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The Economics of Egyptian Fish Production and its Foreign Trade

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ABSTRACT

The Egyptian fish production is estimated at 1402, thousand tons , while the disposable consumption in Egypt is about 5.9% of the average of about 1642, thousand tons and an average per capita in Egypt is approximately 18.3 kg annually and increases Egyptian imports annually at a rate of 7.7% of the average amount of imports of about 259.5 thousand tons for export Egyptian annually by about 12.8% of the average Egyptian exports of 19.6 thousand tons of fish The deficit in the value of the commercial balance is about 410.3 million dollars for the average study period (2005-2019). This research aims to identify the main features of fish production in Egypt during the study period and to highlight the most important ways and axes necessary for the development of fish production in Egypt, as well as clarifying some obstacles to fish development in Egypt and achieving the highest return from Egyptian fish exports or lowering the value of Egyptian fish imports during the study period using Linear programming. The study showed that the model of the least quantity of Egyptian fish importing countries is the best model in the case of maximizing the value of Egyptian fish exports. By performing the linear programming process after adding these parameters, the obtained results indicated that This model included the distribution of Egyptian exports of fish to lesser countries Quantity so that the highest net return from Egyptian fish exports can be achieved, and is estimated The target function of this model is about 38.548 million dollar, more than the value of the target function The actual model is about 0.197 million dollar. The increase of this model over the actual model was achieved by 0.514%, which confirms the priority of the first model. The model also shows that it is possible to increase Egyptian exports of fish to Lebanon, Morocco, Bahrain, UAE and Qatar. While it turns out that the value of Egyptian imports of fish can be reduced by using the higher-priced imports model. By performing the programming process after adding these parameters, the results indicated It should be that this model included an estimate of the target function of this model at about 502.7 million A dollar decrease from the value of the target function of the actual model by about 128.8 million dollars, and this decrease represents about 25.6%, which means that the second model is better than the first model to achieve a decrease in the return from Egyptian imports of fish. The model shows that it is possible to increase Egyptian imports of fish from the United States of America, India, South Korea, Yemen, Taiwan, the United Kingdom and the United Arab Emirates.

Keywords: Fish trade balance -Fish food gap-Self-sufficiency

Introduction

To cover Egypt's needs of fish. During the study period, which runs from 2005 to 2019, it shows an increase in fish production from 889.3 thousand tons in 2005 up to 2036 thousand tons in 2019, The annual rate for Egyptian fencing is more than 5.6% Although Egypt has wide areas of water bodies, some of these areas are natural that include the seas, lakes and the River Nile and its branches, and some other areas are that unnatural include aquaculture in different types. On the other hand, fish production is not enough of the average production of 1402, thousand tons for the medium period (2005-2019) While the disposable consumption in Egypt is about 5.9% of the average of about 1642, thousand tons and an average per capita in Egypt is approximately 18.3 kg annually and increases Egyptian imports

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annually at a rate of 7.7% of the average amount of imports of about 259.5 thousand tons for export Egyptian annually by about 12.8% of the average Egyptian exports of 19.6 thousand tons of fish The deficit in the value of the commercial balance is about 410.3 million dollars for the average study period (2005-2019).

Problem of the study

Despite the vast areas that Egypt enjoys from coasts to seas and rivers, the production of them represents 26.2% of Egypt's total fish production. Egypt suffers from a large defect in the fish trend balance which reached of about 590.2 million dollars, and a decrease rate of fish export coverage of the import which about.

Objective of the Study

This research aims to identify the main features of fish production in Egypt during the study period and to highlight the most important ways and axes necessary for the development of fish production in Egypt, as well as clarifying some obstacles to fish development in Egypt and achieving the highest return from Egyptian fish exports or lowering the value of Egyptian fish imports during the study period using Linear programming.

Methodology of the and Data Sources

The research, on achieving its goals, depends on the methods of economic descriptive and statistical analysis, using the models time trend equations. In addition to using linear programming to achieve the highest return from Egyptian fish exports and reduce imports.

The research data was obtained from the Ministry of Agriculture, the food balance, and from the foreign trade bulletins of the Central Agency for Public Mobilization and Statistics.

The Development of some Productive and Consumer for Fish in the Arab Republic of Egypt

Fish is produced in Egypt from two main sources, one of which is natural sources (seas, rivers and lakes) and the second source is fish farms. The first source produces about 367 thousand tons, while fish farms produce about 1034 thousand tons, representing about 73.8%, while natural fisheries represent 26.2% of the average production The Egyptian fisheries amounting to about 1401 thousand tons for the average from natural fisheries, which means that fish production from them revolves study period (2005-2019). Equation No. (1) Shows the uncertainty of the statistical increase in the quantity of production from farms the fish, which amounts to about 79.1 significance of fish production around its arithmetic average, which calls for increased attention to natural fisheries, while Equation No. (2) Shows a statistically significant annual thousand tons, represents about 7.6% of the average of about 1034 thousand tons, which shows its impact on the total Egyptian fish production. Equation No. (3) shows the statistically significant annual increase, which amounts to 79.2 thousand tons, representing about 5.6% of the average study period of about 1401.7 thousand tons.. This Determination Coefficient reached 0.97.While equation No. (4) shows the statistically significant annual increase in the amount of fish available for consumption in Egypt by about 97.7 thousand tons, representing about 5.9% of the average study period of about 1644 thousand tons. This Determination Coefficient reached 0. 94. Which shows that there is a fish gap as in equation no. (5), where it is clear that the quantity of the gap is increasing annually by 18.5 thousand tons, representing about 7.6% of the average Egyptian fish gap, which amounts to about 242.6 thousand tons. As for the self-sufficiency of fish in Egypt, it swings towards the arithmetic average of about 85.6%, while equation No. (7) Shows that there is a statistically significant annual increase in what concerns the Egyptian individual of fish, amounting to about 0.364 kg, representing about 1.99% of the average per capita share. The total weight is about 18.3 kg during the study period (2005-2019).

The Development of the quantity and value of Egyptian imports and exports of fish during the period (2005-2019).

It is clear from Table No. (2) That the amount of fish imports to the Egyptian market is increasing annually at a rate of 20.1 thousand tons, representing about 7.7% of the average amount of fish imports, amounting to about 259.5 thousand tons, This Determination Coefficient reached 0. 62. while the annual increase in the value of Egyptian fish imports is about 45.3 million dollars, representing about 10.5%

of the average value of about 432.9 million dollars. On the other hand, the annual increase in Egyptian fish exports is estimated at about 2.5 thousand tons, representing about 12.8% of the average exported quantity, which amounts to about 16.6 thousand tons. The annual statistically significant annual increase is estimated at about 3.1 million dollars, representing about 13.8% of the average value of the fish exported, which is about 22.6 million dollars. As a result, the annual deficit in the Egyptian fish balance amounted to about 42.2 million dollars, representing about 10.3% of the average deficit value of about $410.3 million during the period (2005-2019).

Table 1: General Time Trend Equations for the Quantity of Production, Consumption Self-sufficiency of Fish during the Period (2005-2019)

N	Variable	Equation	R^2	Average	Annual Changing Rate
1	The quantity of the production of natural fisheries (thousand tons)	Ŷi =367 + 0.002Xi (0.002)	0.0002	367	0.0004
2	The quantity of fish farms production (thousand tons)	Ŷi =401 + 79.1 Xi ** (21)	0.98	1034.7	7.6
3	The quantity of Egyptian fish production (thousand tons)	Ŷi =768 + 79.2 Xi ** (22)	0.97	1401.7	5.6
4	Quantity available for consumption a thousand tons)	Ŷi =862.2 + 97.7 Xi ** (10)	0.94	16443	5.9
5	The amount of fishery gap (thousand tons)	Ŷi =94.5 +18.54 Xi ** (4)	0.55	242.6	7.6
6	Self-sufficiency%	Ŷi =68.9 -0.168 Xi (0.682-)	0.89	85.6	-0.196
7	per capita per annum of fish kg	Ŷi =15.4 + 0.364Xi * (2.2)	0.28	18.3	1.99

Where Ŷi indicates the estimated value of the dependent variable and Xi refers to the element of time as an independent variable where i (1, 2, 3, 4..... 15.)
** Significant at the level of 1%. * Significant at the level of 5%.
Source: Ministry of Agriculture and Land Reclamation, Economic Affairs Sector, Agricultural Economics Publications, Miscellaneous Editions

Table 2: equations of the general time trend of the quantity and value of Egyptian imports and exports of fish during the period (2005-2019)).

N	Variable	Equation	R^2	Average	Annual Changing Rate
1	The quantity of Egyptian fish Import (thousand tons)	Ŷi =99.5 + 20.1 Xi ** (4.6)	0.62	259.5	7.7
2	The value of imports (million dollars)	Ŷi =70.7 + 45.3 Xi ** (11)	0.90	432.9	10.5
3	The quantity of Egyptian fish exports value (million dollars)	Ŷi =57 + 2.5 Xi ** (9.1)	0.86	19.6	12.8
4	Quantity available for consumption a (million dollars)	Ŷi =2.3 + 3.1 Xi ** (11.8)	0.92	22.6	13.8
5	Fish trade deficit (million dollars))	Ŷi =73+ 42.2 Xi ** (9.8)	0.88	410.3	10.3

Where Ŷi indicates the estimated value of the dependent variable and Xi refers to the element of time as an independent variable where i (1, 2, 3, 4..... 15.)
** Significant at the level of 1%. * Significant at the level of 5%.
Source: Ministry of Agriculture and Land Reclamation, Economic Affairs Sector, Agricultural Economics Publications, Miscellaneous Editions.

The use of linear programming in maximizing the return on Egyptian fish exports

Drafting the model used in the study for the period (2015-2019). To formulate a linear programming method, three parameters must be provided: the objective function, the activities Alternative and limitations of the problem.

Argot indicator

The model used aims to maximize the return on the current Egyptian exports for some types of food. Egyptian fish during the period (2015-2019) Assuming that P represents the price, Q represents the quantity exported to the different countries so the objective function becomes

: £PQ = P1Q1 + P2 Q2 + ……..Pn Qn alternative activities

NS It is considered the most important importing country of fish from the Arab Republic of Egypt As alternative activities, the Egyptian fish importing countries came during the period (201-2015). As follows : Saudi Fish - UAE - Kuwait - Lebanon - America - Jordan - Israel - Italy :- r'v Qatar - China - Morocco - Spain - Vietnam - Bahrain a.

Restrictions

Constraints are divided into the form used for major constraints and additional constraints. Main limitations it is the current import capacity of the most important importing countries previously referred to, and this import capacity was calculated on the basis of the average imported fish already under study from various countries of the world during the period.

Additional restrictions:

These restrictions include the following: A- A restriction on the Egyptian export capacity for fish, and it is stipulated that: The proposed export quantities exceed the annual average of the exported quantity of fish 32,898 thousand tons B- A special restriction on the relative importance of importing countries by maintaining the exported quantities of the most important ones Imported markets, and this restriction means that the average quantity of Egypt's exports of fish to those markets is not less than the total quantities actually exported to them during the period (2015-2019).

: Max Y = p1q1 + p2 q2 + ……..pnqn

Where qn = the proposed quantity of fish to be exported for each importing country
. Pn = Export price per ton in dollars for each fish-importing country.

Mathematical form of the model:

The general form of linear programming is to find the values of the variables qi (1, 2, 3,…….N), which gives the upper bound of the following equation.

Results of the first model analysis

Some restrictions have been added to define a method in proportion to the need for these markets, which are exported to on the basis of the exported quantity of the importing country, provided that the countries are arranged from the lowest quantity to the largest quantity of Egyptian fish and the lowest quantity is shown as follows q1 The quantity exported to the State of Bahrain a q^2 Quantity exported to Vietnam q^3 The quantity exported to Spain Q4 The quantity exported to the country of China..... to country q15

By performing the linear programming process after adding these parameters, the obtained results indicated that This model included the distribution of Egyptian exports of fish to lesser countries Quantity so that the highest net return from Egyptian fish exports can be achieved, and is estimated The target function of this model is about 38.548 million dollar, more than the value of the target function The actual model is about 0.197 million dollar. The increase of this model over the actual model was achieved by 0.514%, which confirms the priority of the first model. The model also shows that it is possible to increase Egyptian exports of fish to Lebanon, Morocco, Bahrain, UAE and Qatar.

The results of the second model analysis

Due to what was observed in the first model of the exaggeration in the value of exports to countries with less quantity Therefore, some limitations have been added, represented in exporting to the higher-priced countries, in addition to these Limitations the obtained results indicated that this is as follows: q1 the quantity exported to the State of Spain. q^2 Quantity exported to Italy q^3 The quantity

exported to the State of America. Q4 the quantity exported to a country. China q5 Quantity exported to the country of Vietnam..... to country q15

We will perform the decoding process after adding these parameters, the results indicated It should be that this model included an estimate of the target function of this model at about 35.612 million A dollar decrease from the value of the target function of the actual model by about 2.739 million dollars, and this deficiency represents about 7.7%, which means that the first model is better than the second model is illogical because of the lack of maximization of the actual model and thus achieving a net return less than the actual.

Table 3: Models of Egyptian fish export determinants for the most important programming importing countries using linear

N	Countries	Actual model	First model (minimum quantity)	The second model (highest price)
1	Saudi Arabia	5.1	0.336	5.11
2	United Arab Emirates	4.5	0.567	2.01
3	Kuwait	2.8	1.134	2.77
4	Lebanon	2.4	0.302	0
5	United States of America	55.4	2.64	5.377
6	Jordan	2..01	2.69	2.014
7	Israel	3.3	0.871	3.351
8	Italy	4.4	4.4	4.413
9	Qatar	0.87	3.35	0.871
10	China	2.6	2.01	2.64
11	Morocco	0.302	5.37	0
12	Spain	0.961	2.44	0.961
13	Vietnam	0.567	2.77	0.567
14	Bahrain	0.326	4.5	2.014
15	Other Countries	2.688	5.1	2.688
	Total	**38.351**	**38.548**	**35.612**
	The Value of the increase or decrease from the actual		**0.197**	**-2.739**

Source The website of the Central Agency for Public Mobilization and Statistics.www.Capmas.gov.eg

The use of linear programming in reducing the return on fish imports to Egypt.

Drafting the model used in the study for the period (2015-2019)

To formulate a linear programming method, three parameters must be provided: the objective function, the activities alternative and limitations of the problem.

Target function

The model used targets the low return on the current Egyptian imports of some types. Fish during the period (2015-2019). Assuming that P represents the price, Q represents the quantity exported to the various countries exporting fish to Egypt so the objective function becomes:

£PQ = P1Q1 + P2 Q2 + ……..Pn Qn alternative activities It was considered the most important exporting country of fish to the Arab Republic of Egypt As alternative activities, the fish exporting countries come to Egypt during the period (2005-2019).

Holland - Norway - Brazil - Japan - Spain - China - Vietnam - Ireland - Oman - Iceland - UAE - Yemen - United Kingdom - Taiwan - India - South Korea America.

Limitation

Constraints are divided into the form used for major constraints and additional constraints.

Main limitations

It is the current export capacity of the most important exporting countries previously referred to, and that export capacity has been calculated on the basis of the average exported fish. These restrictions are not to exceed the imported quantity of fish with the export capacity the number of these restrictions is the same as the number of major exporting countries Additional restrictions: These restrictions include the following:

A restriction on the Egyptian import capacity for fish, which stipulates that the proposed imported quantities do not exceed the annual average of the quantity of fish imports; 384.9 thousand tons

B - A special restriction on the relative importance of the exporting countries by maintaining the imported quantities for the most important ones exporting markets. This restriction means that the average quantity of Egyptian fish imports to these countries is not less than the total quantities actually imported to them during the period (2015-2019). Mathematical form of the model:

The general form of linear programming is to find the values of the variables qi (1,2,3,…….N), which gives the following minimum equation:

Man Y = p1q1 + p2 q2 + ……..pnqn

Where qn = the proposed quantity of fish to be imported for each exporting country. Pn = Import price per ton in dollars for each fish-exporting country

Country, provided that the countries are arranged from the least quantity to the largest quantity of fish and the lowest quantity is shown as follows Q1 The quantity imported from the country; Korea q^2 The quantity imported from the USA q^3 Quantity imported The results of the first model analysis Some restrictions were added to the new curriculum in proportion to the need for these countries, from which imports are made on the basis of the exported quantity of the importing from India country a Q4 Quantity imported from Taiwan.....to country q17

Table 4: Models of fish import determinants from the most important exporting countries using linear programming

N	Countries	Actual model	First model (minimum quantity)	The second model (highest price)
1	Holland	137.8	137.7	137.7
2	Norway	63.2	63.5	63.5
3	Brazil	44.6	44.6	44.6
4	Japan	49.8	49.8	39.7
5	Spain	43	44.02	43
6	China	39.7	300.7	40.1
7	Vietnam	37.2	37.2	17.2
8	Ireland	15.3	15.3	15.3
9	Oman	16.6	16.6	16.6
10	Island	14.5	14.5	12.5
11	United States of America	89.3	8.3	8.3
12	Yemen	19.7	19.7	19.7
13	United Kingdom	5.1	5.1	5.1
14	Taiwan	4.6	4.6	4.6
15	India	6.2	6.2	6.2
16	South Korea	2.7	3.8	2.7
17	United States of America	3.8	2.7	3.8
	Total	**631.5**	**774.4**	**502.7**
	The value of the increase or decrease from the actual		**142.9**	**-128.8**

Source The website of the Central Agency for Public Mobilization and Statistics.WWW.Capmas.gov.eg

By performing the linear programming process after adding these parameters, the obtained results indicated that this model included the distribution of Egyptian imports of fish to the least countries a quantity so that the lowest net return can be achieved from Egyptian fish imports, and it is estimated the target function of this model is about 774.4. $1 million in excess of the target function value the actual model is about $142.9 million. The increase of this model over the actual model was achieved

by 22.6%, which confirms that the first model is not preferred because it did not achieve a decrease in Egyptian imports of fish.

The results of the second model analysis

Due to what was observed in the first model of the exaggeration in the value of exports to countries with less quantity Therefore, some limitations have been added, represented in exporting to the higher-priced countries, in addition to these Limitations the obtained results indicated that this is as follows: q1 the quantity imported from the state of Yemen. q^2 Quantity imported from the country of Vietnam q^3 The quantity imported from India. Q4 the quantity imported from the country. America q5 the quantity imported from the State of Oman.....to country q17. By performing the programming process after adding these parameters, the results indicated It should be that this model included an estimate of the target function of this model at about 502.7 million A dollar decrease from the value of the target function of the actual model by about 128.8 million dollars, and this decrease represents about 25.6%, which means that the second model is better than the first model to achieve a decrease in the return from Egyptian imports of fish

The model shows that it is possible to increase Egyptian imports of fish from the United States of America, India, South Korea, Yemen, Taiwan, the United Kingdom and the United Arab Emirates.

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