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Economics of Honey Beekeeping A CSE STUDY OF Homs Governorate, Syria

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Abstract - *The research aimed to identify the cost structure functions estimate costs and economies of scale for the production of honey bees Homs Governorate. The results showed an analysis of the cost structure of honey production variable costs accounted for approximately (47.38)% of total costs accounted for feeding on the most important by (66.23)%while fixed costs are formed (52.62)%of the total costs, such as family work the important by paragraphs (67.14)%. The results of quantitative analysis that cost function Cube long-run is most appropriate for relationship adopted in the study according to tests of statistical and standard, economic, and The results showed the size of production optimization (632.31) Kg, size best about (65) beehive. The estimated elasticity of costs amounted to 1 achieved at optimal level of production (633) Kg Were calculated as the minimum price (14949.16) SP/Kg, function supply was derived in long -run, showing that is a positive relationship between quantity supplied of honey bees and price when the price is greater than (14949.16) SP/Kg While the price elasticity in the long run period amounted to (2.34) the honey bees is flexible for price changes and results from the show the average cost decreases until it reaches to the optimal level of production while proportion economies of scale achieved to the maximum value (100)% at the optimal level of production .average cost and flexibility equal zero to the level of production optimization, In addition, research showed that measuring the technical efficiency that about (28)% of the economic resources were not optimally utilized, and the economic efficiency of honey bee breeding has not achieved the required level.*

Keywords - *bees, the costs of production function honey. Economies of scale, Function supply, economic efficiency, technical efficiency.*

I. INTRODUCTION

The interest in Honey Beekeeping and its various products of the world has become clear in the last years of the 20th, a, due to their great importance in various fields: agricultural, food, cosmetic and economic [1]. Honey is the most well-known primary product of bee products, where it is commonly had by consumers as it is in its raw state, also can be as an additive to another, or processed and created as a by-product [2]. Honey contains nutrients, proteins, vitamins, vitamins, minerals, essential oils, proteins, and enzymes [3]. Beekeeping or honey harvesting is an extremely old practice in Syria. For many years [4]. Beekeeping offers farmers to earn income with minimal start-up investment, yielding profit within the first year of operation **[5]**. Apart from providing regular income to the family in terms of honey production and other Beekeeping products, it offers a complementary source of income for farmers from crop pollination by increasing yield and quality [6], Where modern and municipal cells are used inbreeding, and the production of a hive of honey varies between governorates as well as between regions, due to the wide difference in environmental and climatic conditions, and the spread of pastures, their diversity, and density, in addition to the difference in the period of nectar-secreting flowers **[7]**. Beekeeping that has been partially destroyed by over five years of civil war has seen colonies destroyed or neglected, **[8]** In addition to poor quality, inadequate food and diseases, Which affected the size of production and in many cases does not adequately cover the costs**[9]**. The bee population has declined in Syria. Bee statistics from 2010 revealed close to (630775) beehives were managed in the country. However, by 2019, that number had dropped to just (493989), in view of vastness Homs Governorate there has ecological succession is various and it is spread over most Stability Zones, pasture and species most suitable for feeding Bees on the nectar and pollen from flowers is to be found [10].
Bee statistics from 2010 revealed that the Homs produced approximately (391) tons of honey yearly from (42937) beehives while Homs’s honey production in 2019 was (265) tons and bee population declined (32161) beehives [11]. In general, Beekeeping has not developed well, that is inconsistent with the agricultural developed Sustainable Development Goals, that is attributed to technical reasons represented by environmental factors, the difficulty of securing medicines and of treatment Veterinary, as most of them are imported, and increasing of the transportation costs and migration between pastures, which causes the lose of a large number of bee colonies, as well as the economic reasons represented by the inefficient use of economic resources, so beekeepers had not achieved sizes of production optimization that lead to costs down, Therefore, it was necessary to study the optimal size and identify economics of scale for honey production so that

this research would be real importance in guiding beekeepers to the number of hives and the quantity of production that approaches the optimum rates of production, and then encourage an increase in the number of apiaries especially after the decline in their numbers Because of the impact of conflict on Syria, It encourages investment in this activity, principally important needing for optimal use for Renewable resources.

Studies in Syria have mostly focused on the impractical aspect of honey production. The number of studies examining honey production economically has remained limited. It is hoped that the findings acquired from the present study will be beneficial for beekeepers producers, researchers, and related institutions.

The purpose of this study was to carry out an economic analysis to estimate the cost function in the long term and scale for the production of the one kilogram of bee honey output minimizing costs, also identifying the cost flexibility, and estimating the supply function and economies of scale .as well as The minimum price hat beekeepers accept to display their products, and Measuring the technical and economic efficiency of honey bee production.

II. MATERIALS AND METHODS

Homs Governorate was purposely selected for the study. The selection was done based on the potentiality of honey production and all the beekeepers who have harvested honey for 2019; the primary data for the study were collected from (79) beekeepers are surveyed, it was randomly distributed representing (5)% of the beekeeper's community in Homs governorate the prime beekeepers of the site, which has a significant potential for honey production. Secondary data were collected from various relevant kinds of literature of national and international publications, government reports, proceedings, books, and websites, for this purpose. The questionnaire survey included activity results such as inputs and costs for the establishment and production period, gross product value, gross profit will be determined honey production costs were classified into a variable and fixed [12], The variable costs associated with honey production were all inputs that directly related to the production of honey and included sugar, drugs and chemicals, labor, fuel-oil or transport, water, marketing, forage access rent, etc. costs. Variable costs were calculated by using current input prices and labor wages. Fixed costs included paid capital interest, depreciation, and other fixed costs. Depreciation was estimated using the straight-line method and the depreciation rate for beekeeping equipment; fixed costs plus variable costs equal total production costs. In this study, total production costs were subtracted from total gross revenue to calculate net return [13]; the unit cost of extracted honey is obtained by dividing the total production costs of extracted honey by the number of units produced. Descriptive analysis of the obtained data was done by using SPSS and MS Excel, and qualitative analysis was done in Eviews.

III. RESULTS AND DISCUSSION

In this section, firstly, physical input-output relationships and the annual activity results of these apiaries are examined.

Table 1 shows Variable and fixed costs and the percentage amount that each item represents of total production costs. For example, variable costs were (47.38)% of total production costs, while fixed costs were (52.62)% of total production costs.

Table 1. cost analysis of honey production

Type of costs	value SP	% Relative importance
Total variable cost	76897289	47.38
Total Fixed cost	85392727	52.62
Total cost	162290016	100

Source: Field survey (2019)

Table (2) shows the percentage of the contribution of the variable costs of the total variable costs. The cost of feeding came. First, the feeding was divided into two types, The first is the natural feeding on the flowers of cultivated crops, and the second is the industrial feeding on Sugar syrup, especially in the winter. Second The costs of Moving of beehives, which are the expenses spent on transporting cells from one pasture to another, followed by the cost of drugs due to the frequent exposure of bees For diseases, then the marketing costs came, which include Packaging costs for products sold and transporting its, followed by the cost of vital nutrients, which are stimulants containing vitamins. The cost of Seasonal workers is sixth, which is a low percentage because most of the workers do have not sufficient experience in beekeeping, and the calculation presented in this paper follows the assumption that seasonal workers are not members of the household, and the costs of their engagement include only their income per working day., then the cost of veterinary service of all kinds lastly .The calculation of these costs was based on the answers of the surveyed beekeepers

Table 2. variable cost analysis of honey production

Cost items	value SP	% Relative importance
feeding	50929075	66.23
Moving of beehives	7474416	9.72
drugs	7066861	9.19
marketing	4975255	6.47
nutrients vital	2399195	3.12
Seasonal workers	2422265	3.15
veterinary service	1630223	2.12
total	76897289	100

Source: Field survey (2019)

Fixed costs were Calculated, Table (3) as the family labor costs and administrative expenses ranked first because the apiary owner and family members supervise the apiary, such as examining the beehives, providing food, transporting, in addition to guarding the beehives. Second, Depreciation of beehives Followed by Depreciation of other tools such as frame, Smoker, honey extractors tools, Bee Suit, Gloves, mask .fourth, the depreciation of Foundation apiary, then came Depreciation of bee, followed by the Wage lands finally Interest expense of capital, the revenues in the sample are mainly based on the returns resulting from the production of honey, while the secondary outputs are considered as an added value to the honey production process in the sample. Accordingly, the focus had been on honey production.

Table 3: fixed cost analysis of honey production

Cost items	value SP	% Relative importance
family labor costs and Administrative costs	57332677	67.14
Depreciation of beehives	10025106	11.74
Depreciation of equipment	5379742	6.3
Depreciation of Foundation apiary	3671887	4.3
Depreciation of bee	4226940	4.95
Land rent	2647175	3.1
Establishment capital interest	2109200	2.47
total	85392727	100

Source: Field survey (2019)

A. Estimation of Profit Function

Ordinary least square was used to estimate the parameters of the profit function. The function model was estimated according to economic theory, which states that the profit equals total revenue (TR) minus total cost (TC) [14].

Profit Function analysis was carried out by using the formula:

$$\pi = TR - TC \quad ...1$$

$$TC = Vi * Xi, \; TR = P*Q$$

$$\pi = P\,Q - \sum Vi * Xi \; ………2$$

where: π: Profit return, TR: total Revenue, TC: Total cost, P: Product price, **Q**: production quantity, **Vi**: resource price, **X**i: resource quantity.

From equation 2, the profit function can be derived as follows: [15].

$$\pi = F\,(P_Q \,.\, C\,.Q\,)$$

Accordingly, the profit function model can specified as follows: [16].

$$\pi = B0 + B1\,P - B2C + B3Q + Ui$$

Where:

π: Profit, TR: total Revenue, C: Total cost, P_Q: sale price, Q: production quantity, b_0: intercept, B_i: Represent Coefficients of respective variables, Ui = error term

$$\pi = -\,3.945 + 402.112\,P - 247.911C + 4518.911Q$$

t = - 2.801 10.217 - 4.111 13.914

(R Square) R^2=0.91

(Adjusted R²)Ŕ= 0.90

DW Test = 412.1**

F Test = 182.47**

B. Economic, Statistical and Econometric Analysis of Profit Function

The profit function had shown that all variables agree with the economic theory, where the price and quantity output parameters have a positive relationship with profit, while production costs parameter has a negative relationship with profit; the analysis revealed that for each additional (1) Sp of the price incurred for (1) Kg the total profit increases by (402.112) Sp; for each additional 1Sp of production costs incurred for (1) Kg the total profit decreases by (247.911) Sp; and for each additional (1) sp production quantity incurred for (1) Kg, the total profit increases by 4518.911 Sp, ceteris paribus, it means that the quantity and price of the output and the decrease in the average production costs on having a significant impact on increasing the profit.

The model confirms its reliability of it in estimating the relationship between profit and the independent variables. t statistics of independent variables and the regression coefficients statistically significant ($p<0.01$). And F statistic confirms. The proposed regression model fits the data well. The adjusted coefficient of determination (R^2) of this model is (0.90). This means that 90% of the change in the dependent variable is explained by the independent variables included in the model. The Durbin-Watson statistic, which is used to ascertain whether there is autocorrelation in the model, is 1.412, indicating no autocorrelation in the model [17]

the Park test had been used for heteroscedasticity by estimating the error square regression equation. Because it is a dependent variable of the independent variables, showing the estimate of the alpha coefficient is statistically insignificant, you have evidence of unheteroskedasticity.

According to the relationship estimated in the logarithmic form as follows:[18] $\ln \hat{\varepsilon}_i^2 = \gamma + \alpha \ln X_{ik} + u_i$

Ln (ei)^2 = y + *a* Ln (P)+ μi

= -17.148 + 4.507 Log P

t (-0.623) (1.178)

D.W = 1.214,F = 1. 412 ،R² = 0.078

Ln (ei)^2 = y + *a* Ln (C) + μi

= 60.47 - 4.117 Ln C

t (1.489) (-0.849)

D.W = 1.198 , F = 0.87 , R² = 0.034

Ln (ei)^2 = y + *a* Ln (Q) + μ_i

= 23.774 + 0.298 Ln Q

t (11.425) (0.417)

R² = 0.047، F = 0.874 , D.W = 1.098

C. Estimation of Cost Function of Honey Beekeeping

Long-run cost functions are used in planning a firm's investment decisions and to determining the

the extent of scale and diseconomies of scale in order to select the optimal size. Knowledge of the short-run cost functions allows the decision-makers to judge the optimality of present output levels and to solve the decision problems of the production manager. Knowledge of long-run cost functions is important when considering the expansion or contraction of size and for confirming that the present size is optimal for the output level that is being produced.

In the present study, the regression model was used to estimate the parameters of the cost function in the short term of the sampled farms and then was obtained the cost function the long term from it after excluding the constant limit [19].

The short-run and the long-run total cost functions relate the cost per unit of output against the number of products. The long-run is defined as the period of time in which no factor units of production are fixed, while the short-run involves at least one unit of production as fixed. The difference between the long run and short run functions is that the long run allows for a variety of capital to labor combinations, which is applicable to the present study, while the short-run generally allows a very limited number of combinations. Other important reasons to consider long-run total costs in the analysis are the type of data (cross-sectional) and the size of the apiary. If cross-sectional data of many establishments, whose size varies substantially (this is the case in our study), the estimated cost function would be the long run one [20].

In the present study, among the forms of cost functions (linear and quadratic, cubic), the cubic the form was found to be the most suitable one [21], depending on the statistical tests.

The general cubic form of cost function is given by:

TC = $\beta_0 + \beta_1 Q - \beta_2 Q^2 + \beta_3 Q^3$+ui………………..(3)

where:

TC: Total cost of honey production

b_0: fixed costs

Q: quantity of honey production

Bi: Represent Coefficients of respective variables

μ_i= Random disturbance term

the TC function be:

. TC= 47800.35 +18147.714Q - 10.117 Q^2 + 0.008 Q^3 (4)

t (2.117) (8.714) (-1.894) (1.921)

R²=0.96 , Ŕ2 = 0.94, F= 2478.34 , D.W =1.748

The estimated cost function was correspondent with the statistical logic regarding model and variables significances, problem and depending on the statistical tests (R Square =0.96, Adjusted R Square = 0.94, F Value =2478.34 significant ($p<0.01$) and parameters of the model (coefficients) significant ($p<0.05$)

To measure the efficiency of the estimates, we conducted standard tests of the estimated model, where Variables Q2 and Q3 are functionally related to variable Q with a non-linear relationship, which supports the suggestion, that there is no multicollinearity [22]. The Durbin-Watson statistic, which is used to ascertain whether there is autocorrelation in the model, is 748.1, which is greater than du of 220.1 and smaller than du -4, which is 141.2 at significant ($p<0.05$), indicating no autocorrelation in the model.

The Park test referred to unheteroskedasticity because the alpha coefficient is statistically insignificant.

According to the relationship estimated in the logarithmic form as follows**:**

Ln (ei)^2 = a + *a* Ln (Q)

= 21.098 + .0684LnQ

t (6.924) (1.241)

D.W = 2.417 , F = 1.478 ,R ²= 0.036

We have excluded specific costs from our analysis because they are mainly related to physical units of output.

The estimated cost function was correspondent with the statistical logic regarding model and variables significances. The typical long-run costs (LRTC) can be shown as follows [23].

LRTC = 18147.714Q - 10.117 Q^2 + 0.008 Q^3 (4)

To obtain the optimal size for honey production, a mathematical function (4) were used to estimate the average optimum cost of production Then, the derivative of this function yields the optimal size by minimum average**:** [24]

LRATC = TC/Q =18147.714 -10.117Q + 0.008 Q^2

Then the derivative is:

dLRATC /dQ =- 10.117 + 0.016Q

Q= 632.31 kg

The average production of the sampled apiaries was (632.31) kg; this level is the level of production at which the economies of the size of the apiary is maximum with costs down

To determine the optimal economic number of cells at which the optimal size, based on the amplitude productivity equation considered as the number of cells is a dependent variable and the quantity of production as an independent variable, as follows: [25]

$M= b_0+b_1Q$

Where: M= number of cells, Q=quantity of honey production, b= Represent Coefficient of respective variable, ***b***=constant

M = - 3.147 + 0.105Q

F= 2748.36 R2=0.967

The above equation can be used to determine the optimum economic number of

Cells: **M=** 65 **cell**

D. Estimation Elasticity and Supply Function for Honey Beekeepers

Supply function, in the Long run, was derived by comparing the profit function with respect to the output and equals it with zero [14].

$$\pi = TR - LRTC$$

$$\frac{\partial \pi}{\partial Q} = p - LMC = MinLARTC = 0$$

$$LMC = Pq = MinLATC$$

π: Profit, TR: total Revenue, LMC: long-run marginal costs, Pq: the price of products, MinLAtC: Lowest point for long-run average costs, S: Quantity displayed.

$$\pi = PQ - (18147.714Q - 10.117\,Q2 + 0.008\,Q3)$$

$$\frac{d\pi}{dQ} = P - (18147.714 - \mathbf{20.234}Q + \mathbf{0.01}6Q^2)$$

$$\mathbf{0.0}24Q^2 - \mathbf{20.234}Q + 18147.714 - P = 0$$

This functional form was written as in Eq**:** [13]

$$\mathbf{s} = \frac{-\mathbf{b} \pm \sqrt{\mathbf{b}^2 - 4\mathbf{ac}}}{\mathbf{2a}}$$

$$S = \frac{\mathbf{20.234} + \sqrt{(\mathbf{20.234})^2 - 4(\mathbf{0.024})(\mathbf{18147.714} - P)}}{\mathbf{2(0.024)}}$$

E. The Least Price Accepted by Beekeepers to Supply their Products of Honey

The price elasticity of supply with respect to the honey price was calculated by doing the first differentiation of the quantity supplied to the price as follows [26]**.**

$$\frac{\Delta \mathbf{Qs}}{\Delta \mathbf{P}} = (\mathbf{0.096}P - \mathbf{1332.77})^{-0.5}$$

Where ΔQ_s= change in quantity supplied, Δp = Change in price

Table 5 Quantities displayed and Flexibility of supply for the production of bee honey at various possible prices.

Price of honey (sp/kg)	Quantity supplied kg	Elasticity of supply
14949.16	632.31	2.34
14969.16	634.28	2.31
15029.16	640.08	2.23
15129.16	649.41	2.12
15269.16	661.87	1.99

Source: Field survey (2019)

From the supply function, it is possible to obtain the different quantities of supplied bee honey, when different values of output prices, taking into account the position of the minimum price, which is the price of the product, which is (14949.16) SP/kg and from it we get the estimated supply quantity of (632.31) kg which represents the optimum level of production, but if the price of the product decline (14949.16) Sp/kg, a loss will be realized. It will cause beekeeping to stop production, but if the product price is greater than (14949.16) SP/kg, the quantity supplied will be a positive relationship with the product price; therefore, the Price elasticity of supply measures the responsiveness to the supply of a good or service after a change in its market price. According to basic economic theory [27], the price elasticity of supply was estimated (Table 5). It was calculating the accurate value of price elasticity of supply at the minimum price that the beekeepers accept to continue to produce honey in the long term.

In the above supply schedule, if the price increase by 1percent, at the minimum price, its quantity supplied will also increase by 2.34 percent; in this case, the supply of the honey is very elastic to price changes level.

To estimate the degree of response of honey beekeepers, elasticity was estimated at a price level above the lowest average cost (14949.16) sp/kg.

So the consecutive increases in price changes for the honey cause a reduction inelastic.

F. Economies of Scale

According to economic theory, producers achieve an ever-increasing proportion of scale when production expands, which approximates more closely to the forecast of the volume under consideration .However, if the production expands above the volume under consideration can occur Diseconomies of scale, Percent cost economies realized was defined as the difference between predicted average total cost (LRATC) at the minimum observed volume and predicted ATC at the volume under consideration, divided by the difference between predicted ATC at the minimum observed volume and predicted ATC at the asymptotic minimum of the function [28]

$$= \frac{\mathbf{LRATCmin.vol - LRATCvol.i}}{\mathbf{LRATCmin.vol - LRATCasympt.min}} \times \mathbf{100}$$

LRATCmin. vol: predicted average total cost (ATC) at the minimum observed volume.

LRATCvol. i: predicted ATC at the volume under consideration.

LRATCasympt. min: predicted ATC at the asymptotic minimum of the function.

The elasticity of average total cost with respect to volume was determined according to [29]

$$\mathbf{Elasticity} = \frac{\Delta(\mathbf{LRATC})}{\Delta(\mathbf{Qi})} \times \frac{\mathbf{Qi}}{\mathbf{LRATC}}$$

Cost elasticity was calculated by:[30]

$$\mathbf{EC} = \frac{\mathbf{MC}}{\mathbf{LRATC}}$$

Table (6) shows that The size of production optimization that achieved (100)% of the economies of scale was (632.31) kg, with an optimal cost-minimizing production of (14949.16) SP/kg, and the table also shows the negative relationship between the average total cost and the size of production that was less than the size of production optimization .The average total cost was (15669.16) SP/kg at the production level (332.31) kg, to become the cost (14969.16) SP/kg at the production level (582.31) kg, while the positive relationship between the average total cost and the size of production After the size of production optimization, as the average total cost was calculated (15669.16) SP/kg at the production level (932.31) kg ,with respect to the past two relationships were clearly reflected when observing the estimated elasticities of the average cost function, where the elasticities of the average total cost with respect to size at production levels that are less than the size of production optimization refer to the negative relationship between production and the average total cost, while the elasticities of the average total cost function were the positive sign at the production of the level greater than the size of production optimization, and the elasticity of average total cost was zero at the optimal production.

The elasticities cost are less than one indicating that the production of bee honey operates in the first phase law of diminishing returns; it indicates that production is subject to increasing returns, i.e., the beekeepers s achieve a growing percentage in production from (332.31) kg until the level (582.31) kg with an average cost decreased from (15669.16) SP/kg to (14969.16) SP/kg, i.e., at a lower relative cost, and with the increase in the size of production up to the level (632.31) kg, at which the elasticity of costs at this level is equal to the one, and this means that production is subject to constant returns, which means that we obtain a relative increase in production with the same increase in costs, but then elasticities cost is greater than one, the production is subject to diminishing returns as we obtain a relative increase in the level of production until it reaches (932.31) kg at a greater relative cost. 15669.16) SP/kg.

Table 6. Percent cost economies realized, average total cost and elasticity of average total cost at the production of the different level

Average Volume) kg(	Average Total Cost SP/kg)	Cost Economies Realized %	Marginal Cost Mc	Elasticity Cost	Elasticity of Average Total Cost	Percentage of Breeders %
332.31	15669.16	21.74	14074.06	0.8982	-0.1018	10.58
382.31	15449.16	45.65	13919.91	0.901	-0.0999	6.29
432.31	15269.16	65.22	13885.76	0.9094	-0.0906	9.73
482.31	15129.16	80.43	13971.61	0.9235	-0.0765	16.52
532.31	15029.16	91.3	14177.46	0.94333	-0.0567	11.74
582.31	14969.16	97.83	14503.31	0.9689	-0.0311	8.75
632.31	14949.16	100	14949.16	1	0	7.21
682.31	14969.16	97.83	15515.01	1.0365	0.0365	11.03
732.31	15029.16	91.3	16200.86	1.078	0.078	2.52
782.31	15129.16	80.43	17006.71	1.1241	0.1241	4.26
832.31	15269.16	65.22	17932.56	1.17443	0.1744	3.16
882.31	15449.16	45.65	18978.41	1.2284	0.2284	3.16
932.31	15669.16	21.74	20144.26	1.2856	0.2856	5.05

Source: Field survey (2019)

The average total cost and the size of production optimization curve (apparent in Figure 1) that intersect at point (1) and point (3) to form Economic Efficiency Zone and its production level ranging (432.31) and (632.31) kg, the percentage of beekeepers within this zone (74.92)%, while the zone extending from point (1) to point (2) formed the increasing economic Efficiency Zone its level of production ranging (432.31) and (632.31) kg, the percentage of beekeepers within this zone (46.74%), as well as the zone extending from point (2) to point (3) constituted the decreasing economic Efficiency Zone with production ranging between (632.31), and (832.31) kg, and the percentage of beekeepers, whose production was within this zone was (28.18)%, while the percentage of the total research sample reached (16.87)% the percentage of breeders who achieved the level of production of high production (832.31) kg about (8.21)%, economies of sizes are practically exhausted at relatively small levels of output.

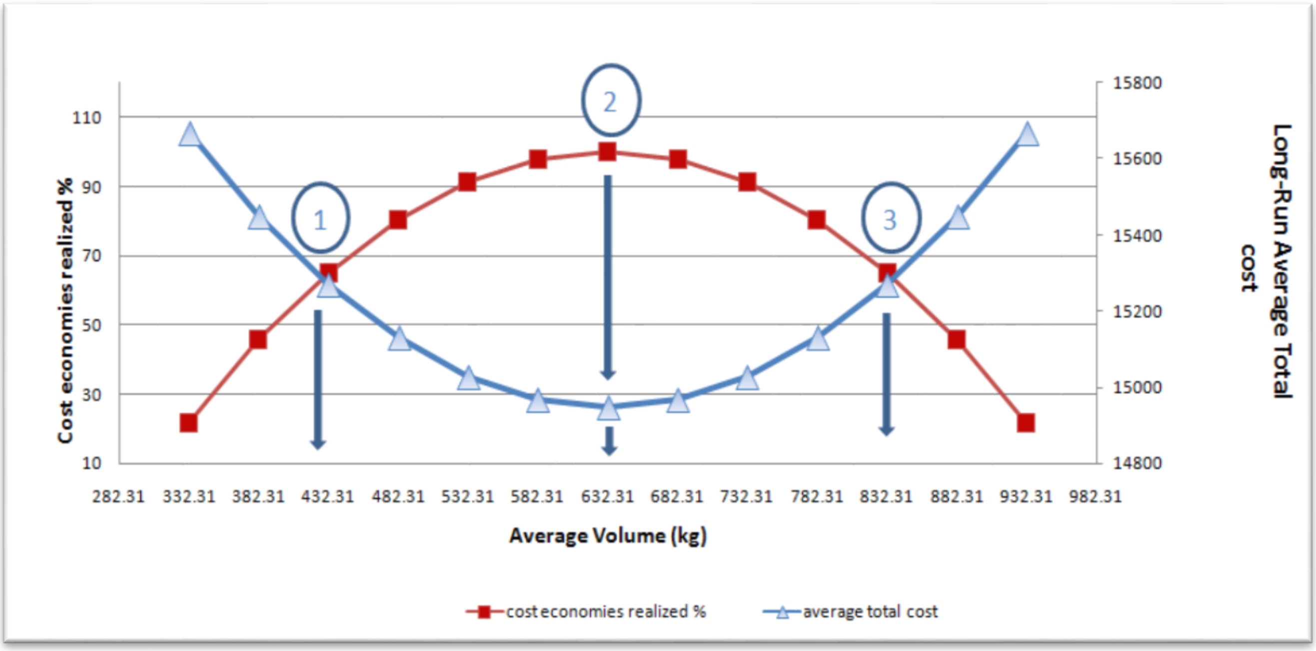

Figure 1. Long-Run Average Total Cost and cost economies realized curve

G. Technical efficiency of honey beekeeping

Technical efficiency is a reflection of the ability to obtain maximum output from a set of available inputs. Defined as the ratio of actual production from farmers at the technical level to the maximum possible production [31]. Technical efficiency measures the relative ability of the farmers to get the maximum possible output at a given level of input or set of inputs. Technically efficient farmers are those that operate on the production frontier, which represents maximum output attainable from each input level [32]
Technical efficiency is calculated by comparing the actual output rate to optimal production; in turn, one can produce optimal products with the least amount of resources [33].

$efficiency = \frac{octual\ production}{optimal\ production} * 100$ [34].

=(457.5/632.31) x100= 72%That means about 28% of the economic input was not optimally exploited. so the actual production was too far from the optimal production based on the econometric analysis

H. Economic Efficiency of Honey Beekeeping

Economic efficiency is achieved when maximum output is produced at minimum cost [35].

$economic\ efficiency = \frac{optimal\ average\ cost}{actual\ average\ cost} * 100$ [36].

=14949.16/19512.9 *100=76.61%

By measuring the economic efficiency of beekeeping that the average cost of the actual production is about (23.39)% higher than the average cost of the optimum production, which would make the economic efficiency of beekeeping were not optimally reached.

IV. CONCLUSION

-Through the study of the cost structure, the value of variable costs amounted to (76897289) SP, the cost of feeding bees came in the first place, and in the second place came the costs of transporting beehives, by the cost of drugs in the third place, then came the marketing costs, followed by the cost of vital nutrients, and then came the cost of veterinary service ranked seventh, while the value of fixed costs amounted to (85392727) SP where the family labor in the first, followed by the depreciation of beehives.

- It was found from the profit function that the quantity of the product had a significant impact on profit compared with the other items, and this means that an increase in the price of the product by (1)SP per kilogram will lead to an increase in profit by (112,402) SP. Also, an increase in average production costs by 1SP per kilogram will lead to a decrease in profit by (911.247) SP, with the stability of other factors.
- The optimum production size was (632.31) kg, and the optimum number of cells was (65) cells.
- Most of the apiaries produced less than the optimal production, as there was a great waste in the use of production resources, which negatively affected Homs's production of honey.
- By measuring the technical efficiency, it was found that about 28% of the economic resources were not used optimally, and this led to the actual product being too far from the optimum level of production.
- By measuring the economic efficiency of beekeeping, it was found that the average cost of the actual production is about (23.39) % higher than the average cost of the

optimal production, which made the economic efficiency of beekeeping did not achieve as the best well.

V. RECOMMENDATIONS

- The results refer to the quantity of production has a significant impact on the profit for that The economic resources used in the production process must be optimally invested, as failure to invest them had led to a decrease in production efficiency and an increase in the production costs of beekeeping.
- Working to follow a production policy that increases the economic efficiency of a single cell and achieves optimal use of available resources, which is reflected in an increase in efficiency in the use of productive resources and an improvement in the efficiency of honey production.
- Providing the honey bee breeding sector in general in Syria, especially in Homs, with all capabilities that will raise the productive efficiency of the beehives and encourage breeders to maintain and expand their apiaries.
- Paying attention to agricultural cooperative societies specialized in beekeeping by supporting them, activating their role, and providing them with expertise.
- Activation the role of agricultural extension to do its role as a tool for linking scientific research institutions and beekeepers.
- Raising awareness beekeepers about the role of bees in increasing agricultural production and allowing them to place their apiaries in suitable places on their lands.
- Laws, regulations, and policies strict protection the pastures and natural forest management and develop a program of pasture conservation and utilization to correct.
- procedure more technical and economic studies and research in order to raise production and economic efficiency in Homs Governorate.
- Encouraging beekeepers to form serious cooperative unions and societies within a legal framework at the governorate level so that they work to provide requirements for bee production on the one hand and help them to market their products easily through the marketing outlets that are established and supervised by those unions in the various governorates and cities close to beekeepers are far from the of middlemen on the other hand.
-The necessity of providing financial support, providing facilities and incentives to beekeepers, and facilitating their access to their production requirements at subsidized prices to ensure their continuation in production.

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