AN ECONOMIC STUDY OF THE EFFECTIVE FACTORS FOR BROILER PRODUCTION IN EASTERN REGIOM, CASE STUDY Al-AHSA GOVERNORATE. KINGDOM OF SAUDI ARABIA.

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ABSTRACT

This research was aimed to study the most important economic variables affecting of the production capacity of poultry meat in Al-Ahsa governorate by estimating the parameters of the production functions, the quantitative and value costs of the broiler farms,. The economic analysis method used a sample of 33 meat projects in the eastern region, representing 35.9% of the total number of projects in the Eastern Region and 92 projects till 2017. was divided into three categories, the first capacity (less than 150 thousand chickens), consisting of 16 projects representing 48.5% of the total sample farms and the second capacity (150 thousand to 300 thousand chickens), consisting of 10 projects representing 30.3% And the third (more than 300 thousand chickens) and consists of 7 projects representing 21.2% of the total sample farms, the results showed that the amount of feed and the number of chicks in the study sample ranked first and second in the total cost items of the first, second and third production capacity, representing about 63.6%, 64.8% and 63.1% (18.4% and 18.7%) with an average of about 63.9% and 18.4% respectively.

Keyword: Production functions, cost functions, production efficiency.

دراسة اقتصادية للعوامل المؤثرة على إنتاج الدواجن بالمنطقة الشرقية من واقع دراسة ميدانية "دراسة حاله محافظة الاحساء" بالمملكة العربية السعودية

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المستخلص

يهدف البحث الى دراسة أهم المتغيرات الاقتصادية التي تؤثر على الطاقة الإنتاجية من لحوم الدواجن بمحافظة الاحساء وذلك من خلال تقدير معالم دوال الإنتاج والتكاليف الكمية والقيمية لمزارع الدجاج اللاحم، واستخدم أسلوب التحليل الاقتصادي لبيانات قطاع مستعرض لعينة من مشروعات إنتاج دجاج اللحم في المنطقة الشرقية بلغ عددها 33 مشروعاً تمثل نحو (35.9%) من إجمالي عدد المشروعات القائمة بالمنطقة الشرقية والبالغ 92 مشروعاً حتى عام 2017م. قسمت الى ثلاث فئات ، السعة الأولى (أقل من 150 ألف دجاجة)، وتتكون من 16 مشروع تمثل 48.5% من إجمالي مزارع عينة الدراسة ، والسعة الثانية (150 ألف الى 300 ألف دجاجة)، وتتكون من 10 مشروعات تمثل 30.3% من إجمالي مزارع عينة الدراسة ، والثالثة (أكبر من 300 ألف دجاجة) وتتكون من 7 مشروعات تمثل 21.2% من إجمالي مزارع عينة الدراسة. واظهرت النتائج ان كمية العلف وعدد الصيصان بعينة الدراسة تحتل المرتبة الأولى والثانية من بنود التكاليف الكلية للسعة الإنتاجية الأولى والثانية والثالثة حيث تمثل حوالي (63.6٪، 64.8٪، 63.1٪) بالنسبة لكمية العليقة في الدورة، أما عدد الصيصان تمثل نحو (18٪، 18.4٪، 18.7٪) بمتوسط بلغ حوالي (63.9٪، 18.4٪) على الترتيب.

الكلمات المفتاحية: دوال الإنتاج، دوال التكاليف، الكفاءة الإنتاجية.

***Received:18/6/2019, Accepted:13/9/2019**

INTRODUCTION

The poultry industry is one of the main agricultural industries in Saudi Arabia. It is one of the main sources of income in agricultural production and provides a large part of animal protein (white meat and eggs). This protein is characterized by high nutritional value, with red meat. The industry is associated with many other industries such as the animal feed industry, pharmaceuticals, veterinary supplies, etc.(12) It is characterized by rapid turnover of capital and high returns, and the need for poultry projects for a large patch of land and the low capital required to invest in this field compared to other productive projects. the poultry sector is considered an important and effective sector for its ability to cover the gap in meat production due to the lack of local production of red meat to cope with the increasing increase in consumer needs, which leads to a food gap and because the problem of meat shortage is important in its study of its direct link to the health of individuals and some level Are obtained from animal protein in the light of increasing population and higher prices of red meat compared to poultry prices, which leads to increased consumption of poultry as an alternative to the gap in food in red meat. (12). The number of broiler chickens projects in Saudi Arabia reached 917 in 2017 with a total capacity of 10850 million birds/year. The total loans for these projects amounted to 3.1 billion riyal representing 22.9% of the total loans granted to agricultural projects amounting to 13.5 billion riyal in 2017. Licensed projects for the production of broiler chickens Eastern Province 92 projects, or about 9.6% of the total projects licensed to produce broiler chickens in the Kingdom, with a capacity of about 37.1 million birds, or about 4.9% of the total production in the Kingdom

The projects specialized in the production of chicken meat from a range of production, administrative and marketing problems have been reflected in the emergence of several indicators, including the failure of some of them to meet the repayment dates of the Agricultural Development Fund and some of them stopped production altogether or operate with a production capacity less than the planning capacity, which requires studying the most important features of production and technical transactions (Technological) of these projects according to the types of production and production capacity as one of the most important indicators of the problems faced by these projects. In view of the importance of the production of broiler chickens in Al-Ahsa governorate as well as the economic importance of the resources used in this activity, and the many problems that it suffers from the high cost of using some of the productive resources used in the production of broiler chickens, especially feed, in addition to the lack of rationalization in the use of others, The percentage of poultry in poultry, which is reflected in a cycle on the efficiency of using the resources used in this sector and then on the profits of producers, which requires the study of the efficiency of the resources used in this activity in order to make maximum use of the use of those resources and increase the output N broiler chickens. This research aims to study the most important features of meat production projects by reviewing and analyzing the production capacity and the most important technical (technical) transactions for chicken meat production projects in the various production scale of these projects in the Eastern Province of Saudi Arabia. The following, Study the most important economic variables affecting the production capacity of poultry meat in Al-Ahsa governorate.and estimating the parameters of the production functions and the quantitative and value costs of the poultry farms in Al-Ahsa governorate.(6,7,13,14,15).

MATERIALS AND METHODS

The study will rely on statistical methods and mathematical models to achieve the objectives of the study such as multiple regression to estimate production functions, quantitative and value costs, and analysis of production. The economic analysis method of the Cross Section Data for a sample of meat production projects in the eastern region was 33 projects representing about 35.9% of the total number of projects in the Eastern Region and 92 projects till 2017 (19) . The research adopted asset of economic criteria to reach the objectives of the research are:

1. Production functions: The production function is defined as a transformative physics

relationship between the quantity produced from the product and the inputs used in production over a given time period. The concept of the production function plays an important role at the macroeconomic level in terms of clarifying the prices of the different production elements. This is useful in studying the efficiency of the use of the production elements, explaining the degree of substitution between them and the return on capacity. In estimating the production functions, Marginalization of technological change, and the substitution elasticity between capital and labor. These models were estimated in a way that minimizes the Least Squares Error to obtain unbiased, efficient, and consistent estimates by means of the linear estimate of the Best Unbiased Estimators under the following conditions,. Model parameters on the linear mode. Sufficiency requirement . There is no restriction on the estimation of these transactions. Number of model variables equal to the number of parameters to be estimated، including the fixed amount.If the conditions for special transactions and assumptions are met in a linear estimation method، this method is called linear estimation of parameters. Some of the most important models that have been estimated by way of written estimation are the following:

1- **Power production function**: (9)

$$Y = \alpha K^{B_1} L^{B_2}$$

Y= Output size , l= Work units K= Capital units B1= Capital elasticity

B2= labor elasticity α = Efficiency coefficient

Note that it is a nonlinear function in regression coefficients, but can be converted into a linear function by taking the logarithm of the two ends of that equation and converting it to a double logarithmic function as follows (2):

$$LnY = B_0 + B_1 LnK + B_2 LnL$$

The function is characterized by: That the regression coefficients are the same as the production elasticities i.e. $\varepsilon_K = B_1$, $\varepsilon_L = B_2$. A semi-concave function around the origin point has a convex production curve, and therefore has a partial first positive differential and a second negative partial differentiation.(]) . A homogeneous function of class (v) in the elements of production. In other words, the increase of the components of production by 1% leads to the increase of production by a certain percentage, and the function of two variables. When the production function is homogeneous, the correlation between the components of production this explains why there are many combinations of capital and labor to produce a certain amount of output, which is called a symmetrical production curve. (16,17,18) It has a negative slope from the top down to the right. Production, and image (b) of the exponential function where 1 = V constant yield with the capacitance and homogeneous first class and this image is called a cup Douglas, meaning that if the costs increased by a certain percentage will increase the total return the same proportion, according to the theory of Ouler distribution (Euler Theorem

2. Cost Functions: is defined as the relationship between costs and output volume, through which the lowest costs for production can be inferred on the assumption that the product is rational in its use of resources and takes the following mathematical form:

The Linear Form:

$$C = B_0 + B_1 Y$$

$$\xi_{CY} = B_1 \cdot \left(\frac{Y}{C}\right)$$

Elasticity Marginal effect $\frac{\Delta C}{\Delta Y} = B_1$

2.2. The Log – Log Form:

$$C = B_0 Y^{B_1}$$

$$\xi_{CY} = B_1$$

Elasticity Marginal effect $\frac{\Delta C}{\Delta Y} = B_1 \cdot \left(\frac{C}{Y}\right)$

RESULTS AND DISCUSSION

1. the most important productive inputs on which the production of broiler chickens depends: Table (1), (2), (3), (4) shows the most important economic variables for the production of tons of live chicken carcasses with different production scales in the research sample as follows.

1.1. **Amount of feed**; concentrated diets are the most important productive inputs affecting the production of broiler chickens. The average amount of feed required for the production of live meat from chickens during the three production cycle was about 1.975

tons / 695 birds, 1.965 tons / 691 birds, 1.934 tons / 681 birds, The total number of total costs of these capacities was about 6389 SR / 695 birds, 6012 SR / 691 birds, 5576 SR / 681 birds, representing 63.6%, 64.8% and 63.1% respectively, with an average of about 1,958 tons / 689 birds. About 63.8% of total costs.

1.2. **Number of chicks**; the number of chicks is one of the most important productive inputs on which the production of broiler chickens depends. This is related to the size of the farm. The average number of chicks needed to produce a ton of live fattening chickens during the cycle was the first, second, third, 695 birds/ tons of meat, 691 birds / tons of meat, 681 birds/ tons of meat, respectively, at a cost of about 1809 SR / 695 birds, 1708 SR / 691 birds, 1652 SR / 681 birds representing 18%, 18.4% and 18.7% of the total cost of producing one ton of live broiler chickens., 10048 riyals / 695 birds, 9273 riyals / 691 birds, 8830 riyals / 681 birds, of the three scales respectively, with an average of about 589 birds / ton of meat, with cost amounted to about SR 1723/689 birds representing about 18.4% of the total cost of about SR 9384/689 bird, and thus occupy the second place between the total cost of items.

1.3. Medications and veterinary care: Veterinary medicines and care are the most important productive inputs affecting the production of chicken meat, which led to the work of a special program for medicines and veterinary care in each farm and under the supervision of a veterinarian, where the role of raising or decreasing the rates of production of live chickens, and veterinary care for the production of tons of live poultry during the cycle with three production scales amounted to 821 riyals / 695 birds, 666 riyals / 691 birds, 724 riyals / 681 birds representing about 8.2%, 7.2%, 8.2% occupy the third place among the items of the total costs of those scales, About 737 riyals / 689 birds were made For about 7.8% of the total costs.

1.4. Human labor: The trained labor force is considered one of the most important productive inputs affecting the production of chicken meat, where it was found that the average human labor used for the production of tons of live chickens during the cycle with the three production scales was about 2, 4 and 6 workers in the cycle respectively with a total wage of about 364 Riyals / 695 birds, 311 riyals / 691 birds, 327 riyals / 681 birds representing about 3.6%, 3.4% and 3.7%, occupy the fourth place among the total cost items of these scales, respectively, with an average of about 4 workers with a total wage of about 334 riyals / 689 birds representing about 3.6% of the total costs.

Table 1. the most important quantitative economic variables for the production of live meat ton of chicken for different production scales in the sample of the study

variable	Unit	First scale	Second scale	Third scale	Average sample
Feeding	**ton**	**1.975**	**1.965**	**1.934**	**1.958**
chicks	**chick**	**695**	**691**	**681**	**689**
Employment	**Man / day**	**2**	**4**	**6**	**4**
Brush	**kg**	**218**	**196**	**204**	**206**

Source: collected and calculated from data of questionnaire

1.5. Rent: It was found that the average rent of the farm to produce a ton of live meat from live chickens during the cycle with the three production scales was about 277 SR / 695 birds, 256 riyals / 691 birds, 247 SR / 681 birds representing 2.8%, 2.8% and 2.8% Respectively, an average of about 260 riyals / 689 birds, representing about 2.8% of the total costs.

1.6. Brush: the brushes of the productive inputs affecting the production of chicken meat, and it turned out that the average expenditure of the farm on the meat to produce a ton of live chicken during the cycle with the three production scales was about 222 riyals / 695 birds, 177 riyals / 691 birds, 182 riyals / 681 birds, representing about 2.2% 2.1% for these scales respectively, ranked sixth among the total cost items of these capacities, respectively, an average of about 194 riyals / 689 birds representing about 2.1% of the total costs.

1.7. **Operating expenses : (electricity, heating, water, petty expenses):** was found that the value of operating expenses used to produce a ton of live chicken during the cycle at the three production levels was about 166 riyals / 695 birds, 143 riyals / 691 birds, 122

riyals / 681 birds representing 1.6%, 1.5%, 1.4% Respectively, an average of about 144 riyals / 689 birds, representing about 1.5% of the total costs.

Table 2. the most important economic variables in riyals for the production ton of live meat of chickens for various production scales in the sample of the study.

variable	First scale		Second scale		Third scale		Average sample	
	cost	%	cost	%	cost	%	cost	%
Feeding	6389	63.6	6012	64.8	5576	63.1	5992	63.8
chicks	1809	18	1708	18.4	1652	18.7	1723	18.4
Veterinary	821	8.2	666	7.2	724	8.2	737	7.8
labor	364	3.6	311	3.4	327	3.7	334	3.6
rent	277	2.8	256	2.8	247	2.8	260	2.8
brush	222	2.2	177	1.9	182	2.1	194	2.1
Other expenses	166	1.6	143	1.5	122	1.4	144	1.5
Total cost	10048	100	9273	100	8830	100	9384	100

Source: collected and calculated from data of questionnaire

Table 3. Total revenue, net yield and sale price in riyal of the production of live meat ton of chicken for different production scales in the sample of the study

variable	First scale	Second scale	Third scale	Average sample
Selling price	10550	10318	10315	10394
Poultry waste	226	206	215	216
Total revenue	10776	10524	10530	10610
Net return	728	1251	1700	1226

Source: collected and calculated from data of questionnaire

Table 4. the average weight of the bird and its profitability and the cost of production and the amount of feed consumed in the cycle

The statement	Amount of feed (kg)	Meat (Kg)	conversion factor *	Profitability	Cost
First scale	2.842	1.439	1.975	1.10	14.46
Second scale	2.845	1.447	1.966	1.81	13.42
Third scale	2.840	1.468	1.935	2.50	12.97
Average	2.842	1.451	1.959	2.08	15.93

Source: collected and calculated from data of questionnaire. * Kg feed / kg meat

1.8. Prices of chicken sales: Prices represent the tool or mechanism by which the income is divided between the producers and the different factors of production, as well as the sharing of the social return between the producers and the consumers. Prices of the sale of live chickens are determined according to prevailing market prices, which are affected by the seasons, holidays, Which affects the sales of farms, where it was found that the average price of sale of tons of live chickens during the cycle with the three production capacities amounted to about 10550, 10318, 10315 SR / ton live meat, respectively, an average of about 10394 riyals / ton live meat.

1.9. Total revenue: Gross revenue reflects the outcome of the reaction of both the productivity and the unit price produced. The increase of one of them gives an indication of the increase in the total revenue of the productive unit and vice versa. The average gross revenue per ton during the cycle at the three production levels was estimated at 10776, 10524, 10530.3 SR / Live chickens respectively, with an average of about 10610 SR / ton.

1.10. Net Return: The net return is one of the economic efficiency criteria that the producer is concerned about when making productive decisions. The average net return of the production cycle per ton of live chicken is about 728 SR / 695 birds, 1251 SR / 691 birds, 1700 SR / 681 birds The first and second and third respectively, an average of about 1226 riyals / 689 birds**.**

Estimation of production functions and costs for broiler farms: This section deals with the attempt to estimate the production and cost functions of the production farms of broiler chickens in Al-Ahsa governorate according to the different production scales of the first scale (less than 150 thousand

chickens). It consists of 16 projects representing 48.5% of the total sample farms, and the second scale (150 thousand – 300 thousand chickens), Consisting of 10 projects representing 30.3% of the total sample farms, and the third (more than 300 thousand chickens) consisting of 7 projects representing 21.2% of the total sample farms by means of data obtained from the study sample to determine the efficiency of using elements Production and costs of those functions**.** The study was based on the selection of a number of production functions in the form of multiple models of multiple regression in linear and logarithmic images in order to determine which inputs are more influential on the production of broiler chickens and their correlation with production as well as production response. Economic and statistical logic, he found that the best of these functions the function of forces of production, which is one of the most common forms in agricultural production in general, if the inclusion of that function on the appropriate number of inputs production, in addition to the ease of calculation of that and to obtain the production elasticity factor and marginal product direct output directly for each factor of production. (3,4) Therefore, the regression method was then used to arrive at a regression equation with the highest coefficient of determination on the one hand, as well as the statistical significance of all the coefficients and the overall moral of the model On the other hand. The function used included the following variables indicating (Y) the amount of production of live chicken meat per ton and (Vy) the value of production in the cycle, while the independent variables are the following: (X1) the number of chicks per thousand at the beginning of the production cycle, (X2) the cost of chicks in rails, (X3) the number of cycles per year,(X4) amount of feed consumed Per ton during the production cycle, (X5) the cost of feed in riyals, (X6) the percentage of chicks spent during the production cycle, (X7) the number of human labor used for daily service operations and on-farm care, (X8) the cost of labor in riyals, (X9) The cost of veterinary and health care in riyals, which includes medicines, serums, vaccines and veterinarian fees.

1. Estimation of the quantitative production functions of the broiler farms in the sample of the study:

1.1. Estimation of the production function of the first production scale

The production function of the first production scale was estimated in the following exponential form:

$$Y = 0.44 X_2^{0.21} X_4^{0.72} \qquad (1)$$

$$t = (7.6)^{**} \quad (13.6)^{**}$$

$$F = (293.8)^{**}$$

$$\bar{R}^2 = 0.93$$

The Equation (1) shows the relationship between the amount of production of live chicken meat and the production elements. Indicates that the cost of chicks in riyal and the amount of feed consumed per ton used in the first production scale, In the study of the effect of each independent variable separately, the effect of the variable on the chicks(X2) was found to be significant and the production elasticity was 0.21 indicating that when the cost of the chicks increased 1%, the production of chicken meat increased by 0.21%, it was also found that the increase in the share of the chick from the feed (X4) used 1% led to an increase in the amount of meat production by 0.72%, while the coefficients of the remaining independent variables were not significant.

1.2. Estimation of the production function of the second production scale:

The production function of the second production scale was estimated in the following exponential form:

$$Y = 0.12 X_1^{0.65} X_4^{0.50} \qquad (2)$$

$$t = (4.1)^{**} \quad (2.9)^{**}$$

$$F = (163.9)^{**}$$

$$\bar{R}^2 = 0.86$$

The Equation (2) shows the relationship between the amount of production of live poultry meat and the number of chicks and the amount of feed used in the second production capacity is statistically significant, The effect of both the number of chicks and the amount of feed separately showed that by increasing the number of chicks (X1) in one unit, it increased the production of chicken meat by 0.65 units, It was also found that the increase

in the share of chick fed (X4) in one unit increased the production of chicken meat by 0.50 units, while the coefficients of the remaining independent variables did not prove significant. (8)

1.3. Estimation of the production function of the third production scale:

The production function of the third production scale was estimated in the following exponential form:

$$Y = 0.33X_1^{0.43}X_4^{0.46} \qquad (3)$$

$$t = (3.8)^{**} \quad (5)^{**}$$

$$F = (123.1)^{**}$$

$$\bar{R}^2 = 0.86$$

The Equation (3) shows the relationship between the amount of production of live poultry meat and the number of chicks and the amount of feed used in the second production capacity is statistically significant, The effect of both the number of chicks and the amount of feed separately showed that by increasing the number of chicks (X1) in one unit, it increased the production of chicken meat by 0.43 units, It was also found that the increase in the share of chick fed (X4) in one unit increased the production of chicken meat by 0.46 units, while the coefficients of the remaining independent variables did not prove significant.

2. Estimation of the quantitative cost functions of the broiler farms in the sample of the study: The cost functions of the broiler farms were estimated using the production data and the costs obtained through the questionnaire. The cost function is estimated by the following indicators: ln C = B0 + B1 ln Y,) C: Shows the total cost of producing chicken meat at the farm level, while Y: expresses the production volume of the broiler chicken farms in each in each farm B1, B0: is a function parameter and fixed. In the study of the relationship between the total variable production costs of each production capacity of the sample farms in the production cycle and the total production per ton, the variable cost function was estimated in the double logarithmic image after it was found that the picture is the most representative, (F), (T). (R^2) for data, compared to linear, cubic and quadratic forms.

2.1. Estimation of production cost function for the first production scale:

The data in Table 5 indicate the estimation of variable cost functions for the production of broiler chickens at the research sample level. The cost function of the first production scale indicates that about 93% of changes in variable costs are due to changes in the production of broiler chickens, the value of (F) significance of the function as a whole, at all probability levels, was also shown from the value of (T) significant estimate of the coefficients of the function. This function was used to estimate the elasticity of production costs in order to know the productive phase expressed by this function. (3,4) The cost elasticity is less than the correct one in the first stage, where the costs increase at a decreasing rate with increased production at an increasing rate. The product intensifies in the production elements until the second phase (the economic stage), where the cost elasticity is greater than the correct one. the average variable costs and marginal costs of the function were derived from the knowledge of the cost elasticity of about 0.98 for the first production capacity and the average variable cost (AVC) was about 9771.3 SR per ton of meat per session, while Marginal Cost (MC) was about 9575.9 SR per ton of meat**,** Thus, the cost elasticity is estimated at 0.98, which means that a 1% increase in production leads to a 0.98% increase in costs. This also means that the cost-to-production relationship in the sample is decreasing, suggesting that sample farm owners can increase their net returns under future input and output prices. The estimate of average variable costs and marginal costs indicates that the average costs exceeded the marginal costs, confirming that production is still in its first phase and that its cost elasticity is less than the right one, and that it is not considered an optimal economic stage of production.

Table 5. Estimation of the Quantitative Cost Functions of Poultry Farms in the research Sample

Production scales	Function	ε_{CY}	t_{B_1}	R^2	F
First	$\ln C = 4 + 0.98 \ln Y$	**0.98**	**23.1****	**0.93**	**532.3****
Second	$\ln C = 4.1 + 0.93 \ln Y$	**0.93**	**16.0****	**0.84**	**257.3****
Third	$\ln C = 4.03 + 0.94 \ln Y$	**0.94**	**11.3****	**0.76**	**128.5****

Source: collected and calculated from data of questionnaire. ** Significant at a probability level of 0.01

2.2. Estimation of production cost function for the second production scale:

The data in Table 5 indicate the estimation of variable cost functions for the production of broiler chickens at the research sample level. The cost function of the second production scale indicates that about 84% of changes in variable costs are due to changes in the production of broiler chickens, the value of (F) significance of the function as a whole, at all probability levels, was also shown from the value of (T) significant estimate of the coefficients of the function. the average variable costs and marginal costs of the function were derived from the knowledge of the cost elasticity of about 0.93 for the second production capacity and the average variable cost (AVC) was about 9016.4 SR per ton of meat per session, while Marginal Cost (MC) was about 8385.3 SR per ton of meat**,** Thus, the cost elasticity is estimated at 0.93, which means that a 1% increase in production leads to a 0.93% increase in costs. This also means that the cost-to-production relationship in the sample is decreasing, suggesting that sample farm owners can increase their net returns under future input and output prices.

2.3. Estimation of production cost function for the third production scale:

The data in Table 5 indicate the estimation of variable cost functions for the production of broiler chickens at the research sample level. The cost function of the third production scale indicates that about 76% of changes in variable costs are due to changes in the production of broiler chickens, the value of (F) significance of the function as a whole, at all probability levels, was also shown from the value of (T) significant estimate of the coefficients of the function. the average variable costs and marginal costs of the function were derived from the knowledge of the cost elasticity of about 0.94 for the third production capacity and the average variable cost (AVC) was about 8582.6 SR per ton of meat per session, while Marginal Cost (MC) was about 8067.6 SR per ton of meat**,** Thus, the cost elasticity is estimated at 0.94, which means that a 1% increase in production leads to a 0.94% increase in costs. This also means that the cost-to-production relationship in the sample is decreasing, suggesting that sample farm owners can increase their net returns under future input and output prices.

3. Estimation of the production functions and the value costs of the broiler farms:

3.1. Estimation of the value of production functions for three production scales:

3.1.1. First production scale**:** was estimated in the following exponential form**:**

$$Vy = 1.4 X_2^{0.18} X_5^{0.72} X_8^{0.05} X_9^{0.07} \quad (4)$$

$$t = (19.5)^{**}\ (29.4)^{**}\ (5.6)^{**}\ (8)^{**}$$

$$F = (2076)^{**}$$

$$\bar{R}^2 = 0.99$$

The Equation (4) shows the relationship between the value of production (Vy) in riyal of live poultry meat and the value of the production elements used for the first production scale, the results indicate that this function is significant. The coefficient of determination is 0.99, which means that the independent variables in this function explain approximately about 99% of the changes occurring in the dependent variable, [10]In terms of the effect of each independent variable, it was found that by increasing the cost of chicks and the share of fodder used and the number of trained skilled workers and veterinary care at a cost of 1%, the value of production increased to 0.18%, 0.72%, 0.05% and 0.07% Respectively, The total production elasticity for all independent variables was estimated to be 1.02, which meant that the value of production increased at a rate greater than the rate of increase in costs, Therefore,

producers of the first production scale should increase the intensification of the production elements (cost of chicks, cost of feed, veterinary care and cost of trained skilled workers) to increase net return and move to the second productive economic stage.

3.1.2. Second production scale**:** was estimated in the following exponential form**:**

$$Vy = 2X_2^{0.16}X_5^{0.66}X_8^{0.03}X_9^{0.09} \quad (5)$$

$$t = (14.6)^{**}\ (20.7)^{**}\ (3.6)^{**}\ (7.6)^{**}$$

$$F = (487.8)^{**}$$

$$\overline{R}^2 = 0.97$$

The Equation (5) shows the relationship between the value of production (Vy) in riyal of live poultry meat and the value of the production elements used for the second production scale, the results indicate that this function is significant. The coefficient of determination is 0.97, which means that the independent variables in this function explain approximately about 97% of the changes occurring in the dependent variable, In terms of the effect of each independent variable, it was found that by increasing the cost of chicks and the share of fodder used and the cost of trained skilled workers and veterinary care at a cost of 1%, the value of production increased to 0.16%, 0.66%, 0.03% and 0.09% Respectively, The total production elasticity for all independent variables was estimated to be 0.94, which meant that the producers of the second production scale should increase the intensification of the production elements (cost of chicks, cost of feed, veterinary care and cost of trained skilled workers) to increase net return and move to the second productive economic stage.

3.1.3. Third production scale**:** was estimated in the following exponential form**:**

$$Vy = 1.7X_2^{0.20}X_5^{0.68}X_8^{0.05}X_9^{0.05} \quad (6)$$

$$t = (11)^{**}\ (18.2)^{**}\ (3.3)^{**}\ (3.3)^{**}$$

$$F = (338.1)^{**}$$

$$\overline{R}^2 = 0.97$$

The Equation (6) shows the relationship between the value of production (Vy) in riyal of live poultry meat and the value of the production elements used for the third production scale, the results indicate that this function is significant. The coefficient of determination is 0.97, which means that the independent variables in this function explain approximately about 97% of the changes occurring in the dependent variable, In terms of the effect of each independent variable, it was found that by increasing the cost of chicks and the share of fodder used and the cost of trained skilled workers and veterinary care at a cost of 1%, the value of production increased to 0.20%, 0.68%, 0.05% and 0.05% Respectively, The total production elasticity for all independent variables was estimated to be 0.98, which meant that the producers of the second production scale should increase the intensification of the production elements (cost of chicks, cost of feed, veterinary care and cost of trained skilled workers) to increase net return and move to the second productive economic stage.

3.2. Estimation of the value of cost functions for three production scales:

3.2.1. First production capacity: The data in Table 6 indicate the estimation of variable cost functions for the production of broiler chickens at the research sample level. The cost function of the first production scale indicates that about 99% of changes in variable costs are due to changes in the production of broiler chickens, the value of (F) significance of the function as a whole, at all probability levels, was also shown from the value of (T) significant estimate of the coefficients of the function. the average variable costs and marginal costs of the function were derived from the knowledge of the cost elasticity of about 0.98 for the first production scale and the average variable cost (AVC) was about 9771.3 SR per ton of meat per session, while Marginal Cost (MC) was about 9575.9 SR per ton of meat**,** Thus, the cost elasticity is estimated at 0.98, which means that a 1% increase in production leads to a 0.98% increase in costs. This also means that the cost-to-production relationship in the sample is decreasing, suggesting that sample farm owners can increase their net returns under future input and output prices. It is clear from the estimation of average variable costs and marginal costs that average costs exceed marginal costs, which confirms that production is still in its first phase and that its cost

elasticity is less than the correct one, and that it is not considered an optimal economic stage of production. That this phase should go beyond a greater intensification of the production components and an increase in its production scales. (11)

Table 6. Estimation of the value Cost Functions of Poultry Farms in the research Sample

Production scales	Function	ε_{CY}	t_{B_1}	R^2	F
First	$\ln C = 0.1 + 0.98 \ln Vy$	**0.98**	**107.1****	**0.99**	**11477.3****
Second	$\ln C = -0.035 + 0.99 \ln Vy$	**0.99**	**49.02****	**0.98**	**2403.50****
Third	$\ln C = -0.09 + 1.001 \ln Vy$	**1.01**	**34****	**0.97**	**1159.2****

Source: collected and calculated from data of questionnaire. ** Significant at a probability level of 0.01

3.2.2. Second production scale: The data in Table 6 indicate the estimation of variable cost functions for the production of broiler chickens at the research sample level. The cost function of the second production scale indicates that about 98% of changes in variable costs are due to changes in the production of broiler chickens, the value of (F) significance of the function as a whole, at all probability levels, was also shown from the value of (T) significant estimate of the coefficients of the function. the average variable costs and marginal costs of the function were derived from the knowledge of the cost elasticity of about 0.99 for the second production scale and the average variable cost (AVC) was about 9016.4 SR per ton of meat per session, while Marginal Cost (MC) was about 8926.2 SR per ton of meat**,** Thus, the cost elasticity is estimated at 0.99, which means that a 1% increase in production leads to a 0.99% increase in costs. This means that there is an opportunity for the owners of the broiler chickens for this capacity to increase their net returns under the input and output prices of the poultry industry in Al-Ahsa governorate during the year of the study sample in the future by increasing the production scales.

3.2.3. Third production capacity: The data in Table 6 indicate the estimation of variable cost functions for the production of broiler chickens at the research sample level. The cost function of the third production scale indicates that about 97% of changes in variable costs are due to changes in the production of broiler chickens, the value of (F) significance of the function as a whole, at all probability levels, was also shown from the value of (T) significant estimate of the coefficients of the function. the average variable costs and marginal costs of the function were derived from the knowledge of the cost elasticity of about 1.01 for the third production scale and the average variable cost (AVC) was about 8582.6 SR per ton of meat per session, while Marginal Cost (MC) was about 8591.2 SR per ton of meat**,** Thus, the cost elasticity is estimated at 1.01, which means that a 1% increase in production leads to a 1.01% increase in costs. Indicating that the production of broiler chickens with this capacity is produced at better economic rates than the production of previous production scales

8. Productive and marketing problems facing meat chicken projects

The problems faced by the chicken-meat projects were expressed in the following three reasons: the high price of the chick, the low quality of the chick, the source of which is not available (the lack of supply of chicks) (23), the owner of each project arranged the problems according to his own opinions and the corresponding of the problems in the working life, and in order to be able to study these reasons separately, these problems were compiled from the questionnaire and classified according to the degree of seriousness of each**.** Table 7 shows that the problem of low quality of chick in the market came first in all the sample with a relative importance of about 70.0% of the total problems of chicks, while the problem of rising prices of chick age one day in the second place and explained the producers that the reason for this increase the lack of herds of farms and mothers of breeding and therefore the number of eggs hatched, and also the lack of supply of chicks because it is much less than demand, and the problem of lack of supply of chicks (represented by the lack of a stable source for the purchase of chicks with the failure of the manufacturers to

deliver the chicks on time), where about 4 views of the total sample with a relative importance of about 10% of the total problems related to chicks, While the problem of high percentage of necks accounted for about 5 % of the total problems of chicks.

Table 7. The most important production and marketing problems facing meat chicken projects in the sample of field study in the eastern region of the production season 2018/2019

The statement	Productive and marketing problems	Repetition	%
chick	The price of chick age one day	6	15
	Low quality chick found in the market	28	70
	High mortality rate	2	5
	Lack of sources of sale of chicks	4	10
	Total	40	100
Feeding	High price of tons of feed	10	50
	Low quality of feed available in the market	7	35
	Lack of sources of feed production	3	15
	Total	20	100
Medicines and veterinary supervision	High prices of medicines and vaccines	6	60
	Low quality of medicines and vaccines	2	20
	Lack of veterinary supervision	2	20
	Total	10	100
Employment	High wages of workers	4	13.3
	Lack of trained labor	26	86.3
	Total	30	100
Cost of production	High cost of fuel and electricity	26	86.7
	High cost of litter and not available	4	13.3
	Total	30	100
Marketing problems	Low selling price	28	18.1
	Exploitation of large shops	28	18.1
	Difficulty marketing in large quantities	28	18.1
	High cost of slaughter and processing	26	16.8
	High storage and cooling cost	14	9
	High cost of transportation and distribution	16	10.3
	High cost packaging	15	9.6
	Total	155	100

Source: Calculated by the researcher based on a questionnaire and using the statistical Program

Table 7 shows that the problem of high feed prices came in first place with a relative importance estimated at 50% of the total problems of feed at the sample of the study, Then came the problem of low quality of fodder found in the market and the lack of supply and delayed arrival respectively at rates estimated at 35%, 15% respectively of the total problems related to feed, the results of the questionnaire showed that the high prices of medicines and vaccines, the lack of veterinary supervision, and the low quality of medicines respectively were estimated at 60%, 20% and 20%, respectively, of the total problems related to veterinary drugs, With medicines, vaccines and veterinary consultations, the results also showed that the projects suffer from the lack of trained labor. The relative importance of this problem is 86.7% of the total employment problems, as for the problem of rising wages of workers, it does not cause an obstacle to poultry producers, where the relative importance of about 13.3% of the problems of Employment, the results showed that the projects suffer from the high cost of fuel and electricity. The relative importance of this problem is 86.7% of the problems related to the cost of production. The high cost of litter and its unavailability does not cause an obstacle to the poultry producers. Whole sale problems with the cost of production. as for the marketing problems and the most important problems obtained, the results of the questionnaire showed that they are low selling prices, exploitation of large shops, difficulty in marketing in large quantities, high cost of slaughter and processing, high storage and cooling costs, high cost of transport and distribution, (18.1%, 18.1%, 18.1%, 16.8%, 9.0%, 10.3%, 9.6%) respectively of total marketing problems, the results of the questionnaire indicate that 95% of the sample size prefer sawdust as a source of straw for the following reasons: (Do not cause foul odor, do not cause rotting under the bird, do not stick to the ground such as hay, warm the chicken, , As

well as easy access). As for the methods of disposal of the deceased, the results of the study showed that farmers get rid of the deceased through the municipality either by burning in the incinerators of the project or through the burial of health. (22).

The research reached a number of conclusions from the study, the following recommendations can be proposed:

1- Encourage and support the expansion of the production of chicken meat to meet the deficit in local production and raise the self-sufficiency rate by encouraging the establishment of projects with large capacity and providing means to enable the integration of existing projects of the results of the study. (20)

2. The importance of carrying out future studies to determine the reasons for the low operational efficiency of existing projects due to the impact on high production costs and low profit margin of projects and decrease their competitiveness and try to help these projects to raise this efficiency. (22)

3. Supply of broiler chickens with easy-to-use loans so that the volume of production can be expanded, thus improving the efficiency of performance and reaching optimum and economic production level. (20)

4. Motivate farm owners to increase their production capacity to optimal capacity in order to maximize resource efficiency

5. Increase awareness among producers of extension and research to increase technical efficiency

6. The work of federations of producers enables them to purchase the production inputs as well as selling their products at the appropriate prices so as to reduce production and marketing costs and thus increase the profits of producers. (21)

Thanks and praise

The researchers would like to thank the Deanship of Scientific Research at King Faisal University for their material and moral support in funding this research project (180134)

REFERENCES

1. Al-Issawi, K. J. 2011. Feasibility Studies and Evaluation of Projects .Al-Manahej Press, amman, Jordan. pp. 127

2. A. Zellner, J. Kmenta and J. Dreze, 1966. Specification and estimation of cobb-douglas production function models, econometrica, 34(4).

3. .C.Savvides, Savvakis.1991.Risk Analysis in Investment Appraisal, C Beech Tree publishing. No1.pp:9

4. Dawood, N. N. 2011. Economic Feasibility Study. Dar Albedaia. .Jordan. pp: 111-112

5. Douglas, B., and D. Michael. 2008. Microeconomics. Mc – Graw. pp: 833

6. Debertin, L. David. .1986. Agricultural Production Economics, MacMillan Canada, lnc: pp162

7. David L.Debertin.1986. Agricultural Production Economics, Macmillan Publishing Company, Division of Macmillan, Inc

8. Fresh, D. 2007. Measuring Farm Net Income to Better Achieve Policy Objectives. Agricultural Economics. Staff paper, Ottawa. Canada. pp: 2

9. Gujarati, D. and D. Porter, 2004. "Basic Econometrics", 5th ed, McGraw- Hill, New York

10. Habbani, A. 2006. Program of Preparation and Evaluation of the Economic and Technical Feasibility of Projects. Doha. pp: 22

11. Hakeem, B. H. 2006. The Feasibility Study and Evaluation the Criteria of Investment Projects. M.Sc. Thesis. College of Economics and Management. Algeria University .pp:196

12. Hsu, S., Yu, M. and Chang, C., An Analysis of Total Factor Productivity Growth in China's Agricultural Sector. American Agricultural Economics Association, Annual Meeting, Montreal, Canada, July 2003

13. Jon P.Doll, Frank Orazem, 1978, Production Economics Theory With Applications, Grid Inc., Columbus, Ohio, 1978

14. Jon P.Doll, Frank Orazem, 1978. Production Economics Theory With Applications, Grid Inc., Columbus, Ohio,

15. Kay, D.M William, and A. Partricia. 2006. Farm Management. 6 th ed. McGrw – Hill. Co. Inc.pp:57

16. Keske, C. 2009. Economic Feasibility Study of Colorado Anaerobic Digester Projects. Colorado State University.pp:79

17. Mousa, N. S. and O. A. Salam. 2011. Feasibility Study of Economy and Evaluate Investment Projects. Massira Press, Amman, Jordan. pp: 145

18. Mahmood .M. A., O. K. Jebara. and S. F. Khater. 2019. Financial evaluation of broiler production projects in diyala governorate in the year 2017 .The Iraqi Journal of Agricultural Sciences.50 (1):446-455

19. Ministry of Environment Water and Agriculture, Statistical Yearbook. 2017.

20. Noureddeene, T.2010. Feasibility studies between theoretical requirements and scientific problems. Journal of the Researcher. 7. 206-208

21. Wilsono, Shaaghnessy, 1992.Ia Faisabilite, de Project. Ed. SMG, France. pp: 173

22. Serrao, A., Agricultural Productivity Analysis of European Union and Eastern Region, American Agricultural Economics Association, Annual Meeting, Montreal, Canada, July2003

23. V.O. Oladokun and A. Johnson, Feed formulation problem in Nigerian poultry farms: a mathematical programming approach, American Journa of Scientific and Industrial Research, Vol(3), No(1) 2012.