Middle East Journal of Agriculture Research
Volume: 13 | Issue: 03| July – Sept.| 2024

EISSN: 2706-7955 ISSN: 2077-4605
DOI: 10.36632/mejar/2024.13.3.39
Journal homepage: www.curresweb.com
Pages: 707-708

Economic Factors Affecting the Peanut Crop in Sohag Governorate

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Received: 25 July 2024 **Accepted:** 05 Sept. 2024 **Published:** 20 Sept. 2024

ABSTRACT

Oil crops occupy an important place in the Egyptian agricultural economy, and their importance comes in that the demand for them is derived from the demand for the production of vegetable oils, which constitute a prevailing and basic food pattern for the Egyptian consumer, and some oil crops are grown to use their products for bilateral or triple purposes. The research aims to answer the most important questions and try to develop solutions to overcome the problems that hinder the increase in the production of peanuts in Egypt, especially since it is one of the crops that are good cultivation in the lands where the cultivation of other field crops is not good, and the research also aims to identify the most influential variables in the response of farmers to the cultivation of the crop and study the production functions and costs of this crop. The results indicated that the annual average area planted with peanuts was estimated at about 147929.6 fedden during the period (2013-2022), and the average productivity per acre was about 1.39 tons per acre, while the average production was estimated at about 205391.79 tons for the same period referred to. Production and cost functions were estimated for the three crop holding categories in the study sample. Finally, the research suggests the following: -1 - The development of high-productivity varieties, compatible with the Egyptian conditions, with the application of modern technology in agricultural operations, with the help of research and extension bodies. 2 - Work to increase municipal fertilization and reduce the quantities of chemical fertilizer, as this leads to an increase in production and reduce costs, which was indicated by the results of the study sample. 3 - Encouraging the establishment of factories concerned with manufacturing in the main production areas such as Nubaria and the governorates of Lower Egypt (Beheira, Sharqia, Ismailia) to encourage farmers to increase their production and supply at reasonable prices.

Key words: Oil crops, production, vegetable oils, economy, Peanut

Introduction

Peanuts are one of the main summer crops in new lands, which are often sandy or light-yellow lands, where this type of land suits him.

The crop brings a quick cash return to the farmer, so it is preferable to plant it in these lands with a bilateral or triple agricultural cycle where the economic return from it is better than other summer crops in addition to the short duration of stay of new varieties such as Giza (5) and Giza (6), where early in maturity about a month for Roman models and semi-flat varieties such as Giza (4) Peanuts are important export crops where about 65-70% of the output is consumed locally and was exported Of it 30-35% for European and Arab countries previously, although the quantities exported of it have declined in recent years due to some problems related to the increase in the percentage of aflatoxin in the seeds, in addition to the fact that it is an oil crop The percentage of oil in its seeds is between 35-47% with a high percentage of protein in the seeds about 27%, and its seeds contain both vitamins B and F , in addition to riboflavin and thiamine, and the average area planted with peanuts in Egypt is about 198763 acres In 2021

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Search problem

Despite the importance of the peanut crop as a crop whose seeds are used as seeds or consumed fresh or in the confectionery industry, and oil is also used in some industries due to the high percentage of oil in addition to being an export crop, but its production has not reached in recent years to the desired quantities of it, i.e. it has been characterized by fluctuation in recent years, which leads to fluctuating self-sufficiency rate. So the problem comes in the form of a question is whether the self-sufficiency rate of this crop can be raised to higher rates. Hence the importance of analyzing the trends of area, production and productivity and studying the extent of its response to the factors affecting its production.

Objective of the research

The research aims to find solutions to the problems that stand in front of the increase in the area planted with peanuts in Egypt, especially as it is one of the crops that are good cultivated in the lands where the cultivation of other field crops is not good, and the research also aims to identify the most influential variables in the response of farmers to the cultivation of the crop and study the production functions and costs of this crop.

Research method and data sources

The research used both the descriptive method to describe the problem and presentation, and the quantitative method by using statistical and mathematical methods to analyze data and draw conclusions in accordance with economic logic.

The research relied on both published and unpublished secondary data, which were obtained from various bodies such as the Ministry of Agriculture and Land Reclamation and its affiliates, the Central Agency for Public Mobilization and Statistics, the Institute of National Planning and some specialized sites for data, in addition to some references and studies on the subject of the research, and the research also relied on the primary data obtained from the questionnaire form, which was designed for this purpose.

Area, productivity and production of peanut crop in Egypt

The peanut crop is considered one of the high-productivity summer crops, consumed locally in eating directly or entering into the candy industry, in addition to being an export crop, and the resulting gain from it is considered high nutritional value for animals Table (1) indicates the development of the area, productivity and production of peanuts in Egypt during the period (2013-2022) and it is clear from the table that the average cultivated area amounted to about 147.929.6 fedden during the period (2013-2022)The area during the study period ranged from a minimum of about 134,440 acres in 2017, to a maximum of about 158949 acres in 2013, with a decrease of about 15.4% from 2013.

The general time trend equation contained in Table (2) indicates that the area planted with peanuts in Egypt decreased annually at a rate of 1149.2 fedden, representing about 0.78% of the annual average cultivated area in Egypt during the period (2013-2022).

Table (1) shows that the average acre productivity of the peanut crop in Egypt amounted to about 1.39 tons per acre in the average of the first period (2013-2022) with a minimum of about 1.27 tons per acre in 2013, and its maximum yield was about 1.56 tons per fedden in 2020.

The equation of the general time trend in Table (2) shows that the productivity of peanuts increased statistically significant annual increase of about 0.018 tons per fedden, representing 1.29% of the annual average during the period (2013-2022).

The total production of the crop is only the result of both the cultivated area and the acre productivity, and the data of Table (1) indicate that the average total production of the peanut crop in Egypt was estimated at about 205391.79 in the average of the first period (2013-2022), with a minimum of about 198763 tons in 2022, while the maximum reached about 243289.1 tons in 2020, and it was shown from the general time trend equation contained in Table (2) that the total production of the peanut crop increased An annual amount of 1090.75 tons represents about 0.53% of the annual average of total production during the study period, estimated at about 205391.79 tons, and this increase has been statistically proven significant.

Table 1: Evolution of the area, productivity and production of peanuts crop in Egypt during the period (2012-2022).

Year	Area Feddan	Scale number	Productivity Ton/ Feddan	Scale number	Production Tones	Scale number
2013	158949	100%	1.27	100%	201952	100%
2014	154813	97.40	1.33	104.72	206513	102.26
2015	148704	93.55	1.38	108.66	205393	101.70
2016	147778	92.97	1.39	109.45	204795.83	101.41
2017	134440	84.58	1.36	107.09	183276	90.75
2018	143022	89.98	1.38	108.66	197243	97.67
2019	152863	96.17	1.35	106.30	205911	101.96
2020	156044	98.17	1.56	122.83	243289.1	120.47
2021	140041	88.10	1.48	116.54	206782	102.39
2022	142642	89.74	1.39	109.45	198763	98.42
Average	147929.6		1.39		205391.79	

Source: Collected and calculated from the data of the Ministry of Agriculture and Land Reclamation, Economic Affairs Sector, Central Administration of Agricultural Economy, Agricultural Economy Bulletin, various issues.

Table 2: Equations of the general time trend of the development of the area, productivity and production of peanuts crop in Egypt during the period (1995-2012).

Variables	Equations	R2	Average	F
Area per feddan	Y=145250.6-1149.27X (-1.397)	0.196	147929.60	1.95
Productivity per tons/ feddan	Y=1.291+0.018X (2.56)	0.451	1.389	6.57
Production per tons	Y=199392.62+1090.75X (0.634)	0.048	205391.7	0.402

Geographical distribution of peanut production in Egypt

Table No. (3) indicates the geographical distribution of the production of peanuts crop distributed over the different regions of the Republic, and it is clear from the table data that the Nubaria region produces the largest amount of peanuts among the different regions, as the production in the average period (2019-2022) reached about 109.6 thousand tons, representing about 51.73% of the total production of peanuts in that period, and occupies the governorates of Lower Egypt, represented in Beheira, Sharqia, Ismailia, Suez, Menoufia and Qalyubia. t.

Table 3: Geographical distribution of peanut crop production in different regions in Egypt during the period (2019-2022)

Governorates	Production quantity in thousand tons	%
Lower Egypt	58 .25	26.56
Middle Egypt	24.3	11.67
Upper Egypt	12.2	0.11
New Valley	10.5	4.57
Marsa Matrouh	0.15	0.074
Nubaria	109.6	51.74
Republic	215	100

Source/collected and calculated from data
Ministry of Agriculture and Land Reclamation, Economic Affairs Sector, Central Administration of Agricultural Economy, Agricultural Economy Bulletin, various issues.

And the second place with a production amount of about 57.25 thousand tons representing about 26.56% of the total production of the Republic, and occupies the governorates of Central Egypt, represented in each of (Giza, Beni Suef, Fayoum and Minya) ranked third with a production amount estimated at about 24.28 thousand tons representing about 11.67% of the total production of the Republic in that period, and comes in fourth place the governorates of Upper Egypt (Assiut, Sohag, Qena and Aswan) with a production amount of about 12.2 thousand tons representing about 5.39% of the total production of the Republic, and then comes in the ranking of the New Valley Governorate with about 10.5 thousand tons

representing about 4.57% of the total production of the Republic, and finally the Governorate of Marsa Matrouh with about 0.07% of the second period. From the above, it is clear the need to pay attention to the establishment of manufacturing factories in the Nubaria area, which is the most important crop-producing areas in Egypt.

Area, productivity and production of peanut crop in Sohag

Table (4) shows the development of the area, productivity and production of peanuts in Sohag Governorate during the period (2013-2022) and it is clear from the table that the average cultivated area amounted to about 2396.4 acres during the period (2013-2022), and the area during the study period ranged between a minimum of about 1171 fedden in 2015, and a maximum of about 3889 fedden in 2013, with a decrease of about 69.8% from 2013.

Table (4) shows that the average acre productivity of the peanut crop in Sohag amounted to about 1.470 tons per fedden in the average of the first period (2013-2022) with a minimum of about 1.11 tons per acre in 2013, and its maximum limit was about 1.68 tons per fedden in 2022, and the equation of the general time trend in Table (5) shows that the productivity of the peanut crop increased statistically significant annually by about 0.085 tons per fedden.

Also, the data of Table (4) indicate that the average total production of the peanut crop in Sohag was estimated at about 2716.4 tons in the average of the first period (2013-2022), with a minimum of about 782 tons in 2016, while the maximum was about 4324 tons in 2013.

The general time trend equation contained in Table (5) showed that the total production of peanut crop increased annually by 95.44 tons.

Table 4: Development of the area, productivity and production of peanut crop in Sohag during the period (2013-2022).

Year	Area	Scale number	Productivity	Scale number	Production	Scale number
2013	3889	100%	1.11	100%	4324	100%
2014	2241	57.62	1.30	117.12	2923	67.60
2015	1171	30.11	0.67	60.36	782	18.09
2016	2431	62.51	0.71	63.96	1717	39.71
2017	2595	66.73	0.67	60.36	1711	39.57
2018	2996	77.04	0.67	60.36	2004	46.35
2019	2025	52.07	1.48	133.33	2987	69.08
2020	2316	59.55	1.58	142.34	3661	84.67
2021	2145	55.16	1.60	144.14	3434	79.42
2022	2155	55.41	1.68	151.35	3621	83.74
Average	2396.4		1.470		2716.4	

Table 5: Equations of the general time trend of the development of the area, productivity and production of peanut crop in Egypt during the period (2013-2022).

Variables	Equations	R2	Average	F
Area per feddan	Y=2775.4-68.9X (-0.882)	0.089	2396.4	0.778
Productivity per tons/ feddan	Y=0.677+0.085X (2.215)	0.357	1.470	4.43
Prodcution per tons	Y=2191.46+95.44X (0.759)	0.067	2716.4	0.576

Estimation of Peanut Cultivated Area Response Function in Egypt

To study the factors affecting the cultivated area of peanut crop during the period (2013-2022), the dynamic supply response function was estimated, and the Mark Nerlove model was used, which is the most compatible model with the use of slowdown period variables (t-1) and assuming that the most important The factors affecting the area of peanuts in Egypt during the period referred to are:

X1 = Net fedden yield of summer maize crop in pounds in the previous year.
X3 = Net a fedden cre yield of the summer tomato crop in pounds in the previous year.
X4 = Net fedden yield of sesame crop in pounds in the previous year.
X5 = Net fedden yield of peanut crop in pounds in the previous year.

R2 = coefficient of determination, F = significant model, and the numbers between the parentheses below the equation indicate the calculated value of (T).** Significant at 1%.

Using the net yield of previous crops (which are crops competing with peanuts in the agricultural cycle) because what matters to the farmer is the net return (farm income of the farmer). The results obtained after applying the multi-stage regression method using Stepwise Regression Analysis show that the best functions estimated from a statistical and economic point of view are Logarithmic image The results indicated that the most important independent variables that affect the area planted with peanut crop are the net acre yield of the summer maize crop in pounds in the previous year (X1), and the net acre yield of sorghum crop in pounds in the previous year (X2), and the net fedden yield of the summer tomato crop in pounds in the previous year (X3), and the net fedden yield of the sesame crop in pounds in the previous year (X4) and the net fedden yield of the peanut crop in pounds in the past (X5) where the significance of the estimated regression coefficients were proven at a significant level of 0.01 and the coefficient of determination was about 0.91, which means that about 91% of the changes that The elasticity of the cropped area of peanuts for each of the net fedden yield of maize, summer tomatoes, peanut sesame crops was estimated at 0.13, 0.34, 1.22 and 0.14respectively.This means that a change of about 1% in the net fedden yield for maize, summer tomatoes, sesame, peanuts in the previous year leads to a change of about 0.13%, 0.34%, 1.22%, and 0.14% in the cultivated area of peanuts, respectively. From the above, it was found that the most important economic factors affecting the area planted with peanuts in Egypt during the period (2013-2022) are the net acre yield of sesame, summer tomatoes and maize crops. And peanuts and the significance of the net fedden yield of the sorghum crop has not been proven.

Lin **y^** = 3.49 +0.13Linx1+0.34Linx3+ 1.22 Linx4+ 0.14 Linx5
(2.97)** (3.91)** (4.11)** (3.19)** (3.81)**
F= 36.12 R2=0.85

where y^ = The estimated value of the cultivated area of peanuts in the current year in thousand fedden
X1 = Net fedden yield of summer maize crop in pounds in the previous year.
X3 = Net a fedden yield of the summer tomato crop in pounds in the previous year.
X4 = Net fedden yield of sesame crop in pounds in the previous year.
X5 = Net fedden yield of peanut crop in pounds in the previous year.
R2 = coefficient of determination, F = significant model, and the numbers between the parentheses below the equation indicate the calculated value of (T).** Significant at 1%.

Statistical Estimation of Peanut Production Functions and Costs
Selection of the study sample in Sohag Governorate

Sohag Governorate was chosen as a case study because it is considered one of the important governorates in the production of peanuts crop at the level of the Republic producing this crop for the season (2022).

Sohag Governorate includes twelve administrative centers, where the center of Sakelta was chosen according to the relative importance of the area planted with peanuts and then two villages were chosen from this center are Al-Twail Al-Gharbia and Al-Jalawiya and Faf for the relative importance of the area and the number of peanut farmers and random tables were used for selection.

The sample size reached 85 farmers and they were divided randomly within each village according to the size of the holding, and the holdings were divided into three categories of holdings and selected from each category a number of farmers with a ratio to the sample size the same ratio between their total number in each category of possession and the size of the community to be the sample representative of each class in society according to the size of the tenure and therefore divide the sample into:

The first category of holdings

Includes holdings that are less than an acre (less than an acre) and includes 30 farmers.

The second category of holdings

Includes holdings whose area is from one acre to less than three acres (1 - less than 3 acres) and includes 30 farmers.

The third category of holdings

Includes holdings with an area of three acres or more (3 acres or more) and includes 25 farmers.

First: Statistical estimation of production functions for peanut crop in Sohag Governorate

The peanut crop production functions were estimated by different statistical images, whether linear or logarithmic, in order to choose the most appropriate ones, as it shows the relationship between the amount of peanut crop production in tons, which is the dependent variable, and the factors affecting production, which are the independent (interpreted) factors.

1. Estimation of the production function for the first Holding **category (less than an fedden)**

By extrapolating the results contained in Table (4), it was found that there is a positive relationship between the amount of production of peanut crop and each of the amount of seeds (x1), phosphate fertilizer (x2), human labor (x5) and the amount of irrigation (x8), as the increase of the user in production by 1% of the amount of seeds, the amount of phosphate fertilizer, human labor, the amount of irrigation leads to an increase in production by about 0.16%, 0.32%, 0.34%, 0.24% respectively, and the statistical significance of all parameters has been confirmed. The coefficient of determination indicates that about 85% of the changes in production are due to the increase in the production elements included in the previous estimates, and the previous estimates can obtain a coefficient of total elasticity of about 1.06, which reflects the increasing return on capacity.

2. Estimation of the production function for the second Holding category (from 1-less than 3 fedden)

Table (4) showed that the best estimates are the logarithmic image, where it was found that there is a positive relationship between the production of peanuts per acre and each of the amount of seeds (x1), phosphate fertilizer (x2), municipal fertilizer (x4), human labor (x5) and irrigation (x8), as by increasing the number of units used in production by 1% of each of the amount of seeds, phosphate fertilizer, municipal fertilizer, human labor, leads to an increase in production by about 0.13%, 0.14%, 0.13%, 024%, 0.13% respectively The statistical significance of all the estimated parameters has been proven, and the coefficient of determination shows that about 83% of the changes in production are due to changes in the production elements included in previous estimates, and the total elasticity coefficient was about 0.77, which reflects the decreasing return on capacity, so it is necessary to intensify the production elements and use them optimally and best to reach the optimal production of the product.

3. Estimation of the production function for the third Holding category (more than 3 fedden)

From Table (6), it was found that there is a positive relationship between the production of acres of peanut crop in the study sample and each of the amount of seeds (x1), phosphate fertilizer (x2), municipal manure (x4), human labor (Q5), irrigation (S8), as it increases the user by 1% of each of the amount of seeds, phosphate fertilizer, municipal fertilizer, labor, irrigation leads to an increase in production by about 0.22%, 0.28%, 0.21%, 0.19%, 0.18% respectively, and statistical significance has been proven For all the estimated parameters, the coefficient of determination shows that about 84% of the increase in production is due to the production elements included in the previous estimates, and the overall elasticity coefficient was about 1.08, which reflects the increasing return on capacity.

4. Estimation of the production function for the total sample

Table (6) shows the relationship between the amount of peanut production in tons and each of the quantity of seeds (X_1), phosphate fertilizer (X2), municipal fertilizer (X4), human labor (X5), irrigation (X8), as increasing the number of units used in production by 1% of each of the quantity of seeds, phosphate fertilizer, municipal fertilizer, human labor, irrigation leads to an increase in production by about 0.19%, 0.11%, 0.22%, 0.31%, 0.19% respectively. The statistical significance of all the estimated parameters has been confirmed, and the coefficient of determination indicates that about 80% of the changes in production are due to the change in the production elements included in

the previous estimates, and the overall elasticity coefficient was about 1.02, which reflects the increasing return on capacity.

Table 6: Estimation of peanut production functions in the study sample

Holding category	Equations	R2	F
1- Holding category (less than fedden)	LinY1=2.89+0.16Linx1+0.12Linx2+0.34Linx5+0.14Linx8 (5.11)** (2.81)*(3.02)** (3.1)** (2.99)**	0.85	54.86
2- Holding category (l fedden to less than 3fedden)	LinY1=5.9+0.13Linx1+0.14Linx2+0.21Linx4+0.19Linx5+0.13Linx8 (4.21)** (3.65)**(2.56)* (2.84)* (2.65)** (3.01) **	0.38	67.23
3- Holding category (More than 3fedden)	LinY1=4.17+0.22Linx1+0.28Linx2+0.21Linx4+0.19Linx5+0.18Linx8 (6.25) ** (2.59) **(2.19) * * (2.11) ** (3.01)** (4.99) **	**0.48**	**79.32**
4- Total Sample	LinY1=6.13+0.19Linx1+0.11Linx2+0.22Linx4+0.31Linx5+0.19Linx8 (7.15) ** (3.22) **(3.1) ** (4.21) * (4.21)** (2.99) **	**0.80**	**86.69**

where :
y^8 = estimated value of productivity per fedden in tons,
x1 = quantity of seeds (kg)
x2 = Number of units of phosphate fertilizer (kg)
X3 = Number of nitrogen units (kg)
x4 = Manure (m3)
x5 = Human labor (man / day / work)
x6 = Animal work x8 = Number of irrigations
R2 = Coefficient of determination F = significant value of the model
The values in parentheses indicate the calculated value (T), ** significant at 1%, * significant at 5%.
Source: Collected and calculated from the data of the questionnaire form for the sample in 2021/2022.

Second: - Statistical estimation of the functions of the production costs of the peanut crop in Sohag Governorate

1. Estimation of the cost function for the first category (less than 3 fedden)

The statistical estimates of the functions of the production costs of the peanut crop for the first category, as in Table (7) that the best estimated estimates were the square picture, which shows the relationship between the total production costs and the volume of production of the peanut crop, where the statistical significance was confirmed at the level of 0.01, and the determination coefficient indicates that about 65% of the changes in production costs are due to changes in the quantity produced from the peanut crop, and through this equation can calculate the size achieved for the lowest cost Productivity (optimal volume of production) and the most volume of profits, the civil size of costs is about 2.14 tons, while the most volume of profit is about 3.63 tons, and the elasticity coefficient can be estimated by dividing marginal costs by medium costs of about 0.98.

2. Estimation of the cost function in the second acquisition category (1- less than 3 acres)

By reviewing the statistical estimates of the functions of the costs of peanut production for the second tenure category, Table (7) shows that the best estimates are the quadratic form, and the statistical significance has been proven at the level of 0.01, and the determination coefficient indicates that about 69% of the changes in production costs are due to changes in the quantity produced of peanuts crop in the study sample, and through the equation can estimate the size achieved for the lowest production cost (optimal volume of production) of about 2.05 tons, and the most For earnings of about 3.66 tons, the modulus of elasticity was about 1.06.

3. Estimation of the cost function in the third acquisition category (more than 3 feddan)

By extrapolating the statistical estimates of the functions of the costs of producing the peanut crop for the third tenure category, it was shown from Table (7) that the best estimates are the quadratic form, and the statistical morale was confirmed at the level of 0.01, and the coefficient indicates that about 75% of the changes in production costs are due to the change in the quantity produced of peanuts in the study sample, and through the equation can estimate the size achieved for the lowest production cost

(optimal volume of production) of about 2.57 tons, and it reached The bulk volume of earnings was about 3.88 tons, and the modulus of elasticity was about 0.77.

Table 7: Estimation of production cost functions of peanut crop in study sample in Sohag Governorate

Holding category	Equations	R2	F
1- Holding category (less than fedden)	TC=-3171+312.5Y1-690Y2 (-4.1)** (4.55)** (-4.2)**	0.65	29.63
2- Holding category (l fedden to less than 3Fedden)	TC= -2951+219.6Y1-700Y2 (-4.36) **(3.59)** (-2.59) **	0.69	21.68
3- Holding category (More than 3 fedden)	TC=-4186.8+418Y1-634Y2 (-5.62) **(2.68)** (-3.56) **	**0.75**	**22.52**
4- Total Sample	TC=-3173.8+380.5Y1-620Y2 (-4.38) **(3.36)** (-4.13) **	**0.80**	**32.11**

TC = Total costs, Y = Fedden productivity, R2 = Coefficient of determination, F = Significant value of the model The values in parentheses below the equations indicate the calculated value T, ** Significant at 1%, * Significant at 5%.

Source: Collected and calculated from the data of the questionnaire forms for the sample in 2013/2022.

4. Estimation of the cost function for the total sample

The data in Table (7) indicate that the best statistical estimates are the quadratic picture, which shows the relationship between the total production costs and production of the peanut crop in the total sample, and the statistical morale has been confirmed at the level of 0.01, and the determination coefficient shows that about 80% of the changes in production costs are due to the change in the quantity produced from the peanut crop, and through the equation can estimate the size achieved for the lowest production cost (optimal volume of production) of about 2.26 tons, and the most volume of production is about 3.99 tons, and the modulus of elasticity was about 0.91.

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