسعيد(حوالي ٢٥٧٩ فدان) تمثل جزء كبير من إنتاج الاستزراع المائي البحري في مصر،تقريبا جميع المزارع في هذه المنطقة هي أحواض ترابية واسعة متعدد الأنواع، وذلك باستخدام اليرقات من مصادر برية البوري وطوبار يشكلون الأغلبية من إنتاجها تليهم سمكة اللوت بالإضافة إلى الأنواع الأخرى مثل القاروص والدنيس . تهدف هذه الدراسة إلى دراسة الإمكانيات الاقتصادية لهذه المزارع باستخدام استبيان منظم. وقد تم جمع البيانات من عينة عشوائية ١٠ من مزارعي الأسماك خلال الفترة من مارس إلى أكتوبر ٢٠١١. تم تحليل البيانات التي تم جمعها باستخدام الإحصاء الوصفي، وتقنيات الميزانية وتحليل الارتباط. أظهر التحليل الوصفي أن الغالبية العظمى من المزارعين كانوا إما لم يلتحقوا بالمدارس (٤٠,٠٪) أو الدراسة المتوسطة (٤٠٪). تقريبا جميع المزارعين (٩٠٪) يقوموا بتغذية الأسماك مرة واحدة يوميا. غالبيتهم يمول إنتاج الأسماك من خلال المدخرات الشخصية (٧٠٪). وكشف تحليل الربحية أن تكلفة الأعلاف تمثل أكبر نسبة (٦٨٪) من التكلفة الكلية للإنتاج الأسماك تليها تكلفة المدخلات الثابتة والمتغيرة الساحل (١٢٪)، ثم الإصبعيات (٧٪) والعمل (١٪) . وقد لوحظ علاقة ذات دلالة إحصائية بين الإنتاج السمكي والعمل والحالة التعليمية ونسبة الاحواض المستخدمة. وأظهرت النتائج أن إنتاج الأسماك في منطقة الدراسة هو مجز من الناحية الاقتصادية ومربحة.