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ORIGINAL ARTICLE

ESTIMATING AND ANALYZING THE COSTS OF EGGPLANT (*SOLANUM MELONGENA*) PRODUCTION UNDER THE GREENHOUSE IN ANBAR GOVERNORATE FOR THE AGRICULTURAL SEASON 2019-2020

Eyid Abbas Abdalltef[1,2&*], Mishal Abid Khalaf[1] and Ibrahim Abd Almoneim Mohammed[3]

[1&2]Department of Agricultural Economics, College of Agriculture, University of Anbar, Iraq.
[3]Department of Planning and Follow-up, Anbar Agriculture Directorate, Iraq.
E-mail: ag.eyid.abbas@uoanbar.edu.iq

Abstract: The research aimed to estimate and analyze the costs of eggplant production under the greenhouses in Anbar governorate for the agricultural season 2019-2020 depending on field data for 12 random samples of eggplant farms under the greenhouses of Anbar Governorate. The analysis results showed that the fixed costs constituted about 38.48%, while the variable costs constituted about 61.52% of the total costs, and the average production costs in the research sample amounted to 192240 dinars/ton. The long-run cubic function was the best among the functions that express the relationship between production costs as a dependent variable and production. Besides, the number of greenhouses in the farm independent variables, due to their similarity with the logic of the economic theory. The adjusted R^2 in it reached 0.9, where it was found that the optimal size of the farm represented by the number of greenhouses in it is 2.5 greenhouses. Thus, it achieved the optimum production size of 18 tons/farm, with an average cost of about 175000 dinars/ton. Furthermore, 50% of the farmers in the study sample achieved economies of scale, while 8.4% do not achieve any economies of scale, while the percentage of farmers who achieve low rates of economic efficiency is about 41.6 %. Finally, the supply function shows that the elasticity of supply decreases with increasing production, this means that the farms have great difficulty controlling production if prices change.

***Key words*:** Costs of Eggplant, Estimating and analyzing, Greenhouse, Costs of Eggplant

Cite this article

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1. Introduction

Eggplant is one of the important economic vegetable crops, which is rich in nutrients beneficial to the human body, and it belongs to the Solanaceae family. Man knew the cultivation of eggplant since ancient times, and after that he began to develop the cultivation of eggplant from open lands to be cultivated inside agricultural greenhouses, through which farmers can increase the yield and production of eggplant, and eggplant has been protected from unsuitable environmental conditions that destroy the life of the plant [Mahmood and Taj Aldin (2018)]. Which is represented in the cold and frost in the winter season, and through its cultivation in any season of the year, the eggplant plant needs warmth and heat, which is compatible with the conditions of its growth and this atmosphere is provided to protect the plant through electrical devices that are electric heaters and lighting lamps that perform the function of rays the sun [Sofia *et al.* (2021)]. Greenhouses provide eggplant cultivation in all seasons of the year, as it needs a temperature between 26-35°C. Eggplant fruits contain protein, carbohydrates and vitamins. Nutrition experts confirm that eggplant helps prevent heart disease. Eggplant is consumed in large quantities as it is eaten cooked, either by frying, boiling or grilling, and it is the main ingredient for some dishes such as makdous and others. There are also eggplant pickles and eggplant jam. There is still controversy over who determines

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the optimal volume of production that requires the producer to reach it by adhering to the optimal greenhouses that achieve the farmer's goals in minimizing production costs per unit of production [Mohammed *et al.* (2020)]. Achieving the optimum size requires commitment to the minimum costs that help farmers provide production at a lower cost and help local production in the ability to compete. And by transforming the relationship from the reality of hypotheses to the actual application, reinforced by quantitative results that will confirm that the optimum size of the profit is dependent on the number of necessary greenhouses that must be adhered to in order to achieve the greatest production at the lowest cost in the long run, because the number of cultivated houses will enter a variable element in the function, and this cannot be done in the short term [Nabil *et al.* (2010)].

Research problem

The research problem is represented in the low levels of production of eggplant crop in greenhouses and poor competitiveness, which reflects the inefficiency in using the economic resources allocated optimally. Also, increasing the average production cost of the producing unit under the greenhouse, and the lack of sufficient experience among farmers for achieving the optimum size.

Research hypothesis

1 The research is based on the hypothesis that production costs are affected by the quantity of output on the one hand and the number of greenhouses on the farm on the other hand.

2 The study also assumes that the majority of eggplant farmers in the greenhouse do not achieve the optimum size of production, which led to rising production costs of the eggplant crop in the research sample.

Research importance

The research importance is through the economic and nutritional importance of the eggplant crop in general, due to its frequent use in the Iraqi tables, as the demand for this crop for food uses is constantly increasing. Also, the high costs of production and the factors affecting it necessitated conducting a study to determine the optimal size of production that minimized costs, and then it can achieve economic efficiency and its impact on the production process. Therefore, identifying the optimal levels that eggplant farmers achieve to reach the highest possible economic efficiency in using available resources and setting a minimum price that eggplant farmers would get represent the pillars for continued production and development.

The research aims

The research aims at the following:

1 Production costs tabulation according to various bases and calculating their contribution to the formation of the total cost.

2 Estimating and analyzing the long-run cost function and its economic derivatives.

3 Determining the optimal size of the greenhouse farm and determining the optimum production level that minimized costs.

4 Derivation of the long-run supply function of the eggplant crop.

5 Proposing recommendations that would expand the field of greenhouses to cultivate eggplant crops, raising the efficiency of agricultural resources and increasing agricultural production.

2. Materials and Methods

Data Sources

The research relied on primary data obtained through a field survey in the study area, where the data were collected through a statistical questionnaire prepared for this purpose. This survey included cross-section data for (Estimating and analyzing the costs of eggplant production under the greenhouses in Anbar Governorate for the 2019-2020 agricultural season). A sample that included 6 districts were selected in Anbar Governorate of eggplant farmers under greenhouses, their numbers reached 12 farmers. The statistical and economic analysis was conducted after checking the data and tabulating it based on the commercial Eviews 10 program.

Method of Analysis

The study depends on

1 Descriptive analysis of the data obtained through a description of production costs and their materiality, which is based on the concepts of economic theory in line with the research objective and hypothesis.

2 Quantitative analysis, which is based on

Table 1: The costs of tradable and local production inputs and their materiality from the total costs of the eggplant crop under the greenhouse for the agricultural season (2019-2020).

Cost paragraph		**Cost (dinars / ton)**	**Materiality %**
Tradable input	Compound fertilizers	36150	42.36
	Seeds	24871	29.15
	Herbicides	13165	15.43
	Depreciation	4176	4.89
	fuel	3900	4.57
	Peat moss	1538	1.80
	Dishes	1538	1.80
	Total	85338	%100
Local input	Family manual labor	78950	40.40
	Hired manual labor	39020	19.97
	Interest on capital	24895	12.74
	Marketing operations	19490	9.98
	Organic fertilizers	12030	6.16
	Mechanical work	8955	4.58
	Irrigation	6450	3.30
	Other expenses	5625	2.88
	Total	195415	%100
Total summation		280753	

* Reference: calculated by the researcher based on the statistical form.

Table 2: Fixed and variable costs and the Materiality of the total costs of eggplant crop under the greenhouse for the 2019-2020 agricultural season.

Cost items	**The amount of costs is thousand dinars/ton**	**Materiality %**
Fixed costs	108021	38.48
Variable costs	172732	61.52
Total costs	280753	100%

* Reference: prepared by the researcher based on the statistical form.

econometric methods, in which the functions of production costs and their derivatives in long run are estimated according to several models (linear, quadratic, cubic). Applying the Ordinary Least Squares OLS method because of the advantage of this method in that it gives a linear unbiased estimator with a minimum variance of estimated constants of the economic model parameters and select the best among them, in line with the logic of the economic theory.

3. Results and Discussion

Production costs

The production costs of producing one ton of eggplant crop under the greenhouse are divided into several items, including the cost of tradable inputs and the other local inputs as in Table 1. The costs of tradable production inputs were distributed among several items and the costs of compound fertilizers ranked the first in terms of materiality and reached 36150 dinars/ton, constituted about 42.36%. The costs of seeds ranked the second, as their value amounted to 24871 dinars/ ton, which constituted about 29.15%, followed by the costs of herbicides, as their value amounted to 13165 dinars/ton, which constituted about 15.43% and ranked the third. Instead, the costs of depreciation ranked the fourth, as it amounted to 4176 dinars/ton, which constituted about 4.89%, and fuel costs ranked the fifth and reached 3900 dinars/ton, which constituted 4.57%. However, the costs of peat moss and dishes ranked the last, reaching about 1538,1538 dinars/ton, which constituted about 1.80% and 1.80%, respectively, of the costs of tradable production inputs. Local production inputs were also distributed among several items, as the costs of family manual labor ranked the first and reached 78,950 dinars/ton, which constituted about 40.40%. The cost of hired manual labor ranked second and reached about 39020 dinars/ton, which constituted about 19.97%. The interest costs on the capital ranked the third and reached 24,895 dinars/ton, which constituted about 12.74%, while the costs of marketing operations ranked the fourth and reached 19,490 dinars/

Table 3: The independent variables and their estimated parameters for eggplant crop using the OLS method before performing the heterogeneity of variance test.

Independent variables	Estimated parameters	Calculated T
Q	294361.1	12.35045
Q^2	– 85861.79	–3.941088
Q^3	372.4033	3.700541
AQ	1060839.	3.321970
A^2	–3881511.	–3.021675
R^2	0.938650	
R^{-2}	0.903593	
D.W	1.985591	

* Reference: Prepared by the researcher using Eviews 10 program.
** Indicates the level of significance 1%.

ton, which constituted 9.98%. Whereas the costs of organic fertilizers amounted to 12030 dinars/ton, which constituted 6.16% and ranked the fifth, and the costs of mechanical work ranked the sixth, as their value amounted to 8955 dinars/ton, which constituted 4.58%. Irrigation costs ranked the seventh and reached 6450 dinars/ton, which constituted about 3.30%, and finally, the costs of other expenses, reached about 5625 dinars/ton, which constituted 2.88%, from the local production inputs of the research sample.

Total cost

The total cost refers to the sum of fixed and variable costs, and it is also equal to fixed costs when production is equal to zero, and it increases as the production increases due to the increase in variable costs [Al-Wadi (2007)].

$$T.C = T.F.C + T.V.C$$

Thus, the total costs of the eggplant crop under the greenhouses in Anbar governorate for the agricultural season 2019-2020 amounted to about 280753 thousand dinars/ton. Besides, the fixed costs constituted 38.48% of the total costs, as it amounted to about 108021 thousand dinars/tons, while the variable costs constituted 61.52% of the total costs, as it reached about 172732 thousand dinars/ton, as shown in Table 2.

Estimation of cost functions

Production costs are defined as the sum of what the production facility spends to obtain the resources that are used in the production process [Heady and John (1961)]. Production costs are defined as the amount of money that projects incur to obtain the services of the production elements necessary to achieve the production of a specific good or service during a specific period [Al-Sreeti (2000)]. The productive cost function of the eggplant crop in the greenhouse was formulated from the data of the eggplant farmers sample in the study area. Several models were adopted in estimating the total cost function of the cucumber crop using three forms of the cost functions (linear, quadratic, cubic), and it was found that the cubic model is the most appropriate for the relationship adopted in the study because of its similarity with statistical, economic and standard tests, and based on economic theory, the short-run cubic total cost function takes the following form [Debertin (1986)].

$$TC = b_0 + b_1Q + b_2Q^2 + b_3Q^3 + b_4AQ + b_5A^2 + ui$$

where, C: a dependent variable that expresses the long-run total costs (Dinar).

b_0: the constant expresses the total fixed costs TFC.

$b_{1,}$ $b_{2,}$ b_3, b_4: represent the regression coefficients.

Q: an independent variable expressing the quantity of output (tons).

Q^2, Q^3: the square of the quantity of output and the cubic of the output are related semantically to the output Q.

A, A^2: represents the area and the square area.

ui: represent the random variable that reflects the effect of other related variables that were not included in the estimated model.

By estimating the above function using the Eviews 10 program, the estimation results listed in Table 3 show the parameters of the estimated function, as well as the values of statistical and standard tests of the constants and the estimated function.

Statistical analysis

The t test proved the significance of parameters estimated at a 1% level of significance using the OLS method, the value of t reached significant levels, and the adjusted R square reached 90.36% as shown in Table 3. This indicates that 90.36% of the changes in the level of production costs (the dependent variable) are caused by the factors included in the model (explanatory variables) and that 9.64% of those variables are caused by other factors not included in

Table 4: Average costs, marginal costs, and elasticity of costs for eggplant farmers in the research sample.

Production (Tons)	Average costs (Dinar)	Marginal costs (Dinar)	Elasticity of costs
6	227486.8	174018.9	0.76
10	197799.9	138478.7	0.70
14	180029.8	138688.9	0.77
18	174176.5	174649.6	1.00
24	187740.6	295622.5	1.57
30	228117.5	497033.9	2.17

* Reference: calculated by the researcher based on the average costs equation, marginal costs equation, and elasticity equation.

the model, such as environmental conditions and other factors.

Standard analysis

In order for the model to be acceptable and reliable in the interpretation of the studied phenomenon, it is necessary to conduct the necessary standardized tests related to the standard problems represented by the problem of Autocorrelation. Therefore, it was found that when analyzing the data using the OLS method the Durbin Watson DW value reached 1.985591, which is smaller than the du value of 2.18 and greater than 4-du, which is 1.83 with a significant level 5%, and degrees of freedom n = 12. Meaning that (du <d <4-du), which are in the range of (2.18 <1.985591 <1.83), where it can be concluded an absence of the autocorrelation problem between residual [Koutsoyiannis (1977)]. The model also fulfilled the assumption that there are no multiple linear relationships between the independent variables (Multicollinearity) because the model is non-linear in terms of the variables. The variables are the square of output (Q^2), the cube of output (Q^3), related semantically to the variable (Q), but the relationship is non-linear [Gujarati (1978)]. Because the research relies on cross-section data, it is necessary to detect the heteroscedasticity problem. The Breusch-pagan-Godfrey test was used to detect the Heteroscedasticity problem, and it was observed from this test that the value of (f) reached 1.392185, which is not significant at 5% level of significance. Meaning that the model does not suffer from the presence of a heteroscedasticity problem.

Derivation of the long-run cost function of the eggplant crop under the greenhouse for the 2019-2020 season

The estimated function can be adopted in the economic analysis to determine the optimum size of a greenhouse farm, average production cost, marginal costs, cost elasticity, and deriving supply equation for those farms from them, as below:

$$LTC = 294361.1Q + 85861.79Q^2 + 372.4Q$$
$$-1060839AQ + 3881511A^2$$

The function is derived according to A and set equal to zero

$$\frac{\partial LTC}{\partial A} 1060839Q - 773022A = 0 \quad \rightarrow A = 0.136Q \quad (1)$$

substituting the value of A into the original costs function

$$LTC = 294361.1Q - 85861.79Q^2 + 372.4Q^3$$
$$+1060839(0.136Q)Q - 3881511(0.136Q)^2$$

Thus, it can get

$$LTC = 294361.1Q - 85861.79Q^2 + 372.4Q^3$$
$$+144274.10Q^2 - 71792.43Q^2$$

and by summing the Q^2, it can get

$$LTC = 294361.1Q - 13380.12Q^2 + 372.4Q^3 \quad (2)$$

It is the equation of costs in the long run as a function of production only.

Long-run average total cost function

Average total cost is defined by dividing the total costs TC by the total units of output Q over a given period of time, and it uses a measure to calculate the cost of one unit of output (unit cost). Otherwise, the share of one unit of output from the total costs in the organization and can be expressed in the following equation [Al-Nisour (2009)]:

$$LRATC = \frac{TC}{Q} = 294361.1 - 13380.12Q + 372.4Q^2 \quad (3)$$

To get the average costs at any level of output, that level is substituted into the average cost function.

Marginal cost

Marginal costs are defined as the amount of increase in the total costs resulting from the increase in production by one unit, in other words, it is the costs of producing an additional unit of output [Al-Ruwais (2009)]. The marginal cost function can be obtained by deriving the total costs function as in the following equation:

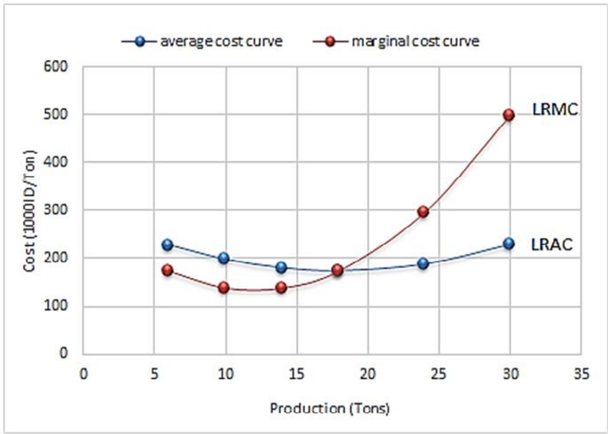

Fig. 1: The long-run average cost curve and the long-run marginal cost curve

* Reference: prepared by the researcher based on the data of Table 4

Table 5: The number of the assumed greenhouses, the output achieved, the average cost, the relative average cost, and the economic efficiency of the eggplant crop in the research sample.

Assumed area	Output achieved	Average cost	Relative average cost	Economic efficiency
1	7.35	216135.2	50	83
2	14.71	178121	41	98
2.5	18	174176.5	40	100
3	22.06	180421.7	42	97
4	29.41	222958.4	52	80
6	44.12	428934.5	100	0.0

* Reference: Prepared by the researcher using greenhouses located within the study area.

$$LRMC = \frac{\partial LTC}{\partial Q}$$

$$LRMC = 29431.1 - 26760.24Q + 1117.2Q^2 \quad (4)$$

where,

LRMC: represents marginal costs.

∂TC : represents the change in total costs.

∂Q : represents the change in output.

Elasticity of costs

It can be found by dividing the long-run marginal costs (LRMC) by the long-run average costs (LRAC) as in the following formula [Doll (1979)]:

$$EC = \frac{LRMC}{LRAC}$$

where, *EC* represents the elasticity of costs, *LRMC* represents long-run marginal costs and *LRAC* represents the long-run average costs and are shown in Table 4.

The relationship between the long-run average cost curve and the marginal cost curve can be illustrated as shown in Fig. 1. Both curves begin to fall from the top to down and the marginal cost curve is below the average cost curve and the marginal cost curve reaches its lowest end before the average cost curve reaches its lowest end achieving economies of scale. Then the marginal cost curve starts to rise and intersects with the average cost curve at the lowest point, then after that the average cost curve starts to rise, and after the intersection point of the two curves, the marginal cost curve is higher than the average cost curve, achieving diseconomies of scale.

The optimum size of production and area (greenhouse)

The optimum size of the production of eggplant crop is achieved when the average cost curve is at its lowest point, and it is obtained by equating the first derivative of the average cost function with zero as follows [Geoffrey Schneider (2019)].

$$\frac{\partial LRATC}{\partial Q} = -13380.12 + 744.8Q = 0$$

Q (Optimum size of production) = 18 tons

As for the optimum size of the farm, expressed by the number of houses in it, it can be defined by substituting the value of output *Q* in Equation (1).

$$A = 0.136Q \quad (5)$$

$$A = 0.136(59.3)$$

(Optimum greenhouse size *A* = 2.5).

Economic efficiency

The primary objective of the product is to achieve economic efficiency, which is the ratio between the value of the output achieved in relation to the value of the inputs used. Meaning that maximizing the ratio between the outputs and the inputs, and the most efficient use of available economic resources to achieve the maximum possible output [Steven (2008)]. Since the efficiency is relative and varies according to the size of the farm, it can be estimated based on the highest average cost achieved in the study sample and assuming the number of greenhouses starting from (1) and ending with (6) houses. By substituting the numbers of houses

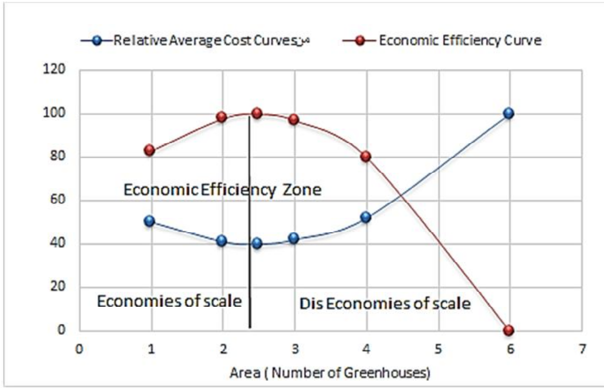

Fig. 2: Economic Efficiency and Relative Average Cost Curves

* Reference: prepared by the researcher based on the data of Table 5.

in Equation (1), it can obtain the production size associated with each size of greenhouse sizes. Thus, by substituting the quantity of output in Equation (3), it can obtain the average cost of production per ton as shown in Table 5. It becomes evident that the long-run average cost starts to decline and reaches its lowest value of 174176.5 dinars / ton at the 2.5 houses, which represents the optimum houses for production. Then, the long-run average cost returns to rise and reaches the highest long-run average cost at the assumed houses, which amounts to 428934.5 Dinars / ton.

$$\text{Relative average cost} = \frac{\text{average cost}}{\text{highest average cost}} \times 100$$

As for economic efficiency, it was obtained through the following law [Ferguson and Gould (1985)]:

$$\text{E.C} = \frac{\text{H.A.C} - \text{R.A.C}}{\text{H.A.C} - \text{M.A.C}} \times 100$$

A.C: represents the highest average cost.

R.A.C: represents the cost of the designated farm.

M.A.C: is the minimum average cost.

It is evident from Table 5 that the economic efficiency starts from 83% and begins to rise until it reaches the percentage of economic efficiency of 100% at the optimum houses for production, which amount to 2.5 greenhouses, which corresponds to the lowest average of production cost of (174176.5) dinars/ton. Then, after that, the economic efficiency begins to decline until it reaches zero at the assumed homes 6 a greenhouse.

Through Fig. 2, economies of scale can be identified through the relationship between the size of greenhouses (houses planted with eggplant crops) and the average total cost. It can observe that economies of scale reduce the average cost per unit of production as the number of cultivated houses increases. Economies of size 100% are achieved at the optimum size of production, which corresponds to the lowest average cost. The increase in the number of houses after this size leads to an increase in production at a lower percentage than increasing costs, which leads to an increase in the average total cost curve, and this makes the farmers work within the area of diseconomies of scale

Supply function of eggplant crop in the long run

To find out the reaction of the eggplant farmers in the greenhouse to the changes that take place in the price of the output, the supply function was derived by equating marginal costs with the price of the product, meaning that the supply function can be derived from the necessary condition of the profit function as follows [Henderson and Quandt (1980)].

$$\pi = TR - TC$$

$$\frac{\partial \pi}{\partial \pi} = P - LMC = Min\, LRATC = 0$$

$$LRMC = P = Min\, LRA\, LRAT$$

By substituting the above marginal cost equation derived from the estimated long-run total cost function, it can obtain the following:

$$294361.1 - 26760.24Q + 1117.2Q^2 = P \qquad (6)$$

$$1117.2Q^2 - 26760.24Q + 294361.1 - P = 0$$

$$a = 1117.2\ , b = -26760.24, c = 294361.1 - p$$

and by using the quadratic formula

$$Q = S = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$Q = S = \frac{26760.24 \pm \sqrt{(-26760.24)^2 - 4(1117.2)(294361.1 - p)}}{2(1117.2)}$$

$$Q = S = \frac{26760.24 \pm \sqrt{716110444.86 + 4468.8p - 1315440883.68}}{2234.4}$$

Table 6: Prices, the expected quantities of the eggplant crop, and the price elasticity of supply for the research sample

Price (thousand dinars / ton)	Quantity (Tons)	Elasticity of supply
175	18	–
300	24.16	0.47
500	30.07	0.36
700	34.48	0.37
900	38.16	0.39
1200	42.86	0.36

* Reference: prepared by the researcher based on the estimated supply function of the eggplant crop.

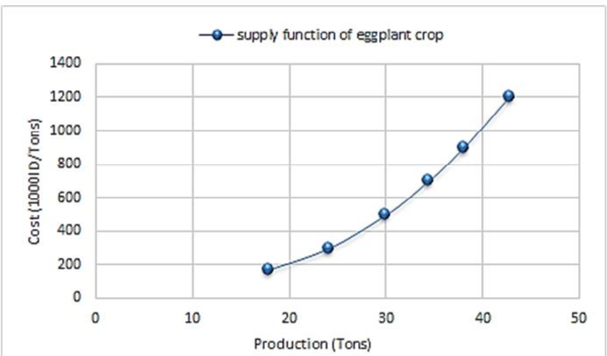

Fig. 3: Curve of the long-run supply function of eggplant crop for the research sample

* Reference: prepared by the researcher based on the data of Table 6.

$$S = \frac{26760.24 + \sqrt{(4468.8P - 599330438.82)}}{2234.4} \quad (6)$$

From the supply function of the eggplant crop under the greenhouse, it is possible to obtain the various offered quantities of eggplant crop when given different values of the output. Taking into consideration that the price represents the price of a product, that is, with regards to the marketing costs when converting the market price into the price of a product. Meaning setting the minimum price of the output that the product accepts, and it represents the lowest average of total costs in the long run, whose value amounted to 175,000 dinars / ton. Thus, it can get the quantity supplied, which amounted to about 18 tons, where this value represents the optimum quantity for the costs at which the product is offered. However, if the output price falls below the minimum price 175,000 dinars/ton, a loss will be achieved that leads to the farmer's stopping production, but if the price is higher than 175,000 dinars/ton, the quantity supplied is directly proportional to the price of the output.

The output supply function represented by the eggplant supply curve can be illustrated as shown in Fig. 3, which is the rising portion of the long-run marginal cost function (LMC) curve, starting from the lowest point on the long-run average total costs curve (LATC).

The price elasticity of supply

The price elasticity of supply for the eggplant crop was calculated, which is one of the most important indicators that can be estimated from the computed supply function by applying the price elasticity law [Nicolson and Christopher (2008)].

$$E\,S = \left(\frac{\partial QS}{\partial P}\right)\left(\frac{P}{Q}\right)$$

By reviewing the data in Table 6, it appears that the minimum price that farmers will accept is 175000 dinars / ton. Since the quantity supplied by the farm of the eggplant crop at this price is about 18 tons and the quantity supplied of eggplant increases to 42.86 tons, when prices rise to approximately 12,00000 dinars/ton. Fig. 3 shows the relationship between the quantity of production and the price of eggplant crop, where the farm prices increased by 10% above their minimum limit, the quantity supplied in the market increases by 5%. This means that the farms have great difficulty controlling production if prices change, and this is mainly due to the low response of production to productive resources used as well as farmers do not want to take risks.

4. Conclusions

1 The average cost of producing a ton of eggplant under the greenhouse is higher than the optimum average cost, which indicates the possibility of reducing production costs.

2 By analyzing the cost structure of the research sample, it was found that the fixed costs formed a percentage (47.86%), while the variable costs formed a percentage 52.14% for the eggplant crop. Thus, the largest part of the fixed costs is manual family work, while the largest part of the variable costs is the compound fertilizers.

3 Through the study, it was found that the cubic functions are the best functions used in the study of the eggplant crop for the research sample, due to their similarity with the economic logic and the compatibility of the estimated parameters in terms of statistical, economic, and analogy.

4 The study showed that the cost elasticity, in the long run, amounted to about 0.70 for the eggplant crop, and this means that the eggplant farmers produce in the first stage, which is the stage of increasing the yield, that is, when the costs increased by a certain percentage, then it can get a greater production.

5 It is evident through the supply function that there is a positive relationship between the offered quantities and the selling price when the price is higher than 175000 dinars/ton. However, the elasticity of supply is low, which indicates the difficulty of responding to the farm supply vertically.

5. Recommendations

1 Paying attention to providing certified seeds to farmers, and good compound fertilizers, and controlling the quality of effective herbicides. Supporting the prices of production requirements for the eggplant crop and providing them in sufficient quantities to contribute to reducing production costs.

2 Raising the marketing efficiency of the agricultural sector products and protecting the local product to help the Iraqi farmer attain competitiveness.

3 Holding seminars and training courses and distributing extension brochures to farmers to raise the technical and administrative competence required by protected agriculture.

4 Enabling and directing farmers to achieve optimal sizes that achieve economic efficiency, by increasing the number of houses on the farm towards the optimum size.

5 This study was for a specific period and in a specific governorate, and its results and findings express that period and, in the site, concerned. Therefore, it is recommended to continue economic studies on the production of the eggplant crop inside the greenhouse, to diagnose the obstacles facing farmers and find solutions to them to improve the optimum production level.

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