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An Econometric Analysis of the Oil Crops Food Gap in the Arab Region

Dr. Ekram Ahmed El Sayed Abd El Rahman and Dr. Rania Abd-Allah El-Saied Tolba

Agricultural Economic Research Institute, Agricultural Research Center (ARC), Giza, Egypt
ekram_9375@yahoo.com

Abstract: The agricultural sector in the Arab world, had natural and human resources, Was able to provide most of the population's food needs until the beginning of the seventies of the twentieth century, Then food ability have changed dramatically in the Arab countries and suffer from a deficit in ability to obtain food security, Especially from strategic food commodities such as vegetable oils. The problem of achieving food security is one of the most important problems facing the Arab world, Represent in a steady gap in many food commodities, and the food gap for commodity groups has increased, The value of vegetable oils represents about 8.5% of the value of the food deficit in 2018, and it is expected Increasing the oil gap, As the percentage of self-sufficiency in oil crops in the Arab world 35.9% year 2018. The research aims to study the current situation of production, consumption and the food gap of oil crops in the Arab world, to analyze the inter-trade structure of oil crops, and applied An econometric analysis for the most important variables affecting the oil gap in the Arab world, Predicting the future of the oil gap in the Arab world. Identify the most important problems facing the expansion of oil production in the Arab world, According to published studies and research to overcome and increase opportunities to reduce oil gap in the Arab world.

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1. Introduction:

Decision-makers and agricultural policy-makers in the world plays an important role in fostering food security and sustainable agriculture, in particular n the developing countries and Arab countries, due to the dependence of the majority of Arab countries on food import and in the context of climate change and Local and global changes. The Arabian agricultural sector with natural resource base provided most of the population's food needs until the early 1970s. Arab countries began to suffer from a deficit in Fulfills their need for food Since the mid-seventies,, and the food crises were exacerbated by the inability of local food production to Fulfills the local demand for food, especially from strategic food commodities such as vegetable oils, which represent an important and essential role in human nutrition and are present in the food menu Daily, because it contains energy equivalent to twice that of carbohydrates and protein because , transporters of vitamins and other vitamin-generating compounds that are present in a soluble form **(Fennema, , 1996),** Currently, most of the agricultural development strategies in the Arab countries have focused on increasing self- self-sufficiency in providing food needs of strategic commodities, encouraging exports and limiting imports**.(Abdul Salam ,1998)** There has been a growing concern on Arab governments in providing vegetable oils to citizens, and some Arab countries have supported it and included it in the ration cards for the poor and marginalized groups, and others Arab countries seek to find alternatives to import, which is to encourage local agriculture in order to reduce this gap and reduce the financial burden on the budgets of Arab countries **(The Arab Organization for Agricultural Development, 2010).**

Research problem:

Achieving food security is one of the most important problems facing the Arab world, due to Arab countries still suffer from a steady gap in many food commodities, and the food gap value about $ 13.9 billion year 2000 increase to about $ 34.7 billion $ year 2018, with an increase of about 149%, and the value of vegetable oils represents about 8.5% of the value of the food deficit in 2018, and expected increase oil gap. According to data from the Arab Organization for Agricultural Development indicated that the percentage of self-sufficiency in oil crops in the Arab world decreased from 49% year 2015 to about 35.9% year 2018.

Objective of the research:

The research aims to study the current and future situation of production, consumption and the

food gap of oil crops in the Arab world, analyze the inter-trade structure of oil crops, An econometric analysis applied for the most important variables affecting the oil gap in the Arab world. Predicting the future of the oil crops gap in the Arab world. Identify the most important problems facing the expansion of oil production in the Arab world, According to published studies and research, in order to overcome and increase opportunities to reduce the oil gap in the Arab world.

Research Methodology and Data Sources:

In order to achieve the Research objectives, the research relied on the method of descriptive and quantitative analysis, using some statistical analysis methods represented in estimating the time trends, averages and percentages, and variance analyzing. Econometric models using simultaneous equations were used to build the standard model using EViews, and the ARIMA model. The series was divided into two periods due to the political situations that the Arab world which affected the economic conditions, and the first period represents the period from (2005-2011), and the second period (2011/2018). The research relied on secondary data issued by the Arab Organization for Agricultural Development, in addition to studies and research related to the research topic.

3. Results and Discussion:

1. The current situation of oil crops production in the Arab world:

Vegetable oils have an important role in the list of food, and this section discusses the development of area, production and productivity of oil crops in the Arab countries. Table (1) indicate that the area cultivated for oil crops in the Arab world increased from 7.4 million hectares during the average period (2005-2011) to 9.8 million hectares during the average period (2012-2018).The growth rate during the two periods was 33%. Sudan represent about 39%, 52% of the area cultivated with oil crops in the Arab world during the periods (2005-2011), (2012-2018) respectively , the area about 2.9 and 5.1 million hectares respectively, and a growth rate 74%. Tunisia, Morocco and Syria comes after Sudan, with relative importance about 23%, 11%, 10% during the first period (2005-2011), about 18%, 10% , 8% during the second period (2012-2018). Egypt occupy the fifth of area during the first period, with an area of 316.5 thousand hectares, The area decreased by 32% during the period (2012-2018), to about 214.7 thousand hectares, occupying the sixth place after Algeria. Although Egypt area cultivated with oil crops were small compared to other countries, it ranks fourth and third in production during the periods (2005-2011), (2012-2018) respectively, due to the high average productivity per hectare compared to other Arab counterparts. It is clear from the table (1) that the Arab world's production of oil crops increased during the first period from 6.8 million tons to 7.3 million tons during the second period, and the growth rate of production 7%. during the two periods, Sudan considered the most important producing country, its production increased from 1.3 million tons to 1.85 million tons during the periods (2005-2011), (2012-2018) respectively. growth rate 38%.the growth rate of Syria, Morocco, Egypt and Tunisia about 18.7%, 15.6%, 14.3% and 13% respectively during the period (2005-2011), while it represented about 12.3%, 19.8%, 13.4% , 12.1%, during the period (2012-2018) respectively. Clarify the production of Syria and Tunisia decreased during the second period compared to the first period. studying the average productivity per acre of oil crops in the Arab world, increased from 1.4 tons / hectare during the first period to 1.51 tons / hectare during the second period. the growth rate about 8% between the two periods, the most important Arab countries according to the cultivated area are Egypt, Morocco, Syria, Algeria, Tunisia and Sudan during the period (2012-2018), Spearman's correlation coefficient about 0.75 this indicates a strong correlation between cultivated area and productivity. This means the production efficiency of oil crops in these countries.

Analysis of the variance of the average productivity of oil crops between Arab countries during the same period, it was revealed that there are a statistically significant differences between the most important Arab countries, which indicates the differences, Table (2).To clarify the differences between countries, the **LSD** (**Least** Significant **Difference**) LSD test was used for comparisons between the average productivity of each country, bilateral comparisons between two averages , it was found that Egypt ranks first of productivity about 4.69 tons / Hectares during the average period (2012-2018)Table (3), and a statistically significant difference at the level of 0.05 from the other countries. Morocco occupying second, with an average productivity 1.42 tons / hectare, and a statistically significant differences, between Morocco and Tunisia , Sudan, a statistically significant difference between Algeria and Syria.

Syria occupying the third place with an average productivity 1.41 tons / hectare, and a statistically significant differences between Syria, Tunisia and Sudan, with a statistically insignificant difference from Algeria. Algeria occupying the fourth place with an average productivity about 0.97 tons / hectare, and there are a statistically significant

differences between Algeria Tunisia and Sudan. Tunisia occupying the fifth place with an average productivity 0.51 tons / hectare, and there are a statistically significant differences with the others countries. Sudan occupying the last place with an average productivity about 0.42 tons/ hectare, and there are a statistically significant differences with others countries.

Table (1) Geographical distribution of oil crops production in the Arab world during the periods (2005-2011) and (2012-2018)

Country	First period average (2005-2011)				Second period average (2012-2018)			
	area	%	Production	%	area	%	Production	%
Jordan	62	0.8%	132	1.9%	70	0.7%	224	3.1%
Tunisia	**1732**	**23.4%**	**892**	**13.0%**	**1762**	**17.9%**	**882**	**12.1%**
Algeria	282	3.8%	244	3.6%	392	4.0%	411	5.6%
Saudi	3	0.0%	5	0.1%	3	0.0%	7	0.1%
Sudan	**2917**	**39.5%**	**1340**	**19.6%**	**5069**	**51.5%**	**1846**	**25.3%**
Syria	**772**	**10.4%**	**1281**	**18.7%**	**755**	**7.7%**	**898**	**12.3%**
Somalia	88	1.2%	56	0.8%	73	0.7%	49	0.7%
Iraq	49	0.7%	81	1.2%	17	0.2%	31	0.4%
Palestine	88	1.2%	94	1.4%	53	0.5%	84	1.2%
Kuwait	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Lebanon	59	0.8%	88	1.3%	63	0.6%	119	1.6%
Libya	213	2.9%	536	7.8%	319	3.2%	295	4.0%
Egypt	**317**	**4.3%**	**979**	**14.3%**	**215**	**2.2%**	**975**	**13.4%**
Morocco	**780**	**10.6%**	**1067**	**15.6%**	**1022**	**10.4%**	**1446**	**19.8%**
Mauritania	4	0.1%	1	0.0%	2	0.0%	1	0.0%
Yemen	26	0.4%	40	0.6%	23	0.2%	27	0.4%
Total	**7391**	**100%**	**6837**	**100%**	**9840**	**100%**	**7296**	**100%**

Area: thousand hectares, production: thousand tons, productivity: tons / hectare **Source:** Compiled and calculated from: Data of the Arab Organization for Agricultural Development, the Statistical Yearbook.

Table (2) Results of variance analysis of average productivity of oil crops in the Arab world during the period (2012-2018)

The source of the contrast	Sum of the square of the deviations	Degrees of freedom	The mean of the square of the deviations	F
Between groups	**88.8**	**5**	**17.77**	***113.41**
Within groups	**5.64**	**36**	**0.157**	
Total	**94.48**	**41**		

* Significance at the level of significance 0.05

Source: compiled and calculated from Table (1).

Table (3) The ranking of the most important Arab oil-producing countries according to the average hectare productivity during the period (2012-2018) and a comparison using the least significant difference L.S.D.

Countries	Average productivity	Sudan	Tunisia	Algeria	Syria	Morocco	Egypt
		0.42	**0.51**	**0.97**	**1.41**	**1.42**	**4.69**
Egypt	4.69	*4.30	*4.18	*3.63	*3.51	*3.25	-
Morocco	1.42	*1.04	*0.92	0.37	0.25	-	
Syria	1.41	*0.78	*0.67	0.11	-		
Algeria	0.97	*0.67	*0.55	-			
Tunisia	0.51	0.11	-				
Sudan	0.42	-					

* Significance at the level of significance 0.05

Source: compiled and calculated from Table (1).

2. Geographical distribution of the most important oil crops produced in the Arab world.

1) The olive crop:

Olives are considered one of the most widespread trees in the Arab world due to its economic, environmental and social importance, it is considered the most important oil crop in the Arab world in terms of area, as it occupies an area representing about 49% , 44% of the area cultivated with oil crops in the Arab world during the study periods (2005-2011), (2012-2018) respectively. The table (4) shows the geographical distribution of olive crop production in the Arab world, the total cultivated area about 3.6 , 4.3 million hectares during the two study periods (2005-2011), (2012-2018), the area's growth rate was 19%. Tunisia occupying the first in cultivated area, represent 48%, 41% during the periods (2005-2011), (2012-2018) respectively, then Morocco, Syria, Algeria and Libya at growth rate about 17%, 15%, 7.7% , 5.6% during the first period (2005-2011), and the percentage of the area planted with olives for the mentioned countries during the second period (2012-2018)represents 22%, 15%, 9%, 7% respectively.

The quantity of olive production in the Arab world about 3.6 and 4.5 million tons during the periods (2005-2011), (2012-2018) respectively, and production represents 53%, 86% of the total production of oil crops in the Arab world during the periods (2005-2011),(2012-2018), the growth rate of production about 75%. Morocco occupying the first place with a production growth rate about 76%, represents about 29% of olive production in the Arab world, and despite the growth of olives cultivated area in Tunisia, the quantity of production decreased, and occupying the second place during The second period (2010-2018), also Syria's production declined by 13%, representing about 15% of olive production during the period (2010-2018). Egypt occupying the fourth place with a production rate about 12.5% , 14% during (2005-2011), (2012-2018), respectively, the growth rate about 41%.

Table (4) Geographical distribution of olive crop production in the Arab world during the two periods (2005-2011)and (2012-2018).

Countries	First period average (2005-2011)				Second period average (2012-2018)			
	area	%	Production	%	area	%	Production	%
Tunisia	1718.5	47.5%	880.4	24.4%	1740	40.5%	873	13.9%
Algeria	279.4	7.7%	241.1	6.7%	390	9.1%	403	6.4%
Syria	544.9	15.1%	786.3	21.8%	649	15.1%	685	10.9%
Egypt	48.6	1.3%	449.5	12.5%	70	1.6%	633	10.1%
Morocco	622.0	17.2%	755.5	21.0%	951	22.1%	1329	21.1%
Libya	203.0	5.6%	174.2	4.8%	309	7.2%	177	2.8%
Others	402.6	%11.13	489.9	%13.60	499	%11.61	2375	%37.71
total	**3616.0**		**3602.7**		**4299**		**6298**	
% oil crops	**49%**		**53%**		**44%**		**86%**	

Area: thousand hectares, production: thousand tons, productivity: tons / hectare

Source: Compiled and calculated from: Data of the Arab Organization for Agricultural Development, the Statistical Yearbook.

2) Sesame crop:

The sesame crop is considered the most important oil crops and the oldest oilseed crops known in the Arab world, it is grown to obtain seeds that are used as human food, and oil is extracted from its seeds for human consumption, making soap, and medicinal purposes, it is residues given to feed livestock and poultry. Sesame cultivated area represents 22%, 27% of the area cultivated with oil crops across the Arab world during the periods (2005-2011), (2012-2018)respectively. The table (5) shows the geographical distribution of sesame production in the Arab world, the total cultivated area about 1.6 and 2.7 million hectares during the periods (2005-2011),(2012-2018)respectively, the growth rate of the area was 60%. Sudan account for 90%, 95% of cultivated area in the Arab world. It is followed by Somalia, Egypt and Iraq at a growth rate about 4.5%, 2%, , 1.2% during the first period (2005-2011), represents 2.2%, 1.2%, 0.2% during the period (2012-2018).

The quantity of sesame production in the Arab world is t about 467,660 thousand tons during the periods (2005-2011), (2012-2018)respectively, represents 7% , 9% of the total production of oil crops in the Arab world during the periods (2005-2011), (2012-2018)respectively, the production growth rate about 41%. Despite the expansion of the sesame cultivated area the production of Sudan is low compared to the average productivity of the Arab

world and the productivity of the countries, Sudan occupying the first place with a growth rate 64%, and production represents 70%, 81% of Sesame production in the Arab world during the two study periods. The productivity of Somalia and Iraq decreased by 18%, 68% during the two study periods. This means that there are losses in the natural resources. Egypt occupying the third and second place during the two study periods, respectively, with a production rate 9.2%, 6.6%, with a growth rate of about 2%.

Table (5) Geographical distribution of Sesame crop production in the Arab world during the two periods (2005-2011)and (2012-2018).

Countries	First period average (2005-2011)				Second period average (2012-2018)			
	area	%	Production	%	area	%	Production	%
Sudan	1500.0	90.4%	327.1	70.0%	2534.8	95.3%	535.9	81.2%
Somalia	75.5	4.5%	48.0	10.3%	57.9	2.2%	39.2	5.9%
Iraq	19.5	1.2%	16.3	3.5%	5.3	0.2%	5.1	0.8%
Egypt	33.5	2.0%	43.0	9.2%	32.5	1.2%	43.9	6.6%
Others	30.9	%1.86	33	%7.06	30.3	%1.14	35.6	%5.40
total	**1659.4**	**%100**	**467.4**	**%100**	**2660.8**	**%100**	**659.7**	**%100**
% oil crops	**22%**		**7%**		**27%**		**9%**	

Area: thousand hectares, production: thousand tons, productivity: tons / hectare

Source: Compiled and calculated from: Data of the Arab Organization for Agricultural Development, the Statistical Yearbook.

3) Peanut crop

Peanut is considered one of the important healthful oil crops , it's often used in cooking, because it's flavor and high smoke point. it is used in many food industries, and its residues are used as food for animals. The peanut crop occupying the third place in the group of oil crops, Peanut cultivated area represents 18%, 26% of the total oil crops cultivated area in the Arab world during the two study periods. Table (6) shows the geographical distribution of the peanut crop in the Arab world, the total cultivated area about 1.3, 2.5 million hectares during the periods (2005-2011), (2012-2018) respectively, the area's growth rate was about 93%. Sudan account for 91%, 96% of cultivated area in the Arab world. Then Egypt and Morocco at a rate of about 4.8%, 1.5% during the first period (2005-2011), 13% , 2.4% during the second period (2012-2018).

The quantity of peanut production in the Arab world is 1.1, 1.5 million tons during the periods (2005-2011), (2012-2018) respectively, production represents 16%, 21% of the total production of oil crops in the Arab world during the periods (2005-2011), (2012-2018) respectively, the of production growth rate 36%. Sudan occupying the first place with of production growth rate about 53%, and production represents 71%, 80% of the crop production in the Arab world during the two study periods. Egypt occupying the second place during the two study periods, with production about 18%, 13%, decline in production of about 0.2%, then Morocco production growth rate about 4.1%, 2.4%, respectively.

Table (6) Geographical distribution of groundnut production in the Arab world during the two periods (2005-2011)and (2012-2018).

Countries	First period average (2005-2011)				Second period average (2012-2018)			
	area	%	Production	%	area	%	Production	%
Sudan	1184.9	90.9%	790.3	71.3%	2408.2	95.5%	1205.4	80.1%
Egypt	62.9	4.8%	202.5	18.3%	62.1	2.5%	202.2	13.4%
Morocco	19.8	1.5%	45.2	4.1%	15.2	0.6%	36.4	2.4%
Others	36.1	%2.77	71.1	%6.41	35	%1.39	61.1	%4.06
total	**1303.7**	**%100**	**1109.1**	**%100**	**2520.5**	**%100**	**1505.1**	**%100**
% oil crops	**18%**		**16%**		**26%**		**21%**	

Area: thousand hectares, production: thousand tons, productivity: tons / hectare

Source: Compiled and calculated from: Data of the Arab Organization for Agricultural Development, the Statistical Yearbook.

4) Sunflower crop

The sunflower crop is considered the third most important oil crop in the world and the fourth in the Arab world, due to its genetic development and improvement systems, adaptation and suitability to different climatic conditions, in addition to its high oil content, The sunflower crop cultivated area represents 3% , 2% of the area cultivated with oil crops across the Arab world during the periods (2005-2011),(2012-2018) respectively, Table (7) shows the geographical distribution of the sunflower crop in the Arab world, it's clear the decrease in cultivated area and production during the second period(2012-2018)compared to the first period (2005-2011).

The total cultivated area about 197,165,000 hectares during the periods (2005-2011), (2012-2018) respectively, the decline represent 37%. Sudan occupying the first place with cultivated area represents 56%, 70% of the total cultivated area in the Arab world. then Morocco and Egypt represent 21%, 6.6% during the first period (2005-2011), 30% , 20% during the second period.

The quantity of sunflower production in the Arab world is estimated at 212, 136 thousand tons during the two study periods, and its production represents about 3% , 2% of the total production of oil crops in the Arab world, The decline in production rate about 40%. Sudan occupying the first place, representing 51%, 53% of crop production in the Arab world during the periods (2005-2011),(2012-2018) respectively. Then Morocco and Egypt, with a production rate about 17%, 15% during the first period (2005-2011), 22%, and 15% during the second period (2012-2018). The decline in production rate about 18%, 36%, respectively.

Table (7) Geographical distribution of sunflower production in the Arab world during the two periods (2005-2011)and (2012-2018)

Countries	First period average (2005-2011)				Second period average (2012-2018)			
	area	%	Production	%	area	%	Production	%
Sudan	109.4	55.5%	108.3	51.1%	114.2	69.2%	71.7	52.9%
Egypt	13.0	6.6%	31.8	15.0%	6.8	4.1%	20.4	15.1%
Morocco	41.1	20.8%	36.3	17.1%	28.7	17.4%	29.9	22.0%
Others	33.6	%17.05	35.5	%16.75	15.4	%9.33	13.6	%10.03
total	**197.1**	**%100**	**211.9**	**%100**	**165.1**	**%100**	**135.6**	**%100**
% oil crops	**3%**		**3%**		**2%**		**2%**	

Area: thousand hectares, production: thousand tons, productivity: tons / hectare

Source: Compiled and calculated from: Data of the Arab Organization for Agricultural Development, the Statistical Yearbook.

5) Soybean crop:

Soybeans are an important food and industrial crop because their seeds contain about 20% cholesterol-free oil and about 40% protein. The soybean crop area represents 0.2%, 0.1% of the area cultivated with oil crops in the Arab world during the periods (2005 - 2011) ,(2012 - 2018) respectively, Table (8) shows the geographical distribution of the soybean crop in the Arab world. The total cultivated area 11.7, 14.3 thousand hectares during the periods (2005 - 2011), (2012 - 2018) respectively, and the growth rate of cultivated area was about 22%. Egypt occupying the first place, the cultivated area represents 78%, 86% of the total cultivated area in the Arab world. then Syria and Morocco at a rate 13%, 9% during the first period (2005-2011), and about 7.2% , 7% during the second period (2012-2018).

The quantity of soybean production in the Arab world is 32.6, 44.5 thousand tons during the periods (2005-2011),(2012-2018)respectively, and production represents 0.5% , 0.6% of the total production of oil crops in the Arab world during the periods (2005-2011), (2012-2018)respectively, and the production growth rate reached about 37%. Egypt occupying the first place, representing 89%, 93% of crop production in the Arab world during the periods (2005-2011), (2012-2018). Egypt is followed by Syria and Morocco, with a production rate about 7.6%, 3.1% during the first period (2005-2011), and about 4.6%, 2.2% during the second period (2012-2018).

Table (8) Geographical distribution of soybean production in the Arab world during the two periods (2005-2011)and (2012-2018)

Area: thousand hectares, production: thousand tons, productivity: tons / hectare

Countries	First period average (2005-2011)				Second period average (2012-2018)			
	area	%	Production	%	area	%	Production	%
Syria	1.5	12.80%	2.5	7.60%	1	7.20%	2.1	4.60%
Egypt	9.2	78.30%	29	89.10%	12.3	85.50%	41.4	93.00%
Morocco	1	8.50%	1	3.10%	1	7.00%	1	2.30%
Others	0.05	0.40%	0.05	0.20%	0	0.30%	0	0.10%
total	**11.7**	**1**	**32.6**	**1**	**14.3**	**1**	**44.5**	**1**
% oil crops	**0.20%**		**0.50%**		**0.10%**		**0.60%**	

Source: Compiled and calculated from: Data of the Arab Organization for Agricultural Development, the Statistical Yearbook.

3. Analysis of the situation of the food gap of oil crops in the Arab world.

The development of the food gap is a result of the development of production and consumption, the consumption growth has led to an increase in the gap of oils. Table (9) indicates an increase in the volume of the oil gap in the Arab world, about 63% during the first period (2005-2011), 75% for the second period (2012-2018) the rate of decline in the self-sufficiency ratio was 32%.

The data indicates that the oil average production in the Arab world about 1.76 and 2.1 million tons, during the periods (2005-2011), (2012-2018) respectively, the production growth rate about 20%, and the rate of extracting oils from crops was 26% in the period (2005-2011). Increased to 33% in the second period (2012-2018), the increase in the growth rate of oil extraction from oil crops is 27%. Despite the development of the industrial and technological sector and the increase in production, the volume of consumption doubled from 4.9 million tons during the first period(2005-2011) to 8.7 million tons during the second period (2012-2018), the demand growth rate about 76% during the periods (2005-2011) , (2012-2018) respectively , Estimating the time trend of consumption it is clear that it is increasing significantly, with annual rate about 449 thousand tons, and an annual growth rate about 6.6%. due to the increase in population growth by 2.1% annually, the population of the Arab world increases significantly with annual rate about 7.9 million, in addition to an increase in the average share per capita from 16.3 kilograms to 23.6 kilograms during the periods (2005 - 2011) , (2012 - 2018) respectively, with an annual growth rate of 4.4%.

The growth of Arab world oil crops exports about 21% during the periods (2005-2011), (2012-2018). The average quantity of exports about 1.18, 1.4 million tons, during the periods (2005-2011), (2012-2018) respectively, Exports quantity are increasing significantly, with annual rate about 61.6 thousand tons, and a growth rate about 4.7 annually. The most important exporting countries in the Arab world are the Emirates, Saudi Arabia, Tunisia, Egypt, and the Sultanate of Oman, representing about 21%, 20%, 18%, 11.7%, 11.6% respectively, during the period (2012-2018). The oil exports are represented in olive oil, soybeans, palm oil, maize and sunflower, with represent about 13%, 10.6%, 11.1%, 10.5% , 10.5% respectively, during the period (2012-2018).

the imports of oils increased during the second period (2012-2018)at a rate about 84% compared to the first period (2005-2011), the quantity of imports was 4.3 , 7.9 million tons during the periods (2005-2011), (2012-2018) respectively. Imports are increasing by statistically significant annual rate about 459.5 thousand tons, with a growth rate about 7.5 annually. The most important importing countries in the Arab world are Egypt, Algeria, Morocco, Saudi Arabia, and the UAE, representing about 26%, 13.6%, 8.3%, 8% , 7.5% respectively, during the period (2012-2018). The imports of oils are represented by soybeans, palm oil, and sunflower, with a percentage representing about 29%, 25% and 12% respectively.

Estimating the effect of imports on the trade balance of Arab countries, it's clear that the value of imports increased from 4.6 billion dollars in the (2005-2011) to 9.8 billion dollars in the (2012-2018), and the value of imports increased at a statistically significant annual rate about 678 million dollars. The value of the trade balance deficit is 2.9 and 7.3 billion dollars during the periods (2005-2011), (2012-2018)respectively. The decreased value of the deficit compared to the value of imports is due to the high value of oil exports in the Arab world, especially olive oil, as the average price of exports is about 1451 and 1756 dollars / ton, compared to the import price, which is t 1067 , 1246 dollars/ton during the periods (2005-2011),(2012-2018) respectively. Therefore, olive oil crop may be one of the solutions proposed to solve the oil gap and reduction of the deficit in the value of the trade balance.

Table (9) Development of production, consumption and foreign trade of oils in the Arab world during the period (2005-2018)

Quantity: one thousand tons. Value: one million US dollars

period	Production	Exports		Imports		Balance of Trade		Available Consumption	Sufficiency ratio
		quantity	Value	quantity	Value	quantity	Value		
The first	1764	1178	1710	4331	4589	3153	2879	4917	37%
The second	2111	1428	2508	7980	9798	6552	7290	8663	25%
Rate of change	**20%**	**21%**	**47%**	**84%**	**114%**	**108%**	**153%**	**76%**	**-32%**

Source: Compiled and calculated from: Data of the Arab Organization for Agricultural Development, the Statistical Yearbook.

4. Analysis of the structure of intra-oil trade:

Table (10), clarify that the decreased of intra-oil exports quantity, the quantity of Arab exports reached about 722, 643 thousand tons during the periods (2005-2011), (2012-2018) respectively. While the Arab countries' exports of oilseeds between Arab countries' increased by 330% during the two study periods respectively, and the intra-regional exports of the total exports of oilseeds represented 9.7% , 33.2%, during the periods (2005-2011), (2012-2018) respectively.

The percentage of intra-regional imports to the total imports of oils in the Arab world is t 10.6% , 11.5% during the periods (2005-2011),(2012-2018)respectively. Intra-regional imports of oilseeds were 3.3%, 5% of the total quantity of oilseeds imports in the Arab world. The lack of trade exchange is due to the increase in Arab countries' imports of soybean seeds; represent approximately 42% of the total imports of oilseeds in the Arab world, with an average quantity 1.3 million tons during the period (2016-2018).

the Arab world production about 43 thousand tons, represent 3% of the total quantity of imports of soybean seeds. This explains the trade exchange between Arab countries, with the exception of Arab exports of olive oil, and it is also one of the important indicators of the inability of Arab olive oil in global markets and the concentration of exports within the borders of the Arab country.

5. An econometric analysis of the most important variables affecting the oil gap in the Arab world:

The simultaneous equations model is defined as a model in which the equilibrium value of at least one of its Endogenous variables cannot be determined without using all the equations contained in the model simultaneously, (Jointly determined variables), so that the Endogenous variables in the equations of the model are correlated to each other, so the dependent variable in the first equation may exist within a group of The independent variables in the second equation, the dependent variable plays a dual role it is the effect in the first equation and in the second equation. These equations are called structural equations due to the basic structure they present to the subject of the study, and the model consists two types of variables: the Endogenous variables, which are determined within the model and the second are Exogenous Variable (Predetermined variables), value is determined outside Form **(Abdel-Qader, 1989).**

Table (10) Intra-Arab trade of oilseeds and oils in the Arab world during the period (2005-2018)

Quantity: one thousand tons. Value: one million US dollars

data	Period	Oil seeds				oils			
		Exports		Imports		Exports		Imports	
		quantity	Value	quantity	Value	quantity	Value	quantity	Value
Intra- trade	1	39	51	105	130	722	812	458	687
	2	171	159	180	228	643	902	916	1042
Rate of change		**338%**	**212%**	**71%**	**75%**	**-11%**	**11%**	**100%**	**52%**
Total Arab trade	1	405	413	3219	2368	1178	1710	4331	4889
	2	515	582	3635	2657	1428	2508	7980	9798
Rate of change		**27%**	**41%**	**13%**	**12%**	**21%**	**47%**	**84%**	**100%**
% Intra-regional exports from	1	**10%**	**12%**	**3%**	**6%**	**61%**	**48%**	**11%**	**14%**
Total Arab exports	2	**33%**	**27%**	**5%**	**9%**	**45%**	**36%**	**12%**	**11%**

Source: Compiled and calculated from: Data of the Arab Organization for Agricultural Development, the Statistical Yearbook.

In order constructed model correctly, must identify the problem of diagnosis or discrimination, as the diagnostic problem refers to the possibility of calculating the structural parameters of the system of simultaneous equations from the parameters of the reduced model or the inability to calculate, and it is one of the basic problems facing the construction of the econometric model, to measure all An equation from the structural equations for the model, and this leads to the identification that the model is formatted to obtain single and unique estimates of the parameters from the data or not.

The equation in the model is fully diagnosed when the number of total variables in the model minus the number of total variables in the equation to be diagnosed is equal to the number of Endogenous variables in the equation minus one, but if it is greater than that, the equation is above the diagnosis, and if it is less than that The equation is under diagnosis and is not suitable for measurement**. (Rania Tolba, 2013)**

According to the conditions of the model, it is not suitable to use the ordinary least squares method, where the two-stage least squares method (2SLS) or the three-stage least squares method (3SLS) are the best ways to estimate the parameters of this model as an application to the model as a whole and not to just one equation.

The optimal model test depends on the identification degree of the simultaneous model (E), and by testing the degree of distinction of the model that was built for the three Endogenous variables, the first, second and third equations are Exact identify, and accordingly the optimal statistical method used to estimate the model relationships, which are (3SLS) Three Stages Least Squares, in the logit form, and the Cochran-Orault method was used solve the problem of auto-correlation between residues, especially when the model relied on time series data during the period (2005-2018).

Discussion of the results of estimating the structural relationships of the proposed model with elasticity parameters to reflect the degrees of relative response to the Endogenous variable associated with possible changes in the exogenous variable.

The model consists of three Endogenous variables (the quantity of imports of oils QIt, the quantity of consumption of oils QCt, the quantity of total production of oils QPt) - and due to the lack of data on oil stocks in the Arab world, this variable has been excluded - and four Exogenous variables (POPt, GDPt). , CAt, PI (t-1)). The model was estimated using the three-stage least squares method (3SLS) in the linear and logarithmic forms, it shows the preference of the double logarithmic form according to the statistical, Table (12) shows the results..

Model Description:

QIt = C(1) - C(2)*QCt + C(3)*QPt + C(4)*CAt + C(5)*PI(t-1)
QCt = C(6) - C(7)*QIt + C(8)*QPt + C(9)*POPt + C(10)* GDPt
QPt = C(11) + C(12)*QIt + C(13)*QCt + C(14)* PI(t-1) + C(15)* CAt

QIt	**Quantity of imports of oils (thousand tons)**
QCt	**Consumption quantity of oils (thousand tons)**
QPt	**Total oil production quantity (thousand tons)**
POPpt	**The population of the Arab world (million)**
GDPt	**Average per capita GDP in the Arab world (thousand dollars)**
CAt	**The cultivated area is thousand acres**
PI(t-1)	**The average import price for the previous year is $ / ton**

1. The quantity of vegetable oils imports:

Equation (1) in Table (11) refers to the factors affecting the quantity of oil imports in the Arab world, the quantity of consumption of oils (thousand tons), the quantity of total production of oils (thousand tons), the cultivated area (thousand hectares), The average import price for the previous year ($ / ton), explains about 95% of the changes in the import quantity of oils. The results show the economic and statistical significance of the consumption of oils (thousand tons), increasing the quantity of consumption of oils by 10% leads to an increase in the quantity of imports of oils by 9.7%, and this result is consistent with the economic logic in the presence of a direct relationship between the two variables.

While the statistical significance were not proved for the area cultivated, the quantity of production of oils, the import price of the previous year, despite the evidence of economic significance in the existence of an inverse relationship between the quantity of imports and each of the quantity of

Arab production, and the price of imports for the previous year. Although there is a direct relationship between the cultivated area and the quantity of imports, this is consistent with the increase in demand due to the increase in the population, especially since oil crops in the Arab world suffer from a high gap in them, as mentioned above. In addition to the expansionary policies pursued by some Arab countries to increase the area of olive trees.

2. Quantity of vegetable oils consumption:

Equation (2) clarifies the factors affecting the quantity of consumption of oils in the Arab world, it was found that the quantity of imports of oils (thousand tons), the quantity of production of oils (thousand tons), the population of the Arab world (million), per capita share in Arab GDP (thousand dollars) , about 95% of the changes in the quantity of consumption. The results indicate that the economic and statistical significance of the quantity of oil imports is evident, an increase in the quantity of imports by 10% leads to an increase in the quantity of consumption of oils by 9.1%,

While the statistical significance of the other variables was not proved. Despite agreement with the economic logic, the data indicate a positive relationship between the quantity of oil consumption in the Arab world; And both the quantity of production, and the population of the Arab world. also there is an inverse relationship between the quantity of consumption and the average per capita share of GDP in the Arab world.

3. Production quantity of vegetable oils:

Equation (3) illustrates the factors affecting the quantity of oil crops production in the Arab world, the quantity of imports of oils (thousand tons), the quantity of consumption of oils (thousand tons), the export price for the previous year is $ / ton, and the area cultivated with oil crops. (Thousand hectares), explains about 84% of the changes in the quantity of production. The results indicate that the statistical significance of the cultivated area is evidenced, an increasing in the cultivated area of oil crops by 10% leads to an increase in the quantity of production by 8%.

The statistical significance of the other variables was not confirmed. Despite its agreement with the economic logic, the data indicate a positive relationship between the quantity of oils produced in the Arab world; And each of the quantity of consumption, the average import price of the previous year. There is an inverse relationship between the quantity of production and the quantity of imports.

Table (11) results of An econometric model for the oil gap for the Arab world in 1000 tons during the period (2005-2018)

Dependent variable	Equations	R^2	R^{-2}	F	D.W
The quantity of imports Of oils	**Log Qit = -1.12 + 0.97 Log QCt + 0.5 Log Act - 0.44 Log Qpt - 0.03 Log $Pi_{(t-1)}$** **(7.3)** (1.2) (-1.1) (0.7)**	0.95	0.93	44.3**	2.41
Quantity of consumption Of oils	**Log QCt = 1.48 + 0.9 Log Qit + 0.28 Log QPt + 0.23 Log POPt -0.2 Log GDPpt** **(6.3)** (1.5) (-0.3) (-1.2)**	0.95	0.92	42.6**	2.27
production quantity Of oils	**Log QPt = 0.3 – 0.29 Log QIt + 0.2 Log QCt + 0.1 Log $PI_{(t-1)}$ + 0.8 Log CAt** **(-1.1)* (0.7) (0.9) (3.7)****	0.84	0.77	*12.1	2.49

Where: * significant at the level of significance 0.05. ** Significant at the level of significance 0.01.
Source: Compiled and calculated from: Data of the Arab Organization for Agricultural Development, the Statistical Yearbook.

6. Future prediction of structural variables for the An Econometric model:

1. Test the model's predictability

The validity of the **An econometric** model of the oils gap is tested in the Arab world, by testing the explanatory ability of the model, and testing its predictability. Table (12) indicates the results of the Thail test for the variables of the simultaneous model, which indicate that the model has the ability to predict by approaching the Thail parameter to zero and far from the correct one.

Table (12) Thail test results for simultaneous model variables

Internal variables of the market equilibrium model	U
The total quantity of oil imports in the Arab world	**0.39**
The total quantity of oil consumption in the Arab world	**0.24**
The total quantity of oil production in the Arab world	**0.04**

Source: Compiled and calculated from: Data of the Arab Organization for Agricultural Development, the Statistical Yearbook.

2. Predicting the behavior of the Endogenous variables of the model:

Scientific prediction of the behavior of economic phenomena is one of the most important goals of econometrics, as scientific prediction is quantitative estimate of the expected value of the dependent variables in the future based on what is available to us from past and current information. The scientific prediction assumes that the behavior of economic phenomena in the future is what It is an extension of the behavior of these phenomena in the recent past, and then the occurrence of sudden, unforeseen changes that may lead to the inaccuracy of scientific predictions regarding the future of economic phenomena. The estimation of the ARIMA model consists of four stages: the Identification Stage, the Estimation Stage, the Diagnostic Stage, and the Forecasting Stage. This methodology is based on three parts as follows (1):

1) Auto-Regression Model (AR):

The Auto-regression model can be written as follows:

YT = B0 + B1YT-1 + B2YT-2 + ... + BPYT-P + eT

YT	The values of the variable Y represent the predicted
YT-1, YT-2, YT-P	The values of the variable Y represent the time-lagged over the period T
B0,B1,B2,BP	The coefficients of the regression equation

2) Moving Average Model (MA):

The moving average model can be formulated as follows:

YT = W0 + eT – W1eT-1 – W2eT-2 + ... – WqeT-q

YT	the values of the variable Y represent the predicted
eT-1,eT-2,eT-q	The lag represents the residuals of the estimation of the YT variable
W0,W1,W2,Wq	Represent weights
eT	Represents the random variable

3) Auto-Regression Model and Moving Average ARMA:

The two previous models can be combined into one form called (ARMA) and the model becomes as follows:

YT = B0 + B1YT-1 + B2YT-2 + ... + BPYT-P + eT + W0 + eT – W1eT-1 – W2eT-2 +..... – WqeT-q

This model is referred to as ARMA of rank (p, q) where the "p" denotes the rank of autoregressive and the " q" denotes the rank of moving average. Before applying the previous equation to the time series data, it must be ensured that this series is stationary, and this means that the dependent variable is a mean and a constant variance during the study period. If the time series is unstable i.e. its variance is not fixed and its direction is increasing or decreasing, then it must be converted into a stable series by finding the first difference d for this variable. The first difference was taken for the variants for chain stability.

4) Predicting research variables:

1. The quantity of imports of oils in the Arab world (thousand tons):

Estimating the ARIMA model to predict the quantity of Arab imports of vegetable oils, it was found that the best prediction is the model that contains a auto regression of the zero (0) AR ,and a moving average of the second order (2) MA along with differences of the first order D (1). Table results for the significant regression coefficients at 0.01 significant level.

The forecast results presented in Table (14) show the quantity of imports of vegetable oils for the Arab world expected during the period (2019-2023), they are expected to reach about 9.9 million tons during the year 2019, and then rise until it reaches about 11.4 million tons during the year 2023, the growth rate estimated about 14.4%

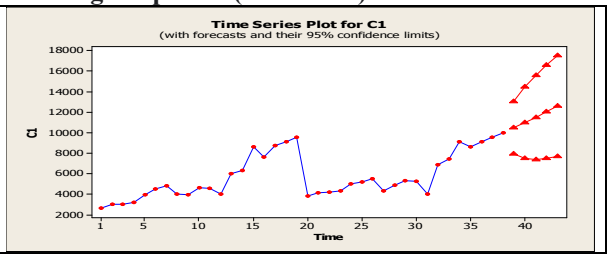
Table (13) results of the ARIMA model (0,2,1) to predict oil imports in the Arab world

Type	Coef	SE Coef	T	P
MA 1	**1.1650**	**0.3188**	**3.65**	**0.002**

Source: compiled and calculated from the results of simultaneous model.

Table (14) expected values of oil imports in the Arab world during the period (2019-2023)

The quantity of imports of oils thousand tons			
years	**Forecasting**	**Biggest Estimate**	**Less Estimate**
2019	9942.7	11571.9	8313.4
2020	10321.4	12443.9	8198.8
2021	10686.9	13073.7	8300.1
2022	11039.3	13564.0	8514.6
2023	11378.5	13963.3	8793.8



Source: compiled and calculated from the results of simultaneous model.

2. The quantity of oils consumption in the Arab world (thousand tons):

By estimating the ARIMA model to predict the quantity of consumption of vegetable oils for the Arab world, it was found that the best prediction is the model that contains auto regression of the zero (0) AR and a moving average of the second order (2) MA , with differences of the first order D (1), The results of the table indicate the a statistically significant regression coefficients at 0.01 significant level

The forecast results presented in Table (16) show the quantity of vegetable oils consumption of to the Arab world expected during the period (2019-2023), as it is expected to reach about 10.4 million tons during the year 2019, and then rise to 12.1 million tons during the year 2023, the growth rate estimated about 16.7%.

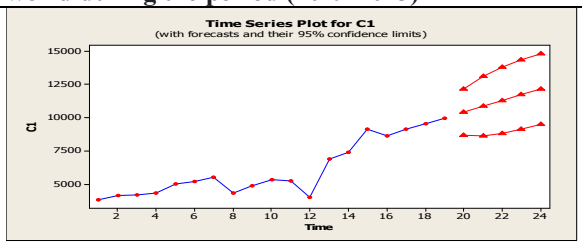
Table (15) results of the ARIMA model (0,2,1) for predicting oil consumption in the Arab world

Type	Coef	SE Coef	T	P
MA 1	**1.1876**	**0.3220**	**3.69**	**0.002**

Source: compiled and calculated from the results of simultaneous model.

Table (16) expected values of oil consumption in the Arab world during the period (2019-2023)

The quantity of oil consumption is 1000 tons			
years	**Forecasting**	**Biggest Estimate**	**Less Estimate**
2019	10401.9	12139.8	8664.0
2020	10841.7	13080.7	8602.6
2021	11277.3	13765.7	8788.9
2022	11708.8	14310.6	9107.0
2023	12136.1	1477.3.8	9498.5



source: compiled and calculated from the results of simultaneous model.

3. Quantity of oil production in the Arab world (thousand tons):

Estimating the ARIMA model to predict the volume of production for the Arab world from vegetable oils, it was found that the best prediction is the model that contains a auto regression of the zero (0) AR and a moving average of the second order (2) MA, the differences from the first order D (1), where The results of the table indicate the statistically significant regression coefficients at 0.01 significant level.

The results of the forecast Table (18) show the quantity of production of vegetable oils to the Arab world expected during the period (2019-2023), it is expected to reach about 2.1 million tons during the year 2019, and then rise to about 2.7 million tons

during the year 2023, the growth rate estimated about 24.3 %

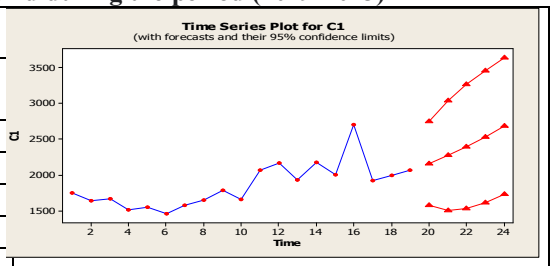
Table (17) results of the ARIMA model (0,2,1) to predict oil production in the Arab world

Type	Coef	SE Coef	T	P
MA 1	1.1540	0.3367	3.43	0.004

Source: compiled and calculated from the results of simultaneous model.

Table (18) expected values of oil consumption in the Arab world during the period (2019-2023)

The quantity of oil production is 1000 tons			
years	Forecasting	Biggest Estimate	Less Estimate
2019	2159.6	2746.1	1573.1
2020	2271.1	3039.3	1502.1
2021	2395.6	3264.5	1526.8
2022	2533.1	3457.5	1608.7
2023	2683.5	3634.9	1732.1



Source: compiled and calculated from the results of simultaneous model.

7. Problems and obstacles to the production and industry of oils in the Arab world:

Oil sector in the Arab world facing some problems, **(The Arab Organization for Agricultural Development, 2017)** which have been discussed in studies and research, and have been divided into production, marketing, manufacturing, financing, legislative, and environmental problems:

A. Production problems:

1. Weak productivity of oilseeds, high production costs, land Fragmentation of agricultural holdings and failure to benefit from economies of scale, lack of interest in introducing of high productivity varieties, early maturity and resistance to climatic conditions, low returns from cultivating oil crops compared to that of competing crops, high rates of losses during harvest and handling **(The Arab Organization for Agricultural Development, 2016).**

B. Marketing problems:

2. The high price of the local product compared to imported products, the absence of cooperatives in marketing oil crops, storing the crop and not supplying it to the factories directly after harvesting or picking, the unavailability of suitable stores in terms of humidity and temperature, high rates of waste during manufacturing and circulation, **(The Arab Organization for Agricultural Development, 2010&2016)** weak local demand for some types Oils like olives.

C. Manufacturing problems:

The high costs of manufacturing, the absence of complementary manufacturing industries such as the soap industry, the low efficiency of factories as a result of aging machines, which negatively affects the quality of products, and positively increases production costs, most of the machines and machines are imported **(The Arab Organization for Agricultural Development, 2018)**, and suffer from a lack of spare parts, and inefficiency of machines and machines manufactured locally Unavailability of juicing machines for crops, especially canola, as it needs pressing machines that differ from soybeans and sunflowers in some Arab countries, unavailability of seeds and oil crops to meet the operational needs of factories, Inefficiency in distributing factories in some Arab countries due to their concentration in cities far from production areas, which leads to increased costs, lack of trained and qualified administrative and technical in some Arab countries, lack of training programs for manufacturing workers, low oil quality as a result of wrong post-harvest practices Such as transportation, storage, and packaging, lack of knowledge in the field of quality control and good practices, lack of knowledge of local and international standards, fluctuation in production of oilseeds and oil fruits from year to year, which limits the factories' ability to develop strong operational plans, and receive mismatched oil crops For standard specifications, The decrease in the operational capacity of the factories, which leads to the length of the period before the era, failure to comply with the conditions of work of the factories in a proper manner, such as the conditions of hygiene in order to save energy, the lack of infrastructure such as roads, transportation, electricity, water, liquid and solid waste disposal ... etc.

D. Financial problems:

Unavailability of proper loans and the complexity of their procedures weak financial capabilities of farmers and mill owners, high production and marketing costs, high labor costs, transportation and packaging materials, weak funding for research, agricultural extension and the application of modern technology

E. Legislative problems and limitations:

The absence of legislation for the protection of national production in some Arab countries, the lack of implementation of the legislation on quality control, the absence of legislation that exempted machines and press machines for the manufacture of oils from imposing customs duties in some Arab countries, the failure to activate the legislation to preserve the environment.

F. Environmental problems:

Water scarcity, instability of annual rainfall rates in some Arab countries, degradation of soil and low productivity as a result of not applying the agricultural cycle in some Arab countries, agriculture in inappropriate environments, exposure of some areas planted with oil crops in Arab countries to frost waves during the winter season or to waves Extreme heat, fluctuation of rain in some Arab countries, and the consequent fluctuation in production.

Summary:

Achieving food security is one of the most important problems facing the Arab world; Arab countries still suffer from a steady gap in many food commodities, especially from strategic food commodities such as vegetable oils, According to data the percentage of self-sufficiency from oil crops in the Arab world decreased from 49% year 2015 to about 35.9% year 2018. So the research aims to study the current and future situation of production, consumption and the food gap of oil crops in the Arab world, There for The research used the descriptive and quantitative method to analysis and introduces the study problem, this research based on secondary data.

-The results and data indicates an increase in the volume of the oil crops gap in the Arab world, about 63% during the first period (2005-2011), 75% in the second period (2012-2018) The rate of decline in the self-sufficiency ratio was 32% .

- The simultaneous equations model, clarifies the factors affecting the quantity of oil crops imports. Consumption and production of oil crops (thousand tons).
- The cultivated area (thousand hectares), The average import price for the previous year ($ / ton), explains about 95% of the changes in the import quantity of oil crops.
- Increasing the quantity of consumption of oils by 10% leads to an increase in the quantity of imports of oils by 9.7%.
- the quantity of imports of oils (thousand tons), the quantity of production of oils (thousand tons), population of the Arab world (million), per capita share in Arab GDP (thousand dollars) , explains about 95% of the changes in the quantity of consumption.
- The results indicate that an increase in the quantity of imports by 10% leads to an increase in the quantity of consumption of oils by 9.1%.
- The quantity of imports of oils (thousand tons), the quantity of consumption of oils (thousand tons), the export price for the previous year is $ / ton, and the area cultivated with oil crops (Thousand hectares), explains about 84% of the changes in the quantity of production.
- The results indicate that an increasing in the cultivated area of oil crops by 10% leads to an increase in the quantity of production by 8%.
- The forecast in the Arab world during the average period (2019-2023), estimates an increase in production 24.3%, also there is an increase consumption16.7%, which led to an increase in to an increase in imports of vegetable oils 14.4%.

Recommendations:

1) Improve productivity by publishing and devising improved, high-yielding varieties, in addition to Using developed methods in agriculture.

2) Activating contractual farming for industrial crops.
3) Establish a competitive price policy.
4) Expanding cultivation of olive tree varieties, and developing varieties of cotton in which the seed content high oil.
5) Development of factories to raise extraction rates, as the percentage of cotton oil extraction about 20%, sunflower crop 35%, and maize 35%, while linen has an oil content ranging between 40% and 45%, canola plant and the percentage of oil between 45%, 50%.
6) Providing proper loans and customs to encourage the owners of old factories to modernize.
7) Applied standard specification for different oils in order to facilitate intra-Arab trade.

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