

## Measuring the Efficiency of Resources Used in Broiler Projects in Iraq (Baghdad and AL-Qadisiyah Governorates): an Applied Model for the Year 2020

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### Abstract

This research aimed to measure technical efficiency in light of constant and variable of return to scale, the scale efficiency, resources level that achieving economic efficiency, surplus and deficit for broiler projects using the data envelope analysis (DEA) program as well as measuring the super efficiency using the Super Efficiency Measurement (EMS). The research relied on the primary data obtained from the questionnaire, which included 36 projects in Baghdad and 30 projects in Al-Qadisiyah governorate, representing 15.5% and 16.75% of the total projects in the two governorates, respectively. The research was divided into two stages; the first one included measuring technical and scale efficiencies, while in the second stage, the projects that achieved full-scale efficiency were separated from the inefficient sample projects using DEA to measure the efficiency of using productive resources. The results showed that broiler projects in Baghdad governorate achieved technical efficiency in according to constant and variable of return to scale and scale efficiency amounted to an average of (83.30%, 92.02%, and 95.40%), respectively, while in Al-Qadisiyah governorate it reached (96.74%, 83.15%, 92.45%). ) respectively. The research concluded that there is a surplus in the use of resources, which indicates that breeders are far from achieving economic efficiency. Accordingly, the research recommends the need for optimal use of the quantities of inputs based on the prices of these inputs, as well as following a production policy aimed at increasing economic efficiency.

**Keywords:** data envelope analysis, super efficiency, Surplus, deficit, technical efficiency.



## Introduction

Poultry farming is an industry that has an important impact on the national economy and plays an important role in providing animal protein from meat and eggs with high nutritional value at acceptable prices. What increases the importance of poultry meat is that it contains a high percentage of protein with a low percentage of fat, in addition to being easy to digest, as the percentage of fat is estimated at (5%) (3). Poultry projects are also characterized by the speed of the production cycle and the cheapness of poultry products compared to livestock products, and then the speed of the capital cycle. The development of this sector and increasing its production provides the possibility to meet the local demand for its products. This will reduce importing this product from abroad which participates in saving foreign currencies to be made available for use in other areas that help achieve economic development. Poultry projects in Iraq have great importance in improving the food situation in the country and creating job opportunities. The importance of the research lies in measuring the technical and super-efficiency of broiler projects. Poultry production is one of the important branches of the economics of animal production, which is an important tributary to achieving the economic growth that all countries of the world seek. Baghdad Governorate ranked first in poultry production, followed by Al-Qadisiyah Governorate, as they constituted

(15.5, and 16.75) respectively of the meat production projects in Iraq (10).

However, this increase in the number of projects and production was not sufficient to meet the increasing local demand for chicken meat, which stems from the increase in the population, the improvement of the living situation, and the decrease in the price of the product compared to other meats. The average annual Iraqi per capita share of poultry meat was (8.5) kg/person. / Year 2020, Arab Organization for Agricultural Development, (2020), which is an indication of insufficient domestic production with subsequent importing. The study aimed to use some descriptive and quantitative economic analysis methods in analyzing the data, specifically the following methods: Analysis of variance (F-test) to identify the extent to which there is a significant effect of the differences between the variables related to the production of chicken meat in Baghdad and Al-Qadisiyah governorates, (DEA), and (EMS). The research is based on a hypothesis that most of the sample producers do not use the resources optimally (according to scientific foundations) leading to a waste of economic resources used in production projects, which negatively affects the economic efficiency of the sample breeders. have been interested in studying efficiency (1, 3, 4, 5, 6, 8, 11,13, 16, 17, 20, 22, 23, 25 and 26 ).



## Materials and Methods

### Data collection:

The study relied on the primary data obtained from the questionnaire involving 34 projects in Baghdad and 30 projects in Al-Qadisiyah representing 15.5% and 16.745% respectively of the total projects in the governorates for the season 2020.

### Data analysis method:

The statistical program Package for Social Sciences (SPSS) was used for descriptive analysis and comparison. Data envelope analysis (DEA) was used to measure economic efficiency. It is one of the most common methods used in the analysis of farm efficiency, as it is a nonparametric method that uses linear programming techniques to measure the relative efficiency of the observations based on the availability of relative homogeneity between these observations. This implies that the observations to be compared use the same inputs and produce the same output (14).

The emergence of the method of DEA goes back to the study of Farrell, (1957), in which he tried to measure the productive efficiency of a model from one input and one output. The methods were then expanded by Charnes, Cooper, and Rhodes, 1978 to be used in various observations and various activities Charnes et al., (1978). Many models have appeared to find indicators of efficiency using this method, most notably: (1) The Constant Returns to a Scale model (CCR), which assumes constant returns to scale, (2) The BCC model which is based on the Variable Returns to

Scale (VRS) hypothesis (13). Through both models, the efficiency index can be found, either from the input side (called Input Orienting Models) or from the output side (called Output Orienting Models). Emphasis was on the input aspect because it corresponds to the objectives, nature, and activity of the farms that represent the decision-making units. Therefore, this model was used in most previous studies on agriculture efficiency (9, 12, 18, 19, 21, 24 and 27). The highly efficient method (MES) was also used, which is a developed model that aims to perform an additional classification to arrange the projects that have achieved the highest degree of efficiency equal to or greater than 1. It reclassifies the projects with degrees of efficiency higher than the correct ones (7).

## Results and Discussion

Research the effect of the variance in the quantities of resources used for broiler projects of the study sample for the year 2020:

Table (1) shows the effect of the variation in the quantities of resources used for broiler projects for the year 2020 for each of the Baghdad and Al-Qadisiyah governorates. There was a homogeneity in the quantities of used resources in Baghdad compared with Al-Qadisiyah. The variation coefficient for chicken number, feeding, medicines, a quantity of vaccine, and the number of workers was (36.22%, 38.99%, 57.47%, 62.91%, and 44.24%), respectively, in Baghdad governorate, compared with (67.95%, 70.07%, 73.81%, 75.67%, and 55.96%) in Al-Qadisiyah governorate.



To find out the significance of the differences between the quantities of resources used by the broiler producers in each of Baghdad and Al-Qadisiyah governorates, the analysis of variance was used. It was found that there was a

significant difference according to the calculated (F) value, which amounts to about (5.424), which is greater than its tabulated value at the probability (1%) between the two governorates in the used quantities of medicines (Table 3). To

**Table 1. Statistical indicators of the quantities of resources used for poultry production projects for the study sample for the year 2020.**

	Statistical indicators	Number of chicks per meal	Feed quantity (tons)	Quantity of medicines (liters)	Quantity of vaccines (vials)	Number of workers
Baghdad	N	34	34	34	34	34
	$\bar{X}$	16553.4	44.22	49.24	38.55	4.25
	S	5996.3	17.24	28.30	24.25	1.88
	C.V%	36.22	38.99	57.47	62.91	44.24
AL-Qadisiyah	N	30	30	30	30	30
	$\bar{X}$	14526.36	50.12	80.25	58.52	4.11
	S	9870.55	35.12	59.23	44.28	2.30
	C.V%	67.95	70.07	73.81	75.67	55.96

Source: calculated by researchers using SPSS.25 software

**Table 2. The impact of the variance in the quantities of resources used for broiler projects for the study sample for the year (2020).**

Source of variance	The sum of squares of deviation	Degrees of freedom	Mean squared deviation	Significant (F)	value (Sig)	
Number of chicks per meal/bird	between categories	2452E8	2	1.226E8	0.884	0.373
	within categories	8453E8	61	1.386E8		
	Total	10905 E8	63			
Feed quantity used (tons)	between categories	1825.37	2	912.685	0.675	0.420
	within categories	82417.42	61	1351.105		
	Total	84242.79	63			
Amount of	between categories	32072.89	2	16036.445	5.424	0.010

medications used \ Liter	within categories	180344.20	61	2956.462		
	Total	212417.1	63			
Vaccine quantity/vial	between categories	2244.30	2	1122.15	0.559	0.427
	within categories	122447.65	61	2007.34		
	Total	124691.95	63			
Number of workers	between categories	7.046	2	3.523	0.754	0.452
	within categories	285.192	61	4.675		
	Total	292.238	63			

Source: calculated by researchers using SPSS software

Table (3) shows the difference within one group for all the resources used in each of the Baghdad and Al-Qadisiyah governorates. It is obvious from the table that there was a significant difference in the quantity of medicines. Accordingly, it

can be said that the Baghdad governorate uses higher quantities of drug resources compared to the Al-Qadisiyah governorate.

**Table 3. Comparison of resources between the governorates included in the study sample for poultry production projects for the year (2020)**

production resource	Baghdad	Qadisiyah	P-value
Number of chicks per meal/bird	16553.40±5996.30	14526.36±9870.55	0.373
Amount of feed used (tons)	44.22±17.24 <sup>a</sup>	50.12 ± 35.12	0.420
Quantity of medications used/liter	49.24 ± 28.30	80.25 ± 59.23	0.010
Vaccine quantity/vial	38.55 ± 24.25	58.52 ± 44.28	0.427
Number of workers	4.25 ± 1.88	4.11 ± 2.30	0.452

Source: calculated by researchers using SPSS software



determine the reason for the significant level difference, LSD was used, and it was found that there was a significant difference between the amount of feed in Baghdad and Al-Qadisiyah

By studying the effect of variation on the total production of broiler producers, for each of the Baghdad and Al-Qadisiyah governorates, there was a homogeneity of total production in Baghdad governorate compared with Al-Qadisiyah governorate as shown in Table (4).

The variation coefficient reached (49.13%) in Baghdad governorate compared with (54.54%) in Al-Qadisiyah Governorate. This is attributed to the increase in the volume of production in Baghdad, which requires the use of higher levels of technology and modern techniques in managing broiler production projects, which increases the rationalization of resource consumption.

**Table 4. Statistical indicators of the total production of broiler projects for the study sample for the year (2020)**

Statistical Indicators		Baghdad	Qadisiyah
Production	N	34	30
Quantity (tons)	$\bar{X}$	28.25	25.87
	S	13.88	14.11
	C.V%	49.13	54.54

Source: calculated by researchers using SPSS software

To find out the significance of the differences between the total production of broiler production projects in Baghdad and Al-Qadisiyah governorates, analysis of variance and the LSD test were used as shown in Table (5). The results showed that there were no significant differences between the averages of

total production between the two governorates, as the calculated (F) reached a value of (0.825), and it proved that the differences between the categories of the total production of the studied sample were not significant.

**Table 5. Study of the statistical differences of the effect of variation in the total production of poultry production projects for the study sample for the year (2020)**

Source of variance		The sum of squares of deviation	Degrees of freedom	Mean squared deviation	Significant (F)	value (Sig)
Production Quantity (tons)	between categories	169.38	2	84.69	0.825	0.342
	within categories	6259.586	61	102.62		

Total 62428.966 63

Source: Calculated by researchers using SPSS software

Table (6) shows the difference within one group for the total production in each of the Baghdad and Qadisiyah governorates. It is clear from the

table that there is no significant difference regarding the quantities of production.

**Table 6. Comparison of total production averages and standard deviation among the governorates included in the study sample.**

production resource	Baghdad	Qadisiyah	P-value
Production Quantity (tons)	28.25±13.88	25.87± 14.11	0.342

Source: Calculated by researchers using SPSS software

It is worth noting that the summary of the effect of variance analysis and the test of significant differences (LSD) for broiler producers in Baghdad and Qadisiyah for each of the quantities of resources and the total production of the sample projects, has indicated that there are no significant differences between the two governorates, which gives a preliminary indication of the absence of a difference in the economic efficiency of the use of resources between projects. Therefore, the research requires an assessment of the economic efficiency of the two governorates together and knowing the impact of projects on the efficiency of resource use.

Measuring the technical efficiency of the (CRS) and (VRS) considering the production function and scale efficiency for broiler projects.

The technical efficiency model and DEA data envelope analysis method

were used for measuring technical efficiency. Under the assumption of (VRS), the results of technical efficiency were obtained from the input side, given that the reality of the environmental conditions surrounding broiler projects makes the breeder control his inputs (number of chicks, quantity diet, the number of medicines and medical supplies, several vaccines, number of workers) more than his control over the outputs (production). In other words, it is possible to reduce the cost of inputs more securely than increasing production. As for measuring scale efficiency, its calculation requires measuring each of the technical efficiency (TE) in light of the (CRS) as well as in light of the (VRS). The results of measuring the capacity efficiency were analyzed as shown in Table (7).

The results indicated that the level of technical efficiency of broiler projects in Baghdad governorate for



the production season (2020) in light of the (CRS) an capacity ranged between a minimum of (64.4%) for the field (6) and a maximum of (100%) for several projects (7 projects), which constituted (20.59%) of the total study sample. As for the projects that operate with increasing scale returns, they are (22 projects) and constituted (64.76%) of

the total sample. The projects that operate with decreasing capacity returns were (4) projects, constituting (11.76%) of the total sample studied in Baghdad. The average percentage of technical efficiency, considering the (CRS), reached (83.30%). Therefore, these projects can increase their production by (16.7%).

**Table 7. Measuring scale efficiency and technical efficiency according to constant and variable scale returns using the DEA program for broiler projects in Baghdad governorate for the production season(2020)**

Efficiency Scale	Technical efficiency/ variable to VRST	Technical efficiency /Constant to scale CRST	Efficiency Scale	An increase or decrease in scale	The project	Technical efficiency/ variable to scale VRST	Technical efficiency /Constant to scale CRST	Efficiency Scale	An increase or decrease in capacitance
1	72.50	84.40	98.20	IRS	18	82.20	83.10	86.90	IRS
2	100.00	100.00	100.00	-	19	94.20	94.40	99.80	IRS
3	89.20	82.30	96.20	IRS	20	70.20	70.20	99.50	IRS
4	82.30	100.00	71.40	IRS	21	100.00	100.00	100.00	-
5	75.20	76.30	99.40	IRS	22	82.84	91.21	91.33	IRS
6	64.40	100.00	65.70	DRS	23	100.00	100.00	100.00	.
7	65.23	100.00	69.80	IRS	24	66.00	70.00	65.70	IRS
8	78.60	100.00	77.70	IRS	25	72.20	83.40	99.40	IRS
9	92.70	91.20	99.60	.	26	75.50	100.00	85.80	IRS
10	85.60	100.00	88.50	IRS	27	92.80	100.00	92.80	IRS
11	84.20	100.00	82.30	.	28	78.00	80.60	96.90	IRS
12	68.40	100.00	78.50	DRS	29	67.60	72.60	93.10	IRS
13	100.00	100.00	100.00	-	30	90.40	96.80	93.30	DRS
14	88.60	86.20	98.10	IRS	31	85.20	100.00	83.20	IRS
15	100.00	100.00	100.00	-	32	69.20	100.00	75.50	IRS
16	79.30	73.30	94.40	IRS	33	100.00	100.00	100.00	-
17	75.00	92.50	91.80	DRS	34	100.00	100.00	100.00	IRS
Mean	83.30	92.02	95.40						
Mix	100.00	100.00	100.00						
Min	64.40	70.00	65.70						

Source: Prepared by researchers based on the results of the DEA program

The estimates of (SE) and (TE) in light of the (CRS) and the (VRS) for broiler breeding projects in Al-Qadisiyah governorate (30 projects) in different regions of the governorate were obtained

from the same method (DEA) as proven in Table (2). The results showed that the levels of SE varied and ranged between (59.9%-100%), with an average of 82.2%. The projects that achieved a full

level of efficiency, which operate (CRS), are (5) projects, constituting (16.67%) of the total study sample. As for the projects that operate with increasing scale returns, they are (25) projects, which constituted (83.32%) of the total sample. The projects that operate with decreasing scale returns were (3) projects representing (10%) of the total sample. The levels of TE varied in light of the (CRS) ranging between (66.90% - 100%)

with an average of (88.57%). The number of projects achieving a full level of TE was (11) projects accounting for 36.67% of the total sample. The TE level considering the (VRS) ranged between (58.90% - 100%), and the number of projects achieving a full level of efficiency was (5) projects, constituting (16.67%) of the total sample, and it exceeded its counterpart in (CRS).

**Table 8. Measuring scale efficiency and technical efficiency in light of (CRS) and (VRS) using the DEA program for broiler projects in the Al-Qadisiyah governorate**

Efficiency Scale	Technical efficiency/ variable to scale VRST	Technical efficiency /Constant to scale CRST	Efficiency Scale	An increase or decrease in scale	The project	Technical efficiency/ variable to scale VRST	Technical efficiency /Constant to scale CRST	Efficiency Scale	An increase or decrease in capacitance
1	100.00	100.00	100.00	-	18	100.00	100.00	100.00	IRS
2	70.20	72.10	95.90	IRS	19	93.00	96.40	96.50	IRS
3	84.80	96.40	85.90	IRS	20	88.60	90.10	92.80	IRS
4	71.70	87.30	82.20	IRS	21	85.90	89.30	96.20	-
5	59.90	100.00	58.90	IRS	22	90.90	92.30	98.40	IRS
6	72.30	73.50	99.80	IRS	23	100.00	100.00	100.00	.
7	69.80	72.80	97.20	IRS	24	100.00	100.00	100.00	IRS
8	95.20	100.00	94.20	IRS	25	80.30	80.80	98.10	IRS
9	87.80	92.50	94.90	IRS	26	75.10	76.30	98.50	IRS
10	85.10	86.00	98.90	IRS	27	81.40	100.00	81.40	IRS
11	84.40	88.60	95.30	IRS	28	77.60	100.00	74.60	IRS
12	66.70	66.90	99.60	IRS	29	66.90	70.50	94.80	IRS
13	89.20	100.00	89.20	IRS	30	72.40	75.00	99.10	DRS
14	77.60	78.40	99.00	IRS	31	69.90	72.00	97.10	IRS
15	100.00	100.00	100.00	-	32	88.00	100.00	85.00	IRS
Mean	82.82	88.57	93.45						
Max	100.00	100.00	100.00						
Min	59.90	66.90	58.90						

Source: Prepared by researchers based on the results of the DEA program

Estimating the volume of resources that achieve the economic efficiency of broiler projects in Baghdad, AL-Qadisiyah governorates

Table (9) shows the total and average size of the resources that achieved economic efficiency in the research sample, which are represented by a chicken number, the amount of feed, medications, vaccines, and manpower used (DEA) according to the cost function. The surplus or deficit in the various resources was calculated through the actual resources in each field and its counterparts that achieved economic efficiency the percentage of surplus or deficit was calculated through the following equation (8):

the amount of surplus or deficit in the inputs = the quantity of the actual resource (used) - the quantity of the resource achieved efficiency (the lowest point of the average costs).

The percentage of surplus or deficit in the inputs was calculated from the following equation:

The percentage of surplus or deficit in the inputs = (the amount of increase or decrease in the inputs / the amount of actual use in the inputs) \* 100

If the sign of the difference between the actual and achieved inputs for economic efficiency is negative, it indicates a deficit in input. It represents the amount of input that should be provided for optimal use. If the sign is positive, it indicates surplus (waste). That is, it represents the amount of reduction in the use of the inputs to be reached optimal use.

A comparison between the chicken numbers that achieved the economic efficiency, and the actual number revealed a surplus in Baghdad, Qadisiyah, governors (563266.78,

435790.80) chickens, respectively, with an average of (16553.4, 14526.30) chickens. The average surplus rate was about (23.14%, and 2.46%) of chickens, respectively. We conclude that the reason for the surplus in the chicken number may be that breeders have the motivation to expand their project due to the high demand in the markets for local chicken meat and that the state has reduced the imported quantities of poultry in 2020 through the directives of the Iraqi Ministry of Agriculture. These directives prompted the breeders to increase their chickens thinking they will reduce the mortality and market the largest number of surviving chickens.

By comparing the quantities of actually used feed and their counterparts that achieved the economic efficiency of poultry production projects in the study sample for Baghdad, Qadisiyah governorates, there is a surplus in the quantities of this resource for the total sample amounting to about (1503.48, 1503.6) tons, respectively, with an average of (44.22, 2.93) tons. The average surplus rate was about (27.07%, 2.93%,) tons, respectively. The reason for this may be due to the increase in the use of the resource beyond the quantities recommended by the specialist to increase production rates. On the other hand, at the same time, there is no agricultural extension and guidance which in turn negatively affected the use of this resource. Regarding the number of medications and veterinary, the results also showed that none of the projects achieved economic efficiency, i.e. the actual quantities and the quantities achieved economic efficiency were not equal in Baghdad and AL-Qadisiyah governorates, with an average of (-1.59, -

1.36) liters respectively, and an average deficit rate of about (-4.05, -1.69%) liters, respectively. The vaccine supplies have also achieved a surplus in Baghdad, and AL-Qadisiyah governorates by (1310.7, and 1755.60) villas respectively, with an average of (38.55, and 58.52) villas respectively. The average surplus rate was about (-1.59m -1.36) villas, respectively. As for the number of workers, the projects in Baghdad, and AL-Qadisiyah governorates did not achieve economic efficiency in the use of this resource, as the actual quantities and the quantities achieved economic

efficiency were not equal, with a sum the surplus rate of about (132, 115) workers, respectively with an average of (3.88, 3.83) respectively workers. The average surplus in this governorate was (8.7%, and 6.81%), respectively. It is evident from the estimates of the size of the surplus and the shortage of the used resources, and after comparing them with their counterparts that achieved economic efficiency, they achieved a (surplus) waste in all the resources of the sample understudy for the production of poultry, except for the number of medications and veterinary.

**Table 9. The actual number of chicks that achieved economic efficiency and the amount of surplus or shortage for chicken meat production projects**

Resources	Governorate		numbers of chicks/hens	numbers achieved for economic efficiency/hens	the amount of surplus or shortage/hence	the rate of surplus or shortage of actual numbers, %
emptying numbers	Baghdad	Total	563266.78	432564.30	130702.48	23.20
		average	16553.4	12722.48	3830.92	23.14
	AL-Qadisiyah	Total	435790.8	425055.9	10734.9	2.46
		average	14526.36	14168.53	357.83	2.46
Feed quantity	Baghdad	Total	1503.48	20.1512	283.33	18.84
		average	44.22	32.25	11.97	27.07
	AL-Qadisiyah	Total	1503.6	1459.50	44.1	2.93
		average	50.12	48.65	1.47	2.93
Medicines and veterinary supplies	Baghdad	Total	1334.16	1393.20	-59.04	-4.43
		average	39.24	40.83	-1.59	-4.05
	AL-Qadisiyah	Total	2407.50	2448.20	-40.7	-1.69
		average	80.25	81.61	-1.36	-1.69
vaccines	Baghdad	Total	1310.7	1220.8	89.9	6.86
		average	38.55	35.91	2.64	6.85
	AL-Qadisiyah	Total	1755.60	1632.30	123.3	7.02
		average	58.52	54.41	4.11	7.02



Workers	Baghdad	Total	145	132	13	8.97
		average	4.25	3.88	1.0	8.71
	AL-Qadisiyah	Total	123	115	8	6.50
		average	4.11	3.83	0.28	6.81

Source: Prepared by researchers based on the results of the DEA program

### Results of the super efficiency of broiler projects in Baghdad governorate

The super-efficiency is related to the modified data envelope analysis model through which the decision-making units can obtain a degree of efficiency greater than the correct one. That is because this

model performs additional classification to the farms that are characterized by complete relative efficiency to distinguish between them and reach the maximum relative efficiency degrees for the unit, which is called the hyper-efficiency model.

**Table 10. Broiler projects in Baghdad governorate that achieved super efficiency**

DMU	SCORE	X1	X2	X3	X4	X5	Y
1	big	0.02	0.98	0.02	0.01	0	8.02
2	285.50%	0	0.02	0	0	0	4.02
3	225.32%	0	0	0	0.42	0	0.44
4	182.20%	0	0.52	0	0	0	2.30
5	154.30%	0	0	0.02	0	0	1.40
6	129.32%	0.04	0	0.54	0	0	2.20
7	112.22%	0.02	0	0.08	0	0	0.42

Source: Prepared by researchers based on the results of the (EMS) program

The (EMS) program was used to interpret the results obtained from the analysis of the data of (8) broiler projects that achieved full efficiency in Baghdad governorate. These projects were as follows:

- The first project achieved a high-efficiency level of more than (285.50%). The producers of this project can increase the number of chicks by (0.02) birds, feed

by (0.98) tons amount of medicine used in the treatment 0.02 and by 0.02 and increase the amount of vaccine by (0.01) vials in each vaccination process while reducing production by (8.02) tons. Under these changes, the product remains efficient.

- As for the second project, it has achieved a high-efficiency level of (285.50%), the breeder can increase the

use of medicines by (0.02) liters, and reduce its production by (4.02) tons, while this product remains efficient.

- The third project achieved an efficiency level of (225.32%). The breeder can increase the use of the vaccine by (0.42) vials in each vaccination process, and reduce its production by (0.44) tons, while the product remains efficient.

- The fourth project achieved an efficiency of (182.20%). the breeder can increase the use of feed by (0.52) tons, and reduce the production by (2.30) tons, while the product remains efficient.

- The fifth project had a superior level of efficiency (154.30%). The breeder can increase the use of medicines by (0.02) liters and reduce the production by (1.40) tons, while the product remains efficient.

- As for the sixth project, it achieved super efficiency of (129.32%). The breeder can increase the number of chicks by (0.04) birds and reduce the production by (2.20) tons, while the project remains efficient.

- As for the seventh project, it achieved a super efficiency of (112.22%). The breeder can increase the number of chicks by (0.02) birds, increase the use of medicines by (0.08) liters, and reduce the production by (0.42) tons, while the project remains efficient.

The results of the super efficiency of broiler projects in Al-Qadisiyah

Governorate

The results of the super efficiency of broiler projects in the Al-Qadisiyah governorate were obtained from the analysis of the data of (5) projects. These projects were separated from the other inefficient projects based on Table (8). They were project number 22. , 21, 16, 15, and 1). The highest efficiency value was 275.22% which was indicated by the word (Big) and it was in the project (16) from the research sample. On the other hand, the lowest value amounted to (100.30%) in project (1) within the study sample.

**Table 11. Broiler projects in Al-Qadisiyah governorate that achieved super efficiency**

DMU	SCORE	X1	X2	X3	X4	X5	Y
1	big	0.02	0.98	0.02	0.01	0	8.02
2	285.50%	0	0.02	0	0	0	4.02
3	225.32%	0	0	0	0.42	0	0.44
4	182.20%	0	0.52	0	0	0	2.30
5	154.30%	0	0	0.02	0	0	1.40
6	129.32%	0.04	0	0.54	0	0	2.20
7	112.22%	0.02	0	0.08	0	0	0.42

Source: Prepared by researchers based on the results of the (EMS) program

Using the (EMS) program, the results were as follows:

- The first project achieved a high-efficiency level of more than (275.30%). The Producers of this project can increase the number of chicks by (0.01) birds, feed by (0.86) liters, and the amount of medicine used in the treatment of different diseases by (0.01) liters vaccine by (0.01) vial in each vaccination process and reduce production by (5.02) tons. Under these circumstances, the product remains efficient.

As for the second project, it achieved a high-efficiency level of (275.22%), and the breeder can increase the use of medicines by (0.02) liters, and reduce production by (2.20) tons, while the product remains efficient.

- The third project achieved an efficiency level of (185.35%), and the breeder can increase feed by (0.04) tons, and reduce its production by (2.44) tons, while the product remains efficient.

## Conclusion

Based on the results of the analysis of the effect of variance and the test of significant differences (LSD) for broiler projects in Baghdad and AL-Qadisiyah for both the quantities of resources and the total production of the sample projects, there are no significant differences between the two governorates, which gives a preliminary indication of the absence of a difference in technical efficiency in resources use. Accordingly, the study requires estimating them together and knowing the impact of projects on the efficient use of resources. The

- The fourth project achieved a high level of efficiency (122.20%). The breeder can increase the medicines by (0.02) liters, and reduce the production by (1.20) tons, while the product remains efficient.

The fifth had a high level of efficiency (100.30%). The breeder can increase the use of the feed by (0.01) tons, increase the amount of vaccine by (0.02) vials in each vaccination process, and reduce the production by (0.04) tons, while the product remains efficient.

We note from the results obtained from the analysis of the super efficiency of broiler projects in Baghdad and Al-Qadisiyah governorates that the reference projects that achieved full efficiency through (DEA) is not equal in efficiency in the two governorates. There are large differences between them, whether in resources or production. It can be deduced that the reference projects for Al-Qadisiyah governorate are more risk-bearing than Baghdad governorate.

study also found that there is a surplus in the use of all resources (inputs) except the number of drugs, which indicates that breeders are far from achieving economic efficiency. The number of reference projects that achieved full efficiency in Baghdad exceeded their counterparts in Al-Qadisiyah, implying that there are significant differences between them, whether in terms of resources or production. Accordingly, the study recommended the optimal use of input quantities based on the prices of these inputs, intensifying government support efforts on the private sector and owners of large

projects, developing an investment mechanism for the poultry industry in line with the advanced global production of chicken meat, importing production lines, using advanced technology to reduce production costs and increase long-term profitability, and following a production policy aimed at increasing economic efficiency.

### Conflict of interest

The authors declare no conflict of interest.

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