Available capabilities for developing fish inter-Arab trade

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Abstract: Developing fish inter-Arab trades considered one of the most important economic development, therefore the problem of research lies in the depression of trade exchange in the field of fish between Arab countries. The research aims at the possibility of increasing intra-Arab trade in the fish domain using the transport costs minimization model. The amount of fish production from capture fisheries and aquaculture represents about 25%, 75%, respectively, of the total fish production in the Arab countries. The most important fish producing countries are Egypt, Morocco, Mauritania, Oman, and Yemen represented about 85.4%, The most important Arab countries that export fish are represented in Morocco, Mauritania, Oman, and Yemen, with about 90.7% of the total amount of fish exports, while it found that the most important Arab countries importing fish are represented in Egypt, the Emirates, Saudi Arabia, Morocco, Tunisia, Iraq, where they imports about 78.6% of the total amount of fish imports. By using the transport costs minimization model, it was found that Morocco, Mauritania, Oman, Yemen, Somalia and Bahrain achieved an export surplus by about 551.5, 524.9, 104.2, 57.2, 1.6, and 0.7 thousand tons during the average period (2012-2018). The study showed that the most important factors affecting on fish exports were the amount of production, export price of fish, consumption, and Exchange rate. While the most important factors affecting on fish imports were the gross domestic product, population, production, import price, Consumption.

Keywords: Fish, Arab-Trade, Production, Export, Import, Surplus, Deficit

1- Introduction:

Arab integration is considered one of the most important axes of economic development in various areas of life, especially in providing the needs of these countries for goods and agricultural products, and despite the availability of natural resources between them, there are deficiencies in the volume of inter-Arab trade exchange, especially in the field of fish production, In addition to the inability of Arab countries with comparative advantage to provide technical capabilities to invest their wealth as well as the exploitation of foreign companies through special agreements, which leads to decrease The inter-Arab trade, despite the diversity and multiple sources of fish production in the Arab world, some of which are natural sources that represents the main source of fish production and the other part of fish is farming. Maritime production areas can be divided into four groups, as follows: the Arab Gulf region, the Arabian Sea, Aden Gulf, the Indian Ocean.

Thus the main objective of this research is possibility of increasing intra-Arab trade in fish.

2- Problem statement

The research problem was represented in the depression of Arab- inter trade exchange in the field of fish, despite the richness of the Arab countries in water areas. As it did not exceed about 17% of the volume of agricultural Arab- inter trade in 2018.

3- Methodology

For evaluating research objectives, some economic indicators have been applied including descriptive and quantitative statistical analysis, Also used arithmetic averages, percentages, annual growth rates and general time trend equations for the variables under study, in addition used minimization of transportation costs model in an attempt to raise the efficiency of fish distribution among Arab countries, The transportation model has been applied with the aim of determining the quantities that must be transferred from productive regions (surplus countries) to consumer areas (deficit countries).

The mathematical model used is one of the types of linear programming, which includes Target function: aims to reduce transportation costs per ton of fish from the surplus (supply) to the deficit (demand) regions.

$$Minz = \sum_{i=1}^{m} \sum_{j=1}^{n} C_{ij} X_{ij}$$

Where:

Cij= cost of transporting a ton of fish from surplus area i to the deficit zone j.

Xij= the target quantity to be transported.

n= number of distribution centers.

m= number of productive areas.

Determinants= It includes both the determinants of production capacity (surplus) it means that the amount transferred from a surplus state to a deficit state must be less than or equal to the surplus from this country.

$$\sum_{i=1}^{n} X_{ij} \leq A_i$$

Where:

A_i=i State surplus i = 1.2...……..m

And determinants of consumption capacity, which means that the quantity of fish received from surplus countries to a specific consumer country must be equal to or less than its consumption capacity.

$$\sum_{j=1}^{n} X_{ij} \leq B_j$$

Where:

B_j= j The absorptive capacity of the country j = 1.2...……..n

In addition to the negative restrictions, the condition of the total demand being equal to the total supply, and in the event that they are not equal, bid or order sites are entered.

The quantities available for export and deficit for fish in Arab countries, and these quantities were calculated based on the following equations:

The quantities available for export (surplus or deficit) = production - consumption

Consumption = production + imports - exports

The costs of transportation between the Arab countries that have been replaced by geographical distances between the Arab countries, on the assumption that the transportation distances are equal to the cost of transportation (due to the inability to obtain the actual cost of transportation between countries).

In addition, identifying the most important factors affecting on exports and imports fish in the most important Arab countries.

The statistical analysis of the research based on the secondary data collected from the publications issued by the Arab Organization for Agricultural Development, and the annual book of agricultural statistics, in addition researches, conferences and scientific theses that related to the subject of the research.

4- Results and Discussion
a- Fish production in the most important Arab countries

Arab fish production was estimated at 4.327 million tons during the study period from capture fisheries and Aquaculture represent about 75%, 25% respectively of the total Arab fish production as shown in Table 1. It increased by about 136.8 thousand tons annually representing about 3.2% of the average Arab fish production during the study period, R^2 statistic indicates that about 97% fish production changes could be explained by time. (Equation 1, Table 2).

It also became clear that Egypt occupies the first position at the level of Arab fish production, with a production estimated at 1.376 million tons, representing 31.8% of the total fish production in the Arab countries during the average study period, where the amount of fish production from capture fisheries and Aquaculture about 26.8%, 73.2%, respectively, of the total fish production in Egypt, fish farming in Egypt has great potential for expansion, such as a favorable climate throughout the year in addition to the existence of networks of canals and drains to serve the irrigation and drainage system.

Egypt fish production increased significantly by about 68.5 thousand tons annually representing about 5% of the average Egypt fish production during the study period, and the R^2 indicates that about 95% of the change in fish production explained by time. (Equation 2, Table 2).

While Morocco occupies the second position at the level of Arab fish production, estimated at 1.229 million tons, representing about 28.4% of the Arab fish production during the study period, fish production in Morocco depends primarily on capture fisheries, which ranks first among Arab capture fisheries production. Morocco fish production has taken increasing trend reached about 59.2 thousand tons annually representing about 4.8% of the Morocco fish production. R^2 indicates that about 97% from the changes in fish production are due to the element of time. (Equation 3, Table 2)

In addition Mauritania fish production occupies the third position estimated at 717.7 thousand tons, represented about 16.6% of the total Arab fish production, where capture fisheries production represents about 100% of Mauritania Fish production. It occupies the second position among Arab capture fisheries production. It has taken significantly increasing trend. (Equation 4, Table 2).

Also Oman occupies the fourth position at the level of Arab fish production, estimated at 208 thousand tons, by about 4.8% of Arab fish production during the study period, where the amount of capture fisheries production represents the largest percentage, it is clear that fish production achieved a statistically

significant of about 15.1 thousand tons, by about 7.3% of Oman fish production, R^2 indicates about 88% of the change in Oman fish production due to the element of time. (Equation 5, Table 2).

While Yemen occupies the fifth position at the level of Arab fish production, estimated at 182.7 thousand tons, by about 4.2% of the total Arab fish production during the study period. Where capture fisheries and Aquaculture production represents by 95.9%, 4.1%, respectively, of the total Yemen fish production, and it taken a declining trend.

b- Fish exports in the most important Arab countries

The total fish exports of Arab countries estimated at 1185.4 thousand tons during the study period (2006-2018).

it was noted that all indicators in general have taken a statistically significant general trend with different annual growth rates for them, as it was found that Morocco occupies The first place at the level of Arab countries in fish export, by about 539.5 thousand tons, representing 45.5% of the total fish exports in Arab countries, with a value estimated about 1725.7 million dollars, (Table 3).

The quantity of exports has increased by about 30.5 thousand tons annually representing 5.7% of the average amount of Morocco fish exports, the R^2 indicates that about 49% of the change in the amount of exports reflected to the time element, (equation 1, Table 4), also the value of Morocco's fish exports took an increasing trend and statistically significant about 79.8 million dollars annually, by 4.6%, and the R^2 explains that about 70% of the changes occurring in The value of Morocco fish exports s due to the time element. (Equation 2, Table 4).

While Mauritania ranks second of Arab fish exports estimated at 343.7 thousand tons, by about 29% of the total Arab fish exports during the study period, with a value of about 346.7 million dollars, the amount of exports is increasing statistically significantly, by about 64.2 thousand tons annually, representing about 18.7% of the average amount of Mauritanian fish exports, The R^2 explains about 77% of the change in the amount of exports reflected to time element, furthermore, it was found that the value The Mauritanian fish exports took an increasing and statistically significant trend of about 57.7 million dollars annually equivalent to about 16.6% of the annual average value of Mauritanian exports, and the R^2 explains that about 67% of the changes in the value of fish exports from Mauritania reflects Time component. (Equations 3, 4, Table 4).

While Oman ranked third on the level of Arab countries in exporting fish with a quantity of about 108.5 thousand tons, equivalent to about 9.2% of the total fish exports in the Arab countries during the study period, with a value of about 206.6 million dollars, The quantity of exports is increasing statistically significantly, by about 5.8 thousand tons annually, by 5.3% of the average amount of Oman fish exports during the study period (2006-2018). The R^2 indicates that the time element explain about 72% From the change in the quantity of exports, also it found that the value of Oman exports has increased by statistically significant by about 6.6 million dollar annually it equivalent of about 3.2% of the annual average value of Oman's exports, the R^2 explains that about 36% of the changes in the value of Oman fish exports reflected to Time element. (Equations 5, 6, Table 4).

In the other hand Yemen ranked fourth of Arab countries in fish exports with a quantity estimated at 83.9 thousand tons, by about 7.1% of the total fish exports in the Arab countries, at a value of about 188.4 million dollars, It was found that the quantity of exports decreased significance by about 8.4 thousand tons annually representing about 10% of the average amount of Yemen fish exports during the study period. The R2 factor explain about 55% of the changes in the amount of fish exports from Yemen are due to time. Also by studied the value of Yemen's fish exports it declining significant trend by about 17.7 million dollar annually, or about 9.4% of the annual average value of Yemen's exports, the R^2 explains about 56% of the changes in the value of fish exports from Yemen are due to time factor. (Equations 7, 8, Table 4).

c- Fish imports in the most important Arab countries

It was found that the total fish imports in the Arab countries is estimated at 772.7 thousand tons during the study period (2006-2018), Egypt occupies the first rank of Arab fish imports, reached about 211.7 thousand tons, by 27.4% of, with a value of about 388.1 million dollars, (Table 5), the amount of Egypt imports took an increasing general trend, and it was found that the value of Egypt's imports of fish took an increasing statistically significant trend of about 22.6 million dollars annually, by about 5.8% of the annual average value of Egypt's imports, R^2 explains that about 64% of the changes in the value of Egypt imports are reflected to time factor. (equation 2, Table 6).

While UAE ranks second of Arab imported fish the quantity reached about 152.7 thousand tons, representing about 19.8% of the total fish imports in the Arab countries during the study period, with a value 401.6 million dollar, It was found that the quantity of imports is increased statistically significant by about 16.5 thousand tons annually representing by 10.8% of the average amount of UAE fish imports,

and the R^2 indicates that about 93% of the change in the quantity of imports reflected to time. Also it was found that UAE's imports of fish have taken an increasing statistically significant trend by 40.8 million dollars annually, with about 10.2% of the annual average value of the Emirates' imports, and the R^2 explains that about 92% of the changes in the value of fish imports to the Emirates are reflected by Time element. (Equations 3, 4. Table 6).

Table 1. Fish Production in Arab Countries during (2006-2018). (1,000 tons)

YEAR	Arab Fish production			Egypt				Morocco				Mauritania				Oman				Yemen			
	Total	Capture fisheries	Aquaculture	Total	% of Total Production	Capture fisheries	Aquaculture	Total production	% of Total Production	Capture fisheries	Aquaculture	Total production	% of Total Production	Capture fisheries	Aquaculture	Total production	% of Total Production	Capture fisheries	Aquaculture	Total production	% of Total Production	Capture fisheries	Aquaculture
2006	3559.03	2901.51	657.52	970.9	27.3	375.9	595.0	866.3	24.3	866.0	0.3	661.4	18.6	661.4	0	152.08	4.3	151.9	0.18	248.4	7.0	229.7	18.7
2007	3573.07	2875.01	698.06	1008.1	28.2	372.5	635.6	878.3	24.6	877.9	0.4	666.5	18.7	666.5	0	149.7	4.2	149.6	0.1	196.3	5.5	179.9	16.4
2008	3876.29	3112.92	763.37	1067.6	27.5	373.8	693.8	1007.6	26.0	1007.4	0.2	828.1	21.4	828.1	0	148.22	3.8	148.1	0.12	142.6	3.7	127.1	15.5
2009	3884.34	3102.37	781.97	1092.9	28.1	387.4	705.5	1158.9	29.8	1158.6	0.3	644.3	16.6	644.3	0	158.82	4.1	158.7	0.12	183.4	4.7	167.6	15.8
2010	4095.3	3094.78	1000.52	1304.8	31.9	385.2	919.6	1137.5	27.8	1137.2	0.33	644.3	15.7	644.3	0	164.02	4.0	163.9	0.12	183.4	4.5	167.6	15.8
2011	4098.48	3041.29	1057.19	1362.2	33.2	375.4	986.8	1137.5	27.8	1137.2	0.33	644.3	15.7	644.3	0	158.73	3.9	158.6	0.13	160.6	3.9	146.3	14.3
2012	4286.0	3200.7	1085.3	1372.2	32.0	354.2	1018	1184.7	27.6	1184.0	0.7	644.3	15.0	644.3	0	191.9	4.5	191.7	0.17	230.8	5.4	230.5	0.25
2013	4611.5	3438.0	1173.5	1588.6	34.4	491.1	1097.5	1262.0	27.4	1261.0	0.97	644.3	14.0	644.3	0	206.9	4.5	206.5	0.35	238.2	4.7	217.9	0.25
2014	4510.0	3309.5	1200.5	1481.8	32.9	344.8	1137.	1369.1	30.4	1368.0	1.12	644.3	14.3	644.3	0	211.6	4.7	211.3	0.28	195.7	4.3	195.4	0.25
2015	4594.8	3319.2	1275.6	1519.1	33.1	344.1	1175.	1371.1	29.8	1370.0	1.05	644.3	14.0	644.3	0	257.4	5.6	257.2	0.17	195.7	4.3	195.4	0.25
2016	4901.1	3498.3	1402.9	1640.0	33.5	336.0	1304.0	1465.1	29.9	1464.0	1.14	773.0	15.8	773.0	0	279.7	5.7	279.6	0.1	158.3	3.2	158	0.25
2017	5053.2	3571.0	1482.3	1707.0	33.8	331.5	1375.5	1535.3	30.4	1534.0	1.3	803.2	15.9	803.2	0	301.7	6.0	301.6	0.1	140.1	2.8	139.9	0.3
2018	5212.9	3650.5	1562.5	1773.9	34.0	326.9	1447.0	1605.4	30.8	1604.0	1.4	1088.2	20.9	1088.2	0	323.6	6.2	323.6	0.1	122.0	2.3	121.8	0.3
Ave	4327.4	3239.6	1087.8	1376.1	31.5	369.1	1006.9	1229.1	28.4	1397.9	1.1	717.2	16.6	717.7	0	208.0	4.8	207.9	0.2	182.7	4.2	175.2	7.6

Sources: Arab Organization for Agricultural Development, Arab Agricultural Statistics Yearbook, different volumes.

Table 2. The general time trend equations for Arab Fish Production during (2006-2018).

country	No. of equation	α	β	$T_β$	μ	G (%)	R^2	F
Total Arab Production	1	3369.8	136.8	**20.8	4327.4	3.2	0.97	**430.7
Egypt	2	896.8	68.5	**15.1	1376.1	5.0	0.95	**227.5
Morocco	3	814.7	59.2	**18.0	1229.1	4.8	0.97	**325.6
Mauritania	4	601.4	16.6	2.0*	717.7	2.3	0.25	3.6*
Oman	5	102.1	15.1	**9.4	208	7.3	0.89	**88.1
Yemen	6	215.7	- 4.7	-2.0*	182.7	- 2.6	0.24	3.5*

Sources: Calculated from table 1.   Thus: *Significant at 0.05 level   ** Significant at 0.01 level G= (μ÷β)×100

Table 3. Fish exports in Arab Countries during (2006-2018). (Quantity 1,000 tons, value million dollar).

YEAR	Total Arab exports		Morocco			Mauritania			Oman			Yemen		
	Quantity	value	Quantity	%	value	Quantity	%	value	Quantity	%	value	Quantity	%	value
2006	736.66	2047.95	417.84	56.72	1217.98	101.25	13.75	132.66	75.50	10.25	183.03	88.88	12.07	257.63
2007	796.45	2360.52	433.10	54.38	1440.70	142.80	17.93	281.65	74.10	9.30	152.20	87.90	11.04	216.10
2008	879.40	2611.86	481.86	54.79	1757.70	119.70	13.61	174.50	74.23	8.44	157.18	139.30	15.84	234.80
2009	907.34	2207.12	521.70	57.50	1552.72	143.04	15.76	119.70	81.00	8.93	158.34	99.45	10.96	223.00
2010	1045.80	2405.83	604.01	57.76	1562.51	143.04	13.68	119.70	87.23	8.34	165.45	129.30	12.36	272.20
2011	695.30	1881.86	231.21	33.25	1120.50	143.04	20.57	119.70	118.84	17.09	271.63	128.26	18.45	188.02
2012	892.96	2638.94	373.00	41.77	1567.90	143.00	16.01	119.70	119.10	13.34	247.80	120.80	13.53	291.90
2013	939.20	2612.79	442.40	47.10	1697.00	143.00	15.23	119.70	126.30	13.45	252.50	109.10	11.62	294.40
2014	1560.82	3283.9	567.00	36.33	1880.50	643.80	41.25	573.00	132.50	8.49	215.30	75.60	4.84	191.20
2015	1493.55	3256.7	641.90	42.98	1963.60	527.50	35.32	559.60	132.20	8.85	198.50	53.60	3.59	117.40
2016	1655.07	3451.7	687.80	41.56	2093.00	620.20	37.47	607.30	151.80	9.17	188.30	37.80	2.28	101.60
2017	1808.85	3742.1	766.50	42.38	2224.28	739.40	40.88	729.20	119.10	6.58	247.80	17.05	0.94	54.03
2018	1999.38	3962.8	845.20	42.27	2355.55	858.80	42.95	851.10	119.10	5.96	247.80	3.70	0.19	6.45
Average	1185.44	2804.9	539.50	45.51	1725.66	343.74	29.00	346.73	108.54	9.16	206.60	83.90	7.08	188.4

Sources: The Arab Organization for Agricultural Development, Arab Agricultural Statistics Yearbook, different volumes.

Table 4. The general time trend equations for Arab Fish exports during (2006-2018). (Quantity 1,000 tons, value million dollar).

country	No. of equation	variables	scale	α	β	$t_β$	μ	(%) G	R^2	F
Morocco	1	Quantity	1,000 tons	325.9	30.5	**3.3	539.5	5.7	0.49	10.7**
	2	value	million dollar	1166.8	79.8	**5.1	1725.7	4.6	0.70	26.1**
Mauritania	3	Quantity	1,000 tons	- 105.7	64.2	**6.1	343.7	18.7	0.77	37.1**
	4	value	million dollar	- 57.3	57.7	**4.7	346.7	16.6	0.67	22.5**
Oman	5	Quantity	1,000 tons	68.2	5.8	**5.3	108.5	5.3	0.72	27.8**
	6	value	million dollar	160.8	6.6	*2.5*	206.6	3.2	0.36	6.1**
Yemen	7	Quantity	1,000 tons	143.0	- 8.4	- 3.7**	83.9	- 10.0	0.55	13.7**
	8	value	Million dollar	312.3	- 17.7	- 3.8**	188.4	- 9.4	0.56	14.1**

Sources: Calculated from table 3.
Thus: *Significant at 0.05 level   ** Significant at 0.01 level G= (μ÷β)×100

While Saudi Arabia ranked third of Arab countries in importing fish with a quantity of about 105.3 thousand tons, equivalent to about 13.6% of the total fish imports in the Arab countries during the study period, with a value of about 247.8 million dollars, also It was found that the quantity of imports is increasing statistically significantly by about 18.7 thousand tons annually representing 17.7% of the average amount of Saudi fish imports, and the R^2 indicates about 70% of the change In the amount of imports, it appears that the value of Saudi fish imports took an increasing general and statistically significant trend of about 42.6 million dollars annually, and about 17.2% of the annual average value of Saudi Arabia's imports, and the R^2 explains about 65% of The changes in the value of fish imports from Saudi Arabia reflected to time. (Equations 5, 6. Table 6).

In the other hand Morocco ranked fourth of Arab countries in importing fish with a quantity of about 62.8 thousand tons, representing about 8.1% of the total fish imports during the study period, with a value of about 142.4 million dollars. the quantity of imports took an increasing statistically significant trend of about 1.63 thousand tons annually representing about 2.6% of the average amount of Moroccan fish imports, and the R^2 explains about 31% of the change in the quantity of imports reflected to time, it appears that the value of Morocco's imports of fish has taken an increasing statistically significant trend of about 9.5 million dollars annually and equivalent to about 6.7% of the annual average value of Morocco's imports, and the R2 factor explains that about 53% of The changes in the value of fish imports from Morocco are reflected to the time component. (Equations 7, 8, Table 6).

In addition Tunisia and Iraq occupied the fifth and sixth of Arab countries in importing fish with a quantity of about 37.9, 37 thousand tons, representing by 4.9%, 4.8% of the total fish imports in the Arab countries during the study period, respectively, with a value of about 71.8, 76.2 million dollars. For each of them respectively. Also it appears that the quantity of imports to Tunisia took a decreasing statistically significant trend of about 1.6 thousand tons annually, representing about 4.3% of the average amount of Tunisian fish imports during the study period, and the R^2 indicates that 57% of the change in the quantity of imports reflected to the time component. Also noticed that the value of Tunisia's imports of fish has taken a growing general trend that is not statistically significant. (Equations 9, 10. Table 6). The quantity of Iraqi fish imports took an increasing statistically

significant trend of about 6.1 thousand tons annually, representing by 16.5% of the average amount of Iraqi fish imports during the study period, and the R2 factor indicates that the factors studied Reflected by the element of time, and they explain about 76% of the change in the quantity of imports. In addition the value of Iraqi fish imports took a statistically increasing general trend of about 15.7 million dollars annually, representing about 20.6% of the average value of Iraqi fish imports during the study period, and the R^2 indicates that 85% of the change in the value of imports reflected to time element. (Equations 11, 12. Table 6).

d- **The available capabilities to increase inter-Arab trade in fish**

To determine some opportunities for increasing the efficiency of distribution fish among Arab countries through using a model of minimize transportation costs. And Due to the difficulty in obtaining the actual transportation costs between the Arab countries, the geographical distances between them will be used. Mauritania ranks first among the Arab countries in terms of the geographical distance and it has an export surplus of fish production amounted to by 524.9 thousand tons during the average period (2012-2018), and it comes in second place after Morocco in terms of the amount of surplus.

Table 7. Indicates the results of the transportation model during the period (2012-2018). Where it was found that Morocco, Mauritania, Oman, Yemen, Somalia and Bahrain achieved an export surplus estimated at 551.5, 524.9, 104.2, 57.2, 1.6 and 0.7 thousand tons. Where it is clear that Morocco can export to eleven countries represented in Egypt, Saudi Arabia, Iraq, Algeria, Jordan, Kuwait, Lebanon, Tunisia, Syria, Libya and Palestine by about 209.8, 125.5, 57.7, 38.3, 34.6, 27.9, 26, 11.8, 8.6 6.7, 4.6 thousand tons, respectively.

While Mauritania can export to Saudi Arabia and Sudan by about 18.2, 0.5 thousand tons, respectively, it was also found that there are about 506.17 thousand tons of export surplus that were not used for the distance between them. It was also found that Oman could export to the UAE about 104.2 thousand tons. And it turned out that Yemen can export to Emirates, Saudi Arabia, and Qatar by about 50.1, 5.4, 2 thousand tons, respectively. Somalia could export to the Emirates, Comoros and Djibouti by about 1.2, 0.3 and 0.1 thousand tons, respectively. Finally, it became clear that Bahrain could export to Qatar approximately 0.7 thousand tons.

Table 5. Fish imports in Arab Countries during (2006-2018). (Quantity 1,000 tons, value million dollar).

YEAR	Total Arab exports		Egypt			UAE			Saudi Arabia			Morocco			Tunisia			Iraq		
	Quantity	value	Quantity	%	value	Quantity	%	value	Quantity	%	value	Quantity	%	value	Quantity	%	value	Quantity	%	value
2006	507.5	625.3	239.87	47.3	156.92	73.41	14.5	181.9	0.0	0.0	0.0	46.77	9.22	66.35	39.14	7.7	50.72	0	0.0	0
2007	475.3	723.2	220.35	46.4	166.64	50.9	10.7	220.3	0.0	0.0	0.0	55.14	11.60	77.99	39.11	8.2	70.49	0	0.0	0
2008	459.5	971.1	167.32	36.4	372.08	50.9	11.1	220.3	0.0	0.0	0.0	69.4	15.10	67.0	46.63	10.1	66.61	18.19	4.0	25.57
2009	505.7	1093.0	148.0	29.3	378.17	91.35	18.1	204.4	0.0	0.0	0.0	50.2	9.93	94.2	46.78	9.3	68.16	21.74	4.3	48.75
2010	598.6	1303.0	182.38	30.5	364.37	132.72	22.2	296.1	0.0	0.0	0.0	77.4	12.93	221.6	45.58	7.6	66.63	21.74	3.6	48.75
2011	725.6	1722.3	178.18	24.6	403.28	151.84	20.9	361.5	162.9	22.4	408.0	54.43	7.50	137.15	43.5	6.0	68.9	14.78	2.0	35.78
2012	903.7	2192.1	234.6	26.0	512.5	171.7	19.0	414.9	171.6	19.0	447.9	49.7	5.50	141.7	47.5	5.3	105.8	45.8	5.1	65.1
2013	951.2	2220.0	236.0	24.8	431.3	183.9	19.3	438.4	179.0	18.8	392.8	52.9	5.56	160.9	35.7	3.8	107.6	46.9	4.9	66.6
2014	1005.0	2352.3	291.2	29.0	405.8	199.4	19.8	609.5	182.5	18.2	443.7	73.7	7.33	195.1	39.5	3.9	71.5	39.6	3.9	66.5
2015	658.6	2222.8	204.3	21.3	432	206	21.5	513.3	169.4	17.7	385.5	76.9	8.02	179.1	26.5	2.8	61.2	92.5	9.6	87.5
2016	966.2	2406.3	220.2	22.8	481.9	213.7	22.1	552.3	171.4	17.7	378.7	66	6.83	164.3	31.5	3.3	73.5	57	5.9	158.7
2017	983.4	2494.3	216.6	22.0	474.3	224.2	22.8	586.7	167.7	17.1	381.1	70.1	7.13	170.0	27.5	2.8	65.4	59.8	6.1	182.1
2018	1005.4	2595.5	213.0	21.2	466.6	234.7	23.3	621.0	164.0	16.3	383.4	74.2	7.37	175.6	23.5	2.3	57.4	62.6	6.2	205.5
Average	772.7	1763.2	211.7	27.4	388.1	152.7	19.8	401.6	105.3	13.6	247.8	62.8	8.1	142.4	37.9	4.9	71.8	37.0	4.8	76.2

Sources: *The Arab Organization for Agricultural Development, Arab Agricultural Statistics Yearbook, different volumes.*

Table 6. The general time trend equations for Arab Fish imports during (2006-2018).

Country	No. of equation	variables	scale	A	β	$t_β$	μ	(%) G	R^2	F
Egypt	1	Quantity	1,000 tons	193.4	2.61	0.94	211.7	1.2	0.1	0.9
	2	value	million dollar	230.1	22.6	**4.4	388.1	5.8	0.64	19.3**
UAE	3	Quantity	1,000 tons	37.5	16.5	11.9**	152.7	10.8	0.93	142.2**
	4	value	million dollar	116.0	40.8	11.5 **	401.6	10.2	0.92	133.0**
Saudi Arabia	5	Quantity	1,000 tons	-25.4	18.7	5.1**	105.3	17.7	0.70	25.9**
	6	value	million dollar	50.3-	42.6	4.6**	247.8	17.2	0.65	20.8**
Morocco	7	Quantity	1,000 tons	51.4	1.63	2.2*	62.8	2.6	0.31	*4.8
	8	value	million dollar	75.8	9.5	3.5**	142.4	6.7	0.53	12.4**
Tunisia	9	Quantity	1,000 tons	49.2	- 1.6	- 3.8**	37.9	-4.3	0.57	14.4**
	10	value	million dollar	69.2	0.38	0.3	71.8	0.53	0.01	0.1
Iraq	11	Quantity	1,000 tons	-5.72	6.1	5.9**	37.0	16.5	0.76	35.1**
	12	value	million dollar	-33.7	15.7	8.1**	76.2	20.6	0.85	65.0**

Sources: *Calculated from table 3.* Thus: *Significant at 0.05 level; ** Significant at 0.01 level G= (μ÷β)×100

Table 7. The results of minimization transportation cost model

surplus countries	Deficit countries	Exports Quantity
Morocco	Egypt	209.8
	Saudi Arabia	125.5
	Iraq	57.7
	Algeria	38.3
	Jordan	34.6
	Kuwait	27.9
	Lebanon	26.0
	Tunisia	11.8
	Syria	8.6
	Libya	6.7
	Palestine	4.6
Mauritania	Saudi Arabia	18.2
	Sudan	0.5
	Unused quantities	506.17
Oman	Emirates	104.2
Yemen	Emirates	50.1
	Saudi Arabia	5.4
	Qatar	2
Somalia	Emirates	1.2
	Comoros	0.3
	Djibouti	0.1
Bahrain	Qatar	0.7

Sources: *Calculated from the model.*

e- The most important determinants that affecting on fish exports and imports in Arab countries

Through the results of the transportation model, deficit and surplus countries have been identified, thus this section was estimated export and import functions in different mathematical forms and it turned out that the best estimate was the linear function, The study investigated the statistical significance for the total model and for the regression coefficients, and investigated the agreement of the regression coefficients with the economic logic. so the most important determinants that affected on fish exports and imports in most important Arab countries were production, fish export price, fish consumption, and Exchange rate. While the most important factors affected on fish imports were the gross domestic product, population, production, import price, and consumption.

Through studying the export function in the most important Arab countries, it became clear that the models 'were significance at 0.05%, in addition there is a direct relationship between the amount of production and exports, while there is an inverse relationship between the amount of exports and both of the export price and the amount of consumption. (Table 8).

On other hand, the models of import function were significance at 5%, in addition there is a direct relationship between the amount of imports and both of consumption and population, while there was an inverse relationship between the amount of imports and both of the import price and the production. (Table 9).

Table 8. The most important determinants that affecting on fish exports in Arab countries during the period (2006-2018).

country	model	R^{-2}	F
Morocco	$Y^\wedge =559.14 + 0.44pro - 0.17pri$ (7.8)* (- 8.1)*	0.93	*83.4
Mauritania	$Y^\wedge = 143.7 + 0.91$ pro -1.27 con (4.2)* (-7)*	0.92	*51.1
Oman	$Y^\wedge = 109 + 0.95$ pro - 0.03 pri -1.26con (12.1)* (-5.3)* (-9.8)*	0.96	*91.7
Yemen	$Y^\wedge = 76.4 + 0.55$ pro -0.96 con (2.9)* (-4.8)*	0.70	*15

$Y^\wedge$= exports quantity (Thousand/ton)　　　pro = Fish production (Thousand/ton)
pri= export Price (dollar/ton)　　　con= Fish consumpation (Thousand/ton)
chan= exchange rate　　　f= calculated f value　　　R^-2 =adjust determinations
*significat 0.05.　　( )= calculated t value
Sources: Calculated from tables1-3.

Table 9. The most important determinants that affecting on fish imports in Arab countries during the period (2006-2018).

country	model	R^{-2}	F
Egypt	$Y^\wedge = 128.8 -0.098$ pro-0.036pri + 0.180con (- 3.1)* (-6.1)* (6.6)*	0.94	*59.12
Emirates	$Y^\wedge = -163.2 + 26.3$pop + 0.46con (3.4)* (2.8)*	0.90	*53.3
Saudi Arabia	$Y^\wedge = 232.63–0.028$pri (-3.4)*	0.72	*11.72
Morocco	$Y^\wedge =26.63 + 0.052$con (3.1)*	0.41	*9.38
Tunisia	$Y^\wedge = 10.27 – 1.1$pro+ 1.14con (-12)* (6.9)*	0.94	*89.9
Iraq	$Y^\wedge = -166.5+7.2$pop - 0.02pri (7.1)* (-3.61)*	0.83	*25.4

$Y^\wedge$= imports quantity (Thousand/ton)　　　pro = Fish production (Thousand/ton)
pri= import Price (dollar/ton)　　　con= Fish consumpation (Thousand/ton)
pop= population (million)　f= calculated f value　　　R^{-2} =adjusted determinations
*significat 0.05.　　( )= calculated t value
Sources: Calculated from tables1-5.

5-   Conclusion

There are deficiencies in the volume of inter-Arab trade in the fish field to develop this trade this paper discussed The most important variables that affected on inter Arab trade such as production, imports and exports in the most important Arab countries, results illustrate that most of these variables were significant.

In addition, to identify the possibility of cooperation between Arab countries used transportation model, further more have been studied the most important factors that affecting on exports and imports. Based on these findings, the paper recommended that can be provide the material and technical capabilities of Arab countries with a comparative advantage in fish resources that occupy a position in production and exports to invest their wealth, foremost among them are Morocco, Mauritania, Oman and Yemen, where most of the fish production methods are traditional, farther more Create a database on fish and investment opportunities available in each country to guide investors in this sector. Moreover, Promote fish investment that serve the marketing and trade of fish, such as manufacturing and preserving fish in various ways, which requires cooperation between Arab countries.

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