Economic Impact of Lake Edku Pollution

El-Tatawy Nashwa

Economics and Agribusiness Dept., Faculty of Agricalture, Alexandria University, Egypt

Abstract

Edku lake lay on the west branch of rashid, 40 km from Alexandria governorate, the lake relate to northern side of the western Mediterranean Sea through Almadia Bogaz. As for the sources of water supply is from salt and fresh water. This paper aims to shed light on the effect of Edku lake pollution and compute the effect on lake pollution on income and Maximum sustainable yield and the expected production under these conditions in 2015.

Keywords: Edko lake-fish production-impact of pollution- Maximum sustainable yield-Egypt

1. Introduction

In the last two decades several studied has been carried out on the lake Edko pollution. Most of these studied concerned with the technical component of that pollution i.e. toxicity, water quality and effect on biological conditions. Nevertheless a very few studies has concerned with the economic aspects of the fishery pollution. None of the published studies had concerned with the social effects of the lake pollution.

As the welfare of both economy-and individuals is the end purpose of the sustainable development, Socio-economic aspects should be considered by every plan for the development and rehabilitate of the lake. The objectives of this study are:

1. To investigate the effect of the pollution on production and productivity.
2. To define and compute the prevailing output-input relationships under pollution.
3. To define and measure the economic impact of the lake pollution on income.
4. expected production of lake Edko under the pollutio

2. Material and methods

Data required was collected from the fish statistical reports of the national institute of oceanography and fisheries, central agency for public Mobilization and statistics and from published papers and studies on Lake Edko pollution. Data collected the period 1985-2010.

Descriptive statistical analysis was carried out to identify the pollution effect on production, Labor and capital. The Econometric analysis was utilized to identify and compute the output-input relationship. The ordinary least squares (OLS) was the method of parameters estimation. The study has utilized the descriptive as well as the quantitative methods in the analysis. The simple as well as the multiple regressions have been used to estimate the functions. Different functional forms have been estimated using static as well Double Exponential Smoothing.

3. The impact of pollution on production

The historical data on production is graphically represented in Figure (1). The data can be distinguished into three time periods. The first from 1985 to 1992 reflects a slow decreasing trend of production. The second from 1993 to 2003 reflecting an increasing trend and the period from 2004 to 2010 this reflects a dramatically decreasing production trend.

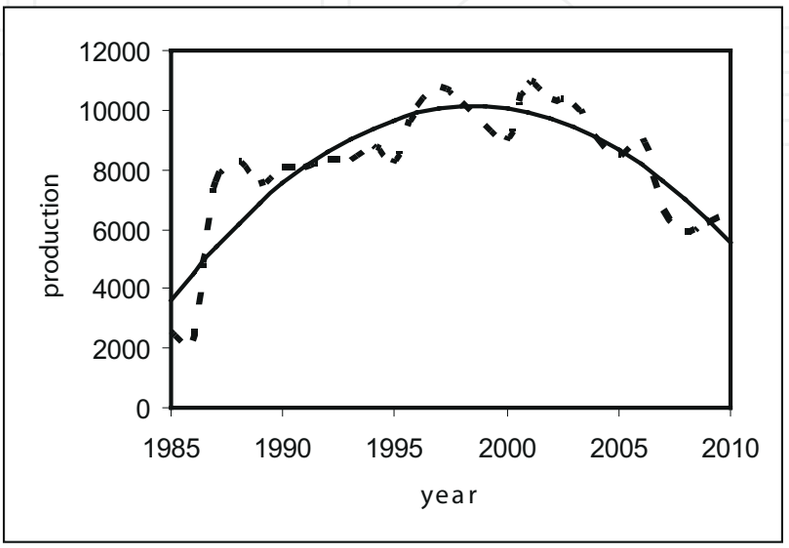

Fig 1. Production trend of lake Edko

Table (1) shoes the descriptive statistics of the previous three periods. The statistics reflects the features of every period. The overall trend of production during the hall period (1985-2010) can be represented by the following equation:

$$Y = 2627.72 + 1028.19\ t - 35.24\ t2$$

(8.67) ***, (8.27) ***

R^{-2}=0.77, F=37.75***

Where: Y: production T: time ( ) ***: t values significant at (0.01) level.

Main statistics	1985-92	1993-2003	2004-2010
Minimum (ton)	2210	8209	5886
Maximum (ton)	8300	10910	9056
Mean (ton)	6758	9808	7395
Standard deviation	2488	908	1388
Coefficient of variation	36.82	9.25	18.77

Table 1. Main statistics of the three time periods of production

Source: computed from: Central Agency for public Mobilization and statistics (CAPMAS) annual fishery statistics.

4. The development of productivity

Productivity is a measurement of efficiency which affects profitability. Total factor productivity refers the amount of production to all factors of production (Land, Area, Capital...). Partial factor productivity refers production to only one of the factors of production. Due to lack on proper data needed for computing total factor productivity, only partial productivities are computed. Table (2) summarizes the descriptive statistics of this productiveness. it is clear to notice the declining of the three partial productivities particularly from 1997 to 2010.

	Labor Productivity	Capital Productivity	Hectare Productivity
Minimum (ton)	2.13	6.35	1.21
Maximum (ton)	3.67	10.99	1.93
Mean (ton)	2.68	8.14	1.55
Standard deviation	0.42	1.19	0.23
Coefficient of variation	15.68	14.62	14.84

Table 2. Descriptive Statistics for productiveness

Source: computed from: CAPMAS, annual fishery statistics, and National institute of oceanography and fisheries, Annual fishery estimation reports.

The Maximum Labor productivity (i.e. per capita production) amounted to 3.67 ton in 2001. The minimum was 2.13 in 1998. The Maximum per boat production (capital productivity) amounted to 10.99 ton in the same year 2001 and only 6.35 ton in 1998. The maximum production per Hectare.

Of the lake reached 1.93 ton in 2001 and only 1.21 ton in 2008. The previous result confirms the detraction of the lake productivity due to the increasing pollution particularly in the last decade.

5. The relationship between production, Labor and Capital

In spite of declining of production and productivity the fishery, particularly in the last ten years, the labor and capital (the number of boats) in the fishery has taken a rapidly increasing trend.

	The equation	R-2	F
1	log Y = 8.35 + 0.73 log L (2.01)*	0.19	4.04*
2	log Y = 7.22+ 0.88 log C (2.4)**	0.27	5.75**
3	log Y = 6.60 + 1.443 log L – 0.55 Lon C (1.20) (-0. 49)	0.22	2.83*

Table 3. The relationship between production, Labor and Capital

Number between bracts are the t values

* significant at the (0.1) probability level. * *significant at the (0.05) probability level

Technique was utilized to estimate the quantitative relationships between production & labor and capital for the period 1997-2010. Results or shown in Table (3).

Equation (1) and (2) characterize one input-output relationship. The coefficients of labor (L) and No. of boats (C) are negative. This means that the marginal product as well as the elasticity is negative. In another word, the value of marginal product is actually less than the opportune cost of labor and capital. It can be concluded that under prevailing conditions of the fishery if labor and capital is reduced the production would not decrease. Equation (3) is a two input-output relationship. Although the equation represents positive Marginal product of labor, however it is not statistically significant, therefore it was interpreted.

$$Y = 10.73 - 0.003\,F$$

$$(-2.17)^{**}$$

$$R^{-2} = 0.18,\ F = 4.72^{**}$$

Where: Y : production (catch)F : effort(number of boats) ( )** : t values significant at (0.05) level.

Maximum Sustainable yield(MSY) will be 9594 ton and it was not happened in this period ,and Maximum Effort which make this Sustainable yield will be 2104 boats.

The study has been estimated fish production using static as well Double Exponential Smoothing as seen in table (4).

Year	Production Ton	No. of boats
2012	5188	690
2013	4748	640
2014	4308	590
2015	3868	541

Table 4. expectation of fish Production , and the number of boats in lake edko

Source: computed from: CAPMAS, annual fishery statistics, and National institute of oceanography and fisheries, Annual fishery estimation reports.

6. Economic impact of the lake pollution

The losses due to pollution can be measured the difference between the maximum value of production before pollution and the yearly values after pollution.

The Maximum production during the period 1997-2010 was 10784 ton in 1997. The minimum o the other hand was 5886 tons in 2008. Therefore 1997 were considered as a base year (minimum pollution). Table (4) represents the economy losses due pollution during 1997-2010. The economy losses amounted to 6.70 Million dollar in 2007. The economy losses reached 6.70 Million dollar at current prices in 2007. The whole losses during the period 1997-2010 reached 42 Million dollar. The expected economy losses will reach 6916 ton, the value of this loss will reach9.31 Million dollar at current prices in 2010. The whole losses during the period 2012-2015 will reach18.11 thou-

sand ton, the value of this loss will reach 244 Million dollar at current prices in 2010.

7. Summary and conclusion

Edku lake was one of the richest lakes fish in Egypt ,especially marine fish , accounted for its contribution to Egyptian fish production about 3.5%during 1985,as a result of exposure to the pollution problem and constrains in production ,this ratio reached about 1%in 2010, so that this paper aims to shed light on the effect of Edku lake pollution and compute the effect on lake pollution on income and Maximum sustainable yield and the expected production under this conditions in 2015 to identify the constrains and problems that led to this decline and to development of fish production of Edko lake.

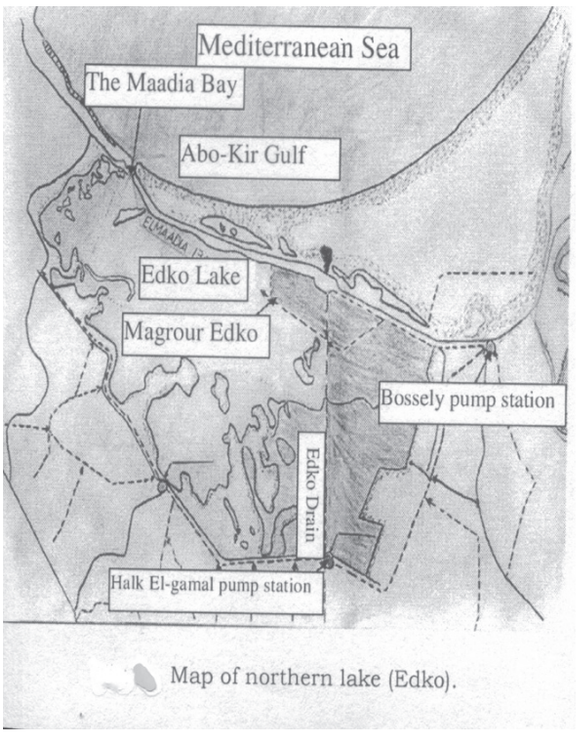

Fig 1. Map of northern lake (Edko)

Year	Production (ton)	Deviation from base year (ton)	Economy Losses Value (1000$)*
1997	10784	-	-
1998	10280	504	949
1999	9494	1290	2457
2000	8922	1862	4173
2001	10510	174	428
2002	10336	448	780
2003	10230	554	710
2004	9056	1728	2191
2005	8490	2294	3019
2006	8986	1798	2886
2007	6645	4139	6709
2008	5886	4898	6020
2009	6206	4578	6308
2010	6493	4291	5776

Table 5. National welfare losses due to lake pollution

*Deviation from base year X average price per ton

Source: Computed from: CAPMAS, annual fishery statistics, and National institute of oceanography and fisheries, Annual fishery estimation reports.

8. References

[1] Central Agency for public Mobilization and Statistics, Annual Fishery Statistics.

[2] David. L. (1988). Production Economics, Mac Millan, New York.

[3] El-Caryony , E., (1986), Bioeconomic Analysis of fishery Management in lake Mariut (Egypt) Ph.D. thesis, Olsztyn, Poland.

[4] El-Mallah,G.,S.Fattouh and Nahwa El-Tatawy, (April,1998) Economic impact of lake Marut pollution, Mansoura,J.Agric.sciences,Vol.19,No.(4), Mansoura University..

[5] El-Sharkawy, F. (1978). Final report on the study of: Pollution of lake Mariot Due To Sewage and Industrial Wastes, The High Institute of Public Health and Academy if Scientific Research and Technology, Alexandria.

[6] Gamil, H. and El-Karyony. L. (1994) Phosphor, Nitrogen, Loading and trend of fish catch as index of Lake Mariot Eutrophication.

[7] Hanaw, A. and Rustemyer, F. (1975). Productivity: Definition, Measurement, use, Agrarwirtshaft, Hanover (in German).

[8] H.M. Nagy, S.A. Kantoush and K. Watanabe, (2003). Simulation for flood routing and tidal propagation in coastal drains, Alexandria Engineering Journal, Vol., 42.

[9] National Institute of Oceanography and Fisheries, Annual Fishery Estimation Reports.

[10] Shimaa Ameen, (2009). An economic study for the production and marketing of fish in Lake Edco, the Degree of Master of Science In Agricultural economics, dept. of agric. Alex. University, Alex. Egypt.

[11] Tomas,G.H,El-Caryony,I.A ,Fisheries of the Egyptian Northern Delta Lakes during (19621989),Alex,J.Agric.Res.,Vol.40,No.(1),Alexandria Journal of Agricultural reseaech,Alex. University,April,1995.