ECONOMIES OF BEEKEEPING IN IRAQ

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ABSTRACT

There is no doubt that improving of economic performance of farms by using various factors of production available increases the participation rate of the agricultural sector in the GDP. The challenges those facing activity of beekeeping led to the departure of production units of this activity to achieve optimal productivity, which is employing economic resources used, and the level of economic and technical efficiency of these resources, so analyze the production economies and determine the level of technical efficiency are contribute a lot about the extent of the contribution of economic resources used in production and diagnose bugs and shortcomings down to put processors to ensure achieving the optimal use. The study aimed to analyze the economies of honey production and determine the levels of technical efficiency of beekeeping projects in the province of Baghdad for a random sample consisting of 50 beekeeper from Al-Madaen and Al-Mahmmodia in production year 2015. The analysis included a set of independent (explanatory) variables : the total number of workers, cages of queens, boxes of packages, the amount of the sugar nutrition, cans of treatment and frames, while the dependent variable is the quantity of honey, and using Stochastic Frontier Analysis (SFA) approach via using the Trans Log function. The results showed that the average of technical efficiency of sample of beekeepers was 85%, and that indicates a waste in the resources about 15% in average. The results also showed that the fixed costs (especially the family labor) represent the great part of total costs because that their percentage were 57% from total costs, the study found that the sugar of nutrition consisted high percentage of the variable costs and its percentage is 33% from variable costs, besides there are rising in the cost of production. The study showed that most of beekeepers achieved high returns during the production year 2015. The estimation of parameters of function by the Ordinary Least Squares method (OLS) showed that there are a positive relationship among the amount of the honey production and workers, cans of treatment and frames, while it was a negative relationship with number of cells, number of cages of queens, number of boxes of packages and the amount of sugar of nutrition. The study recommended to reduce the quantity of inputs and the necessity of development of the industry of honey in Iraq through supporting the beekeepers.

Key words: Economic Efficiency, Beekeepers, Technical Efficiency, Stochastic Frontier Analysis .

أقتصاديات تربية النحل في العراق

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المستخلص

ان تحليل اقتصاديات الانتاج وتحديد مستويات الكفاءة التقنية والاقتصادية يسهم كثيراً في تحديد مدى أسهام الموارد الأقتصادية المستخدمة في الأنتاج وتشخيص مواطن الخلل والقصور في ذلك وصولاً الى وضع المعالجات والصيغ الكفيلة بتحقيق أفضل أستخدام لها. ان التحديات التي تواجه نشاط تربية النحل في العراق ادت الى ابتعاد الوحدات الانتاجية لهذا النشاط عن تحقيق الانتاجية المثلى التي تتمثل بمستوى توظيف الموارد الاقتصادية المستخدمة من ناحية ومستوى الكفاءة التقنية والاقتصادية لتلك الموارد من ناحية أخرى. لقد حاولت هذه الدراسة دراسة اقتصاديات انتاج العسل و تحليل مستويات الكفاءة التقنية لمناحل تربية النحل وانتاج العسل في محافظة بغداد كأنموذج تطبيقي عن العراق وذلك من خلال استمارة استبانة شملت 50 مربياً للنحل للسنة الانتاجية 2015، حيث شملت الدراسة جملة متغيرات اقتصادية مستقلة تمثلت بكل من : اجمالي عدد خلايا النحل و اعداد صناديق الطرود واعداد اقفاص الملكات و كمية سكر التغذية و اعداد العمال العاملين في المنحل وعلب المعالجة واعداد الاطارات المستخدمة في حين كان المتغير المعتمد في التحليل هو اجمالي كمية العسل المنتجة، وذلك بأستخدام أسلوب تحليل الحدود العشوائية (SFA) Stochastic Frontier Analysis بأستخدام الدالة اللوغاريتمية المتسامية Trans Log، حيث أشارت النتائج الى أن الكفاءة التقنية للمناحل في عينة الدراسة كانت 85% في المتوسط أي ان هناك هدراً في الموارد مقداره15%، وتبين من تقديرات معلمات الدالة بطريقة المربعات الصغرى الاعتيادية OLS Ordinary Least Squares وجود علاقة ايجابية بين كمية العسل المنتجة والمدخلات (عدد العمال و علب المعالجة والأطارات)، في حين كانت سالبة مع أجمالي أعداد خلايا النحل و أعداد أقفاص الملكات و أعداد صناديق الطرود وكمية وسكر التغذية. لقد وجدت الدراسة أن هناك هدراً في الموارد الأقتصادية المستخدمة وأرتفاع في تكاليف الانتاج وان التكاليف الثابتة (العمل العائلي خصوصاً) تمثل الجزء الاكبر من التكاليف الكلية اذ بلغت نسبتها حوالي 57% من التكاليف الكلية، كما وجد أن سكر التغذية كان هو الأعلى ضمن التكاليف المتغيرة حيث مثل 33% من التكاليف المتغيرة. وان معظم مربي النحل قد حققوا ايرادات عالية في العام الانتاجي 2015. وأوصى البحث بضرورة تخفيض كمية المدخلات المستخدمة وضرورة تطوير صناعة أنتاج العسل في العراق من خلال الأعانات الحكومية لمربي النحل.

الكلمات المفتاحية: الكفاءة الاقتصادية، مربو النحل، الكفاءة التقنية ، تحليل الحدود العشوائية.

INTRODUCTION

The beekeeping is considered an important agricultural and environmental activity, besides the project of beekeeping is considered one of the projects those have speed in cycle of capital, and the pollination of economical and medical plants was parallel activity with honey production in the most of the world countries, because the beekeeping projects were specialized in this activity, and that proved from the agricultural experiences and researches that bees causing an increase in production of the various fruit trees by 30%-40%, 10% in cucumbers and 60% in sunflower(4) . Furthermore the beekeeping and honey production is considered one of sources those increase the level of farm income, and to activate the jobs those joined with beekeeping like producing the tools of beekeepers, the queens, the packed bees, the tools of treatment from the bees pests and the employment of the workers, besides it is loveable and funny hobby to many people over the world. The honey is one of the product in Iraqi food basket especially after improvement of the food pattern because improvement of living level in Iraq, besides the importance of other products of bees especially the royal food, the pollination grains and wax (11) . The projects of beekeeping in Iraq influenced by many conditions those affecting negatively on them like depending of the bees on flowers and fruity trees which influenced by shortage in the level of Tigress and Euphrates and the influence of that on the vegetation and degrading in suitable conditions of the bees, furthermore the influence of bees pests especially the Varro and the Red Wasp. The production of the honey in Iraq is influenced by the level of the economical resources employment and their scarcity versus the multiple uses of them. The honey production in Iraq suffers from many environmental problems : the scarcity of rain and desertification, the managerial problems, using of the pesticides and the economical problems, the absence of actual investment in beekeeping and inefficient of the honey marketing because of competition of imported honey and the adulterated honey, and technical problems like : the Red Wasp and the Varro(9). The most important verities of honey which produced in Iraq were the Eucalyptus honey, the Buckthorn honey, the Clover honey and the Citrus honey. The quantity produced of honey in Iraq in 2015 was about 1012 tons, therefore per capita Iraqi person of honey doesn't exceed 28 grams and it is very low comparing with other countries (20) . The importance of the study comes from that the beekeeping is one of agricultural production activities, and it provides an important food and medical products like the royal food, the pollination grains and the bees poison besides the honey which is considered a medicament to many diseases, furthermore it's value as food because it contains the carbohydrates, the enzymes, the vitamins, the proteins and high percentage of sugar reaches to 81%, and in addition to the jobs those connected with the industry of honey. Therefore the studying of the economical and technical efficiency and economies of beekeeping projects are considered very important. The study hypothesis, is there is disparity in using of the resources in optimal form in the beekeeping projects in Iraq and that reflects on achieving high levels of the economical and technical efficiency and that also reflects on the costs and production. The problem of the study concentrates in that the beekeepers missing in most years the optimum usage when trying to achieve the economical efficiency either technical and allocative. The study aims to measure and evaluate the level of performance of beekeeping projects and the production of honey in Iraq in the productive year 2015 via the following measuring:

1. The technical efficiency of beekeeping projects by using Stochastic Frontier Analysis approach.
2. Volume of the resources those achieving the economical efficiency of beekeeping projects and estimate the surplus or the defect in the economical resources which are used in such projects. The main sources of data in this study is the primary data which are obtained via questionnaire from sample of beekeepers from Baghdad province consists of 50 beekeeper from Al-Mada'an and Al-Mahmmodia, 32 beekeeper from Al-Madaa'an and18 from Al- Mahmmodia, besides the secondary data which were obtained from Ministry of Planning /Central Statistical Organization and the Arab Organization of Agricultural Development. Regarding the analysis approach which is used in this study, the study depends on the descriptive economic approach via deducting the variables of the economic efficiency besides the quantitative economical approach to evaluate the results by using the Stochastic Frontier Analysis through using the Trans log function.

MATERIALS AND METHODS

First: Concept and importance of economical efficiency:

The economical efficiency means the ability of any firm to produce same quantity of output by using less amount of the inputs or costs, or producing higher quantity of output (product) by using the same amount of inputs (costs). The study of economical efficiency is considered very important to determine the problems of production and introducing solution on the base of the experimental results which compatible with economic logic. The analysis of economical efficiency can be used by the policy makers to determine the plans which aim to improve the productivity of agricultural unit, then increases the level of the farm income (18). It indicates to common impact of each of technical efficiency and allocative efficiency and to mixing the elements of production (inputs) in best shares which achieving higher level of agricultural product by using certain level of agricultural costs to achieve higher level of the net agricultural income (profit) (7). Therefore it means ability of agricultural producer to achieve maximum profit , the value of economical efficiency between 0-1, and the production unit is perfect in economical efficiency if the factor of economical efficiency =1 (1).

Second: Components of the economical efficiency:

The economical efficiency consists of technical efficiency and allocative efficiency. The technical efficiency means ability of the productive unit to minimize the inputs should be used with certain level of product and this meaning is more acceptable, and it is define as ability of the farm to transform the inputs to physical outputs within limits of the ability of production and the available technology, it is a physical relationship between the inputs used in production and which the unit (farm) using best of the available technique in production and it's value is lying between zero and one (16) .The allocative efficiency means choosing the mix of the production sources (inputs) when the total costs in certain level of production were minimum, here we take into account prices of the inputs (17) .The farm has allocative efficiency if Value of Marginal Product (vmp) = Marginal Factor Cost (mfc), and the factor of allocative efficiency like technical efficiency between zero and one (10) .

Third: Measuring the economical efficiency: Because the economical efficiency is mix of technical efficiency and allocative efficiency, therefore their measure is compound measure from the two efficiencies, and there are two methods to measuring and evaluating it, the first one from inputs side and it's called Input Orientated Measure, and the second one from output side and it's called Output Orientated Measure, the first

one means declining the inputs share without changing the produced quantities (outputs), and the technical efficiency is:

$$\mathbf{TE}=\frac{OQ}{OP}$$

Where:

TE= The technical efficiency of economic unit.

OQ= Quantity of the inputs which achieving the technical efficiency.

OP= Quantity of the inputs which produce the product (Y).

While the allocative efficiency is:

$$\mathbf{AE}=\frac{OR}{OQ}$$

Where:

AE= The allocative efficiency of economic unit.

OR= Quantity of the inputs which achieving the allocative efficiency.

OQ= Quantity of the inputs which achieving the technical efficiency.

Therefore the economical efficiency is:

$$\mathbf{EE=TE*AE}$$

$$\mathbf{=}\frac{OQ}{OP}\ *\ \frac{OR}{OQ}$$

$$\mathbf{EE}=\frac{OR}{OP}$$

Where: EE is the economical efficiency

While the Output Orientated Measure define as the method which is using to increase the outputs (the product) without increase quantity of the inputs (the production sources), and it's measure by the same method of Input Orientated Measure (8) . whichis:

$$\mathbf{EE=TE * AE}$$

The value of EE has numerical value between zero and one (5).

Forth: Methods of estimating the economical efficiency:

The methods of measuring the economical efficiency by using the traditional and modern approaches, the traditional approach depend on Marginal Analysis via using Ordinary Least Squares (OLS), while the modern approaches depend on Parametric Methods, and the most important of Parametric Methods is Data Envelop Analysis (DEA) and the another is The Boundary Approach which is called Stochastic Frontier Analysis (SFA) which is used in this study. We will explain briefly SFA approach, it is boundary approach used widely, it is more former than others because it's ability to connect between the economic concept, and the actual realistic models, and because it is compatible with logic of the economic theory and it is characteristic of simplified their econometric estimation . This approach more suitable in the related studies with agricultural production because it's ability to dealing with random errors which control most of data in the agricultural sector and because it's driven out hypotheses of traditional tests and this approach is used to measure the productivity efficiency and efficiency of the producer performance , and it can be used in case that the functional form is deterministic, and from the general model it is able to calculate elements of random error or random errors besides estimation of the parameters and calculating the deviation in data, it is used to estimate the limits of production, because the output here is function of all inputs, inefficiency and random error (5) . When we estimate the functions of production and cost by this approach, the actual production should not exceed limits of the maximum production in certain level of inputs, and it requires to determine the functional form to transform the inputs to outputs via function of production or cost, function of Cobb - Douglas and linear and logarithmic function, the production function of random boundary considers the appropriate function to estimate the technical function of economic sectors which suffer from problems, variance and missing data especially the agricultural sector, and the general form of this function is:

$$\boldsymbol{Yi = F(Xi, B) + Ei}$$

Where: Yi= quantity of the bees outputs i. Xi=quantity of the inputs used in the project I to produce the output quantity Yi.

B=parameters of the production function which should be estimated.

Ei= the error term which equal Vi-ui. We can obtain the technical efficiency from the production random boundaries function by share of actual production to optimum production as:

TEi = Yi / Yi*

Where: TEi= The technical efficiency of project i.

Yi = The actual production of project i.

Yi*= The optimum production of project i which has the technical efficiency by using the same level of the inputs .By using the logarithmic transform form to the model of the random boundaries production function within assumption of presence set of productive units using only one input and producing only one product, the production function of productive unit according to SFA will be (6) :

Ln Yi = Ln Xi B + (vi-ui)

Where: LnYi= Logarithm of production of project i .

LnXi= Logarithm of inputs of project i .

B= Vector represents the estimated parameters.

vi = The random error term.

ui = Random variable which has positive value which represents limit of inefficiency.

Therefore the equation connecting between limits of inefficiency u with the random error v, if the value of u=zero, then the project has efficiency equal 100%, and if it is more than zero, then the project is inefficient. Estimating of the Stochastic Frontier Cost Function (SFCF) is more realistic besides ability to using it in predication, and from it we can obtain out the same time the technical efficiency and allocative efficiency together and it takes the following formula (11) :

Ln Ci = F (Qi, Pi, B) + vi + ui

Where: LnCi= Logarithm of total costs of the productive unit i.

Qi=Quantity of total product of the productive unit i.

Pi=Prices of the inputs used in the productive unit i .

B=Parameters of the cost function which should be estimated .

Vi=Random variable distributed normally with mean equal zero and constant variance and it's distributed is independent of vi. Therefore the approach of SFA is a parametric approach, takes into account the random error and required previous determination to the used model, and the case of inefficiency can happen in it because of misspecification of the model (the incorrect specification) . It can be estimated by using the usual econometric methods like Ordinary Least Squares (OLS) .

Fifth : The environmental influence of beekeeping projects : The modern studies begin to concentrate on integration of the environmental influence in calculations of the economic and productivity efficiency especially the agricultural projects to enhance the sustainable development, therefore any attempt to improve the economic efficiency should be environmental friendly , it should takes into account the environmental impact (15) . There is no doubt that from important benefits of the bees honey is mixing pollination of flowers of large number of economic crops, because the bee is the loneliest insect that can control it by human to the purposes of pollination by transferring it to the agricultural fields. It's the most important insect that pollinates the flowers and it does a basic role in pollination because it has high speed ability of flying and moving among the flowers of plants and also has modifications in it's body which help it to transform the pollination grains, the bees do about 90% of mixing pollination(3). And it help very much to improve the production by pollination the trees of fruits and the vegetables, and the economical benefits those can obtain from mixing pollination estimated about by 20 times of the economical benefits those come from value of selling the honey,

wax and other products(2). The maintenance of this important worth is common responsibility, therefore many countries issue laws to protect the bees from the pesticides harm by organizing the usage of these pesticides to maintain the useful insects, the agricultural producer and the consumer. Therefore common understanding should be maintained between the beekeepers and their associations and the agricultural producers, the farmers and the pesticides users.

Sixth: The real production and trade of honey in Arab countries and Iraq:

The total amount of honey production in Arab countries was about 26.50 thousand ton in 2014, Egypt occupied the first rank in the honey production then came after it Morocco and Tunis, where the imported quantity of the honey by Arabs was about 29.42 thousand tons of value equal 103.12 million US$ in 2014, and the Kingdom of Saudi Arabia was the first among the Arab countries those imported the honey, where the United Arab Emirates has the second rank and Morocco has the third rank, and about exporting of Arab countries of the honey was about 43.12 millions US$ and the KSA has the first rank among the exporting countries then came Egypt then came Yemen (19). In Iraq production of honey was about 1.3 thousand ton in 2014 and Iraq imported from the honey in that year about 1.75 thousand ton, but Iraq didn't export any quantity of honey in 2014 nor during 2003-2014 (12). About the production of the provinces, the provinces of Baghdad, Waset and Diala competed on the first ranks in production of honey during 2003-2015, and the total number of the apiaries in Iraq were 4172 apiary only 3923 of them have actual production and the percentage of them 92.9% of total number of the apiaries, and 1260 apiary of them in the urban which they consist 35.5% while there are 267 stopped apiaries and 71 apiaries under construction, the higher number of apiaries were in Nenavah province by about 822 apiaries all of them were working before June 2014, then came Daiala province by about 550 apiaries where 435 apiaries of them working and Baghdad province came after them by 389 apiaries where 371 of them working and in Waset province there are 283 apiaries all of them are working, while in Al-Najaf province the production was 109 ton in 2015 which represents 5.9% of total production of honey in Iraq and in Al-Najaf about 152 apiaries only 142 of them are working (12). The production of honey in Iraq is distributed on three seasons of year spring, summer and autumn and there isn't any production in winter because of the cold, winds and rain except the sunny days, therefore the beekeepers resort to several actions for bees success in winter.

Seventh: The economical indicators of honey production in Iraq (Baghdad province as a case study) :

The total value of fixed assets of apiaries in Iraq in 2010 was about 196876 million I.D, the estimated value of apiary in public sector was about 82370 thousand I.D while in private sector was 53776 thousand I.D which contain land, transportation, building, non-residential buldings, tools and furniture, and the value of these assets were about 7995349 thousand dinar in Baghdad province, value of the land has highest share from the total value of fixed assets and it was 48.5%, while the buldings has 45.3% where as the other fixed assets represented 6.2% of the total value, the most important problems those faced the beekeepers in Iraq and in Baghdad province especially were shortage in the human resources, shortage of the medicament, inefficiency of the marketing, degrading in the genetic factors, non- stability of the prices, problems of the honey marketing , competition of imported honey and the adulterated honey furthermore the diseases, pests and epidemics like red wasp, Abo al-Khudair bird, the Varro, root diseases European brood and root diseases American

brood (13). The average total cost in each cell of sample of the study about 98.60 thousand I.D during the productive year 2015 and it contains the costs spent on sugar of the nutrition, the treatment, the frames and boxes of the cells as calculated from questionnaire and the sugar of the nutrition consisted 35% from total variable cost, while the average fixed cost was about 13154 thousand I.D consisted of the family labour, the annual rent of land and deprecation of woody boxes and secretions and the others tools and the family labour alone represented 41% from total fixed cost, therefore the average total cost of apiaries in sample of the study were about 25710 thousand I.D as average of three categories of apiaries : the large, the medium and the small, the fixed cost was the higher of total cost about 59%, and sugar of the nutrition was the higher from variable cost was about 34%, while the total revenue as average of the three categories of apiaries were about 1167.34 thousand Dinar in the productive year 2015, on base of the average price of the kilogram of honey was 20 thousand Dinar and average price of expulsion was 150 thousand Dinars and average price of one gram of the royal food was 5 thousand Dinar and average price of the propels was 20 thousand Dinar. The average productivity of one cell of honey in sample of the study was about 14.00 kilo and of the royal food was 119.00 gram and of expulsions 3 expulsion and from the propels about 0. 510 kilo during the productive year 2015.

Eighth: The economical and social characteristics of beekeepers in the Baghdad province in the productive year 2015 : The sample of the study contains 50 beekeeper from Al-Mada'an an Al-Mahmmodia districts in Baghdad province from 505 beekeepers, the sample of the study represented about 10% from the total number of beekeepers in Baghdad province which distributed in Al-Mada'an, Al-Mahmmodia, Al-Mashahda , Al-Taji, Jisr Diayla, Al-Rashidia , Al-Naser and Al-Salam, Al-Rashed , Al-Tarmia, Abo Graib and Baghdad center. The number of beekeepers which have experience about 10 years are less than 25 beekeepers, while those have experience more than 10years and less than 20 years were about 15 beekeepers, the number of beekeepers who more than 20 years and less than 30 years were 7 beekeepers , while the number of the beekeepers who have experience more than 30 years were 3 beekeepers only. The Table 1 explain the relationship between years of the experience and net of the annual revenue of honey for one cell.

Table 1. The relationship between years of the experience and net of the annual revenue of honey for one cell in area of the study

Years of the experience	Number of beekeepers	Total number o the cells	Total of revenue of one cell of ho (1000 I.D)	Cost of one (1000 I.D)	Net Revenue (profit) one cell (1000 I.D)
10 years and less	25	687	149.50	75.40	74.10
More than 10 years an less than20 years	15	1017	208.77	73.33	135.44
more than20 Years and less than 30 years	7	996	280.12	63.46	216.66
more than30 years	3	570	309.49	68.11	241.38

Source: preparing of researcher depending on questionnaire.

From Table 1 we can show the clear impact of level of experience of the beekeeper on total of the achieving annual revenue then the net income (profit), the table explain that when the years of experience of the beekeeper increases the profit will increase in this industry, because the beekeeper who has good experience can do good job, and vise versa he will losing his bees,

and here we can see clearly impact of the training and agricultural extension for the callow beekeepers. About the number of workers, the apiaries of sample of this study depend on the family labour, we depended measure unite of worker/year, and we divided the apiaries into three categories : small, medium and large depending upon number of the cells , the small category has less than 50 cells and there were 549 workers /year and the medium about 50-100 cell and they have 10 apiaries and about 961 worker /day and large apiaries of more than 100 cells have about 5 apiaries and 1360 workers /year, the daily average payment of worker about 20 thousand Dinar, the study found surplus in number of the workers then surplus in cost of labour especially in the large apiaries.

RESULTS AND DISCUSSION

First- Specification of the econometric model:

To estimate the technical efficiency and measuring it to determine the economical efficiency of each apiary we should know the random boundaries production function. This function contains two error terms and it takes the following formula:

Ln Yi = bo + Ln Xi + (Vi – ui)

Where: Yi= Total of the produced quantity of the honey yearly in the apiary i (kg) and it represents the dependent variable.

Xi= The inputs and they represent the independent (explanatory) variables,

Vi= The random error and it contains errors of the measurement and uncontrolled conditions in the apiaries.

ui=random variable represents technical inefficiency. On base of the former model, the technical efficiency is calculated by dividing the actual production on the predicted production in each apiary as follows:

TEi = Yi / Yi* .

To estimate parameters of the model and to measure the technical efficiency, the study use the statistical program (Frontier) and estimating the parameters by two approaches: 1. Estimating by (OLS) Ordinary Least Squares to obtain the Best Linear Unbiased Estimator(BLUE) of parameters of the model. 2. Estimating the parameters again by (ML) Maximum Likelihood to calculate the technical efficiency. To measure the technical efficiency by using the Stochastic Frontier Analysis, we transfer the former random function to Trans Log function, where the quantity produced of the honey is dependent variable while the inputs are explanatory variables, therefore the used model to measure the technical efficiency by using the Stochastic Frontier Analysis by (TL) approach is as follows:

$$LnYi=Bo+B_1lnX_1+B_2LnX_2+B_3LnX_3+B_4LnX_4+B_5LnX_5+B_6LnX_6+B_7LnX_7+B_8LnX_8+B_9(LnX_1)^2+B_{10}(LnX_{2)+}\ B_{11}(LnX_3)^2+\ B_{12}\ (LnX_4)^2\ +\ B_{13}(LnX_5)^2+\ B_{14}(LnX_6)^2+\ B_{15}(LnX_7)^2+\ B_{16}(LnX_8)^2\ +\ B_{17}(LnX_1\ LnX_2\ LnX_3\ LnX_4\ LnX_5\ LnX_6\ LnX_7\ LnX_8)\ +\ (vi-ui)$$

Where: Yi= Total of the quantity produced of the honey annually (kg).

X_1= Number of years of the experience in beekeeping (year).

X_2= Number of the cells in each apiary (cell) .

X_3= Number of the workers in each apiary (man /year).

X_4= Number of cages of the queens (cage /year).

X_5= Number of the packages (package /year).

X_6= Quantity of the nutrition sugar (kg / year).

X_7= Number of canes of the treatment (cane / year).

X_8= Number of the frames (frame/year).

Vi= Random variable (errors of the measurement and uncontrolled conditions).

ui= Random variable (the technical inefficiency).

Second- Results of estimating the technical efficiency (TE) by using the Stochastic Frontier Analysis (SFA) of the beekeepers in sample of the study in productive year 2015 : The study estimated the technical efficiency by using the Stochastic Frontier Analysis by the former Trans Log function. The model contains as we

saw the explanatory variables to analyses the technical efficiency according to the production function are: number of years of the experience in beekeeping, number of the cells in each apiary, number of the workers in each apiary, number of cages of the queens, number of the packages, quantity of the nutrition sugar, and number of the frames. We obtain estimates of the parameters of the explanatory variables of the production of Trans Log function by two methods, first Ordinary Least Squares (OLS) and the second is the Maximum Likelihood (ML), and Table 2 shows values of the parameter of the explanatory variables those were responsible about the changes in the dependent variable in apiaries in sample of the sample.

Table 2. Values of parameters of the production Trans Log function by two methods Ordinary Least Squares and the Maximum Likelihood (ML)

The parameter	Value of the parameter by using Ordinary Least Squares	Value of the parameter by using Maximum Likelihood
Bo	**3.87**	**4.99**
B1	**-0.99**	**-0.99**
B2	**-0.57**	**-0.57**
B3	**0.31**	**0.31**
B4	**-0.12**	**-0.12**
B5	**-0.04**	**-0.04**
B6	**-0.11**	**-0.11**
B7	**0.98**	**0.98**
B8	**0.02**	**0.02**
B9	**0.19**	**0.19**
B10	**0.13**	**0.13**
B11	**-0.01**	**-0.01**
B12	**0.05**	**0.05**
B13	**0.001**	**0.001**
B14	**0.02**	**0.02**
B15	**-0.18**	**-0.18**
B16	**-0.001**	**-0.001**
B17	**-0.00001**	**-0.00001**

Source: Calculating from the researcher depending on data in questionnaire and the statistical program Frontier.

From Table 2. We show that value of the parameter Bo when using OLS was 3.87, where it's value when we using ML was 4.99, and the values of all of the explanatory parameters in function represent the production elasticities of these variables, because the function is logarithmic function, therefore the values of parameters represent the partial elasticities. Now we will explain values of the parameters of the explanatory variables in function and their compatibility with the economic theory regarding to OLS because it was achieved BLUE. The signs of each of Number of the workers in each apiary, number of canes of the treatment and number of the frames were compatible with the economic logic because of their positive impact of increasing these inputs to increase the quantity produced of the honey. Increase by 1% in each of the three inputs (variables) will increase production of the honey by 0.31%, 0.98% and 0.02 % consequently, while other signs of the rest variables which are number of years of the experience in beekeeping, number of the cells in each apiary, number of cages of the queens, number of the packages and quantity of the nutrition sugar were negative and not compatible with the economic logic, because they confirm the inverse influence of increasing these inputs upon the quantity produced of the honey, as increasing any one of these inputs by 1% will decrease production of the honey by 0.99%, 0.57%, 0,12%, 0.04%, and 0.11%. Interpretation of this inverse relationship may be referring to interaction in data on the study sample and to other reasons like waste in using these inputs from the beekeepers. Results of table 2 showed

significance of squared logarithm of variables of number of the packages and number of frames, and all signs of squared logarithm of variables were positive expect squared logarithm of number of the workers in each apiary, number of the frames and number of cans of the treatment which have negative sign of their squared logarithm, the logarithmic function of maximum likelihood has negative value of 134.67 and this indicates presence of technical changes influence inversely in the random variable and then in the technical efficiency of the apiaries. From values of the Trans Log function which estimated by OLS and ML estimate values of technical efficiency of each apiary in sample of the study and as average of all aperies of sample of the study as show in Table 3.

Table 3. Results of estimating of the technical efficiency of the honey apiaries in Baghdad province (the study sample) from the productive year 2015

The apiary	T technical efficiency (TE)%	The apiary	The technical efficiency (TE)%
1	88.67	26	87.88
2	92.67	27	91 23
3	85.76	28	85.88
4	89.90	29	88.14
5	91.87	30	90.62
6	90.43	31	84.72
7	87.65	32	91.90
8	88.20	33	87.33
9	88.88	34	89.22
10	91.34	35	91.55
11	90.99	36	91.82
12	85.78	37	88.51
13	87.56	38	85.33
14	83.89	39	91.73
15	90.11	40	90.44
16	91.33	41	88.09
17	86.86	42	87.45
18	89.97	43	85.90
19	88.41	44	91.66
20	90.54	45	86.01
21	90.65	46	88.85
22	90.71	47	86.87
23	88.43	48	84.48
24	87.11	49	89.43
25	90.77	50	85.11
88.76	The average		
92.67	Max TE		
83.89	Min TE		

The source: Preparing by the researcher depending on questionnaire and the statistical program frontier .

From Table 3 we can show that the technical efficiency of the apiaries in sample of the study was about 92.67% as max limit and 83.89% as min limit and average of TE was 88.76% and it is high average, and this result of the average indicates that the beekeepers in sample of the study can increase their production by 11.24% without increasing the inputs, or they can produce the same former product with less inputs by 11.24%, and the average of the technical efficiency was 88.76% indicates deviation in the actual production than level of the optimal production by 11.24%, and the apiaries can reach to the optimal production if the inputs are used in optimal form. All the apiaries in sample of the study did not achieve perfect technical efficiency 100%, therefore any of the apiaries did not achieve perfect economic efficiency 100%, therefore all apiaries in sample of the study do not produce on the production ability curve but they are far away from it by different percentage and this give the chance to the apiaries to reduce their amount of the inputs to reaching to the same level of the production or used the same amount of the using inputs to reach to higher volume of production. The Table no. 4 explains levels of the technical efficiency those achieved by aperies in sample of the

study and percentage of it, from the table we can show that number of the apiaries those achieved levels of the technical efficiency less than 100%-90% were 19 apiaries represented 38% of volume of the studied sample.

Table. 4. Levels of the technical efficiency and percentage of it of the studied sample in the productive year 2015

Levels of the technical efficiency	Number of the apiaries	It's percentage of the total number of the sample %
90 <TE <100	19	38
80 <TE <90	31	62
The total	50	100

Source: Gathering and calculating by the researcher depending on results of the table(3).

We observe from the Table that number of the apiaries those achieved levels of the technical efficiency between 90%-80% were 31 apiaries represented 62% from size of the studied sample. From above we can conclude: the fixed costs represented the larger part of the total costs in projects of beekeeping in Baghdad province because their percentage were 57% of the total cost, while the family labour represented the larger part of the fixed costs, and this indicates the dependence of the apiaries on human labour mainly, and Sugar of the nutrition as one of the production inputs represents the higher item within the variable cost by 33%, because the beekeepers use the artificial nutrition for bees in case of inactivity of bees because the diseases. The beekeeper especially those have large apiaries achieved an economical profits in the productive year 2015 by benefiting from benefits of the mass production .and the average of the technical efficiency by the Trans Log production function which estimated by SFA was 85% and this means a waste in using the inputs by 15% from total of the used inputs. And only 19 apiaries achieved technical efficiency more than 90%, and they represent more than 1/3 of the apiaries in sample of the study. Also there is surplus in all of the used inputs in the apiaries, and this was clear from amount of the resources those achieving the efficiency, and the beekeeper is producer and honey marketing in the same time because there are no specialized markets to sell products of the honey bees, and the honey marketing to the marketing centers in the towns. From conclusions, some recommendations were recommended: Increasing of beekeeping in Baghdad province and the other provinces especially those are good producer of the honey, because like these projects have short cycle of capital and do not need modern techniques in the production. and necessity of the optimal using of the inputs used in beekeeping by the beekeeper to achieve the technical efficiency and allocative efficiency to achieve max. profit. Studying the reasons of high levels of technical efficiency in some apiaries in the sample to be an experience can benefit the other apiaries from it. Also the government should introduce the incentives to the beekeepers and the Iraqi beekeepers association in form of the long run loans with small interest . Maximum benefit from the surplus achieved from the inputs to establish new projects or expand in present projects to using the surplus inputs those decreasing the technical efficiency then the economical efficiency, and contributing of the Ministry of Agriculture in pesticides the bees pests by co-operating with the Iraqi beekeepers association. Finally, activate law of the agricultural quarantine and controlling import the bees from untrusted origin especially the queens to maintain the Iraqi bees and to prevent entering pests and diseases of the imported bees.

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