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# ESTIMATING THE ECONOMIC AND TECHNICAL EFFICIENCY OF IRAQ'S MEATY CHICKEN FARMS USING DATA ENVELOPE ANALYSIS FOR THE 2021 SEASON

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## ABSTRACT
Chicken production is affected by many factors, including the level of use of economic resources and their level of productive efficiency and the scarcity of these resources as a result of multiple uses. As a result of the low level of efficiency in its use, it is necessary to study this important activity and identify the economic efficiency (EE) and its components as the most important measure of economic performance efficiency, and thus to identify the amount of economic efficiency achieved by meat chicken breeders. The research aimed to assess the technical and economic efficiency of meat frog farms in Salah Alden province for the 2021 season using data envelope analysis. This study relied in its research data on preliminary sources obtained through a field survey by distributing a form representing 85.5% of poultry farmer's meat in Salah Alden according to specific questions about economic efficiency data as well as interviews of animal production professors, poultry sector specialists and some researchers and scholars together. As for the amount of resources achieved for economic efficiency, it was found that, in the shadow of the change in capacity return, most sample farms had a surplus using these resources.

## KEY WORDS
Technical efficiency, economic efficiency, data envelope.

The agricultural sector is considered to be one of the most important productive sectors in Iraq, and the high nutritional importance of poultry because of its great nutritional value is that it is a rich source of animal protein, salts, calcium and other highly important nutrients, poultry farming is an important industry in the national economy because of its high nutritional value, and poultry prices are acceptable when compared to meat prices and other animal derivatives. Attention to this sector and work to increase its production provides the possibility to meet the domestic demand for its products, and the need not to import them from abroad, the production of meat chicken is usually influenced by the level of employing economic resources and their level of productive efficiency and because of the scarcity of these resources before multiple uses and because we believe the low level of efficiency in use on it has become necessary to study this important activity and identify the economic efficiency (EE) and its components as the most important measure of economic performance efficiency, and then to know how much chicken breeders achieve meat of economic efficiency.

Poultry production farms in Iraq, like other livestock breeders, suffer from a lack of optimal use of economic resources and are in attempts to achieve economic efficiency and their components both (technical and specialized efficiency), and there may be deviation from the optimal level resulting from waste and a rise in some undesirable environmental elements, and the high price rise in inputs used in the production process causes an imbalance in the production process where the high prices of production costs significantly

compared to the importer leads to Many poultry farmers are reluctant to work and many consumers are reluctant to buy the local product.

Importance of research comes from the importance of producing chicken meat economic, which is considered one of the basic food in Iraq, where it is considered one of the main products in achieving food security, and the fact that the study specializes in the process of assessing the economic efficiency of the farms of the production of meat chicken in Salah Alden, and we are waiting to adopt development plans to increase production of meat chicken, the use of various technology is one of the most important ways to help agricultural expansion, which leads to higher productivity some inputs are important factors to help The farmer in carrying out agricultural operations properly in a timely manner, for your mind had to study the economic implications of using these inputs on the economics of meat chicken production.

*The research hypothesis.* The vocabulary of economic efficiency (technical and specialized efficiency) has a gap represented by its incompatibility, resulting in a waste of economic resources and higher production costs at the field level.

The research aims mainly to measure economic and technical efficiency through the use of deep data envelope method for meaty chicken farms in Salah Alden province for the year 2021 through:

- Estimate the economic efficiency of the farms producing meat chickens in Salah Alden province;
- Determine the following factors of production on the amount produced from meat chicks.

This study relied in its research data on the initial sources obtained through a field survey by distributing a form representing 85.5% of poultry farmer's meat in Salah Alden according to specific questions about data on economic efficiency as well as personal interviews of animal production professors, poultry specialists and some researchers and scholars together.

A study (Zaman, Ali, & Ullah, 2018) estimated the technical efficiency of broiler chicken farms in Pakistan. Raw data from 134 respondents were obtained using a multistage sampling method through a well-structured interview schedule. To estimate a stochastic boundary tans-log production function. The results indicated that there were significant structural breaks across the sampled farms. Based on these results, three different models for small, medium and large farms were estimated, respectively. The mean technical efficiencies calculated for small, medium and large farms, respectively, were 0.76, 0.96 and 0.92. This means that the medium-sized farms in the study area were the most efficient in the use of resources compared to the small and large-sized farms while the small farms were the most efficient in resource allocation. Orinoco and Tolorunju (2019) study technical competence in Nigeria tested using a random production function model. The primary data was collected using a structured questionnaire form from (120) poultry farms selected using multi-stage sampling techniques, from the Poultry Association of Nigeria. The level of technical competencies varied widely across farms, ranging from 64 percent to 97 percent, with an average of 85.6 percent. Only years of experience negatively affected TE, while an increase in other socioeconomic variables, such as education, age, and farm location led to an increase in TE value. A wave of the previous studies (e.g., Abushammala et al., 2015; Alabdullah et al., 2018; Alabdullah et al., 2018; Alabdullah et al., 2019; Alabdullah et al., 2020; Alabdullah et al., 2020; Alabdullah et al., 2020; Alabdullah et al., 2021; Alabdullah et al., 2021; Alabdullah et al., 2018; Alfadhl & Alabdullah, 2016; Ahmed et al., 2014; Ahmed et al., 2016; Ahmed et al., 2017; Ahmed et al., 2019; Ahmed et al., 2020; Ahmed et al., 2021; Ahmed et al., 2021; Kanaan-Jebna et al., 2022; Hatzizisis & Dotas, 2020; Omar et al., 2021.also argued in this regard. For example, Hatzizisis & Dotas, (2020) presented a study entitled Measuring Technical Efficiency in the Production of Broiler Chickens in Greece. The aim of this study was to determine the TE efficiency and SE efficiency scale of broiler farms of DMUs in Epirus region, Greece. Data were collected through questionnaires and personal interviews for 110 farms. The TE and SE of the DMUs were determined using output-oriented data. DEA envelope analysis approach The results showed that broiler meat applied

in the Epirus system is intensive and large-scale, characterized by high capital investment, high quantities of feed used and high efficiency. The output is significantly affected by the amount of feed used and the average working capital. TE under CRS fixed return scale and VRS variable return scale models run up to 0.79 and 0.85 respectively. According to a study conducted by (Parlakay & Çimrin, 2021) determining the technical efficiency of broiler production as a case study in Turkey. The study aimed to measure the degrees of technical efficiency of broiler production farms located in southern Turkey using the DEA method, which is often preferred in measuring data efficiency. The measurements were made with the input-oriented approach under the assumptions of (DEA-CRS) and (DEA-VRS). A Tobit regression model was used to determine the causes of inefficiency after DEA scores were calculated. In the analysis, the technical proficiency score was calculated using DEA-CRS as 0.95; And with DEA-VRS like 0.97. It was determined that the examined broiler farms could produce at the same production level by reducing the inputs used in the current production technology by 5% according to the DEA-CRS approach and 3% according to the DEA-VRS approach. Efficient in manpower in terms of number (Hassan, 2021) prepared a study entitled Data Envelope Analysis (DEA) approach to estimate the technical and economic efficiency and standards of broiler farms. The technical, economic and volumetric efficiency of broiler farms in Egypt were surveyed and evaluated using DEA technology. To achieve the specified objective, stratified random sampling technique was used to collect information from 150 broiler farms. The results showed that the average technical efficiency of the broiler farms was 0.915 and 0.985 under constant returns to scale (CRS) and variable returns to scale (VRS), respectively, which means that the farmer on average can reduce the use of inputs by 8.5% and 1.5% for production. And (El-bardisy 2021) studied a study entitled Technical and Economic Analysis and Evaluation of some poultry production farms in Egypt, where it was found that there is an increase in the production of specialized farms at a rate of 1.25 annually, and by 57.5 million tons annually during the period (2006-2018). Loss rates increase in farms aged between 7-10 years, and there is a rise in investment costs, especially in farms with large farm capacities. Iron is one of the most important items of investment costs in the first farm capacity (6000-12000) birds by 29%. It is followed by the ceiling with a percentage of no less than 20%, and the feed item is considered one of the most important items in variable operational costs, with a percentage of no less than 63% of the total operating costs. The first farm capacity is the highest in terms of the value of net farm income.

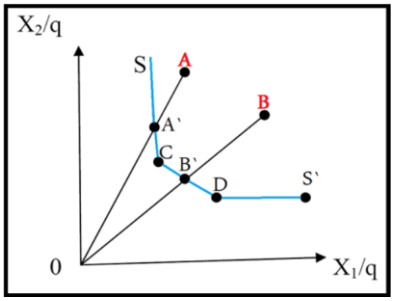


Figure 1 – Source: Coelle T.J A guide to Frontier version, 1996:13

It is a non-parametric method based on linear programming used to measure the efficiency scores of economic institutions (Al-Jubouri, Al-Hadith: 2021). The DEA data envelope method is based on Pareto optimality, which states that any decision-making unit is inefficient if another unit or combination can One of the units is to produce the same amount of output with less quantity or input, and the production unit will have Pareto efficiency if the opposite is achieved (Helal, 1998,59), as a model for solving the issue of maximizing output or minimizing inputs, and this method depends on linear programming to create an envelope or field It contains the data so that it is possible to estimate the efficiency of the various establishments (farms) according to the combination of the resource used in this envelope (Al-Hijami and Al-Ukaili, 2015).

## RESULTS AND DISCUSSION

*Technical, allocative and cost efficiency used in the research sample.* In this section, we have three efficiency criteria, which are technical and allocative efficiency, as well as cost efficiency in light of the price of resources or their production cost, and through Table (2), which shows us the results of these standards, which shows that the technical efficiency averaged (0.949), which is identical to the result that was obtained It is based on the variable return on capacity to calculate the capacity efficiency, which indicates an increase in the cost of the fields by 6%, and it was used again in calculating the cost efficiency. As for the allocative efficiency AE, it ranged between a minimum (0.766) and the correct one as a maximum, as it averaged (0.876) at the sample level.

Table 1 – Descriptive Statistics

| n/n | N | Range | Minimum | Maximum | Mean | Std. Deviation | Variance | Kurtosis | |
|---|---|---|---|---|---|---|---|---|---|
| | Statistic | Statistic | Statistic | Statistic | Statistic | Statistic | Statistic | Statistic | Std. Error |
| Y(production) | 77 | 197.25 | 6.75 | 204.00 | 36.4466 | 28.85863 | 832.821 | 14.523 | .541 |
| (Experience) | 77 | 28 | 2 | 30 | 7.62 | 4.810 | 23.133 | 6.600 | .541 |
| (Educational level) | 77 | 4 | 1 | 5 | 2.88 | 1.192 | 1.420 | -.651 | .541 |
| (the age) | 77 | 38 | 24 | 62 | 40.08 | 8.956 | 80.204 | -.067 | .541 |
| field area | 77 | 4180 | 320 | 4500 | 1180.87 | 582.982 | 339868.562 | 12.916 | .541 |
| Carrying capacity | 77 | 83000 | 3000 | 86000 | 15468.83 | 12151.611 | 147661647.300 | 14.741 | .541 |
| family employment | 77 | 6 | 0 | 6 | 1.83 | 1.185 | 1.405 | 2.240 | .541 |
| The date the field was created | 77 | 1 | 1 | 2 | 1.27 | .448 | .201 | -.941 | .541 |
| veterinary doctor | 77 | 1 | 1 | 2 | 1.36 | .484 | .234 | -1.711 | .541 |
| Agricultural engineer | 77 | 1 | 1 | 2 | 1.94 | .248 | .062 | 11.265 | .541 |
| education system | 77 | 1 | 1 | 2 | 1.29 | .455 | .207 | -1.093 | .541 |
| field owner job | 77 | 1 | 1 | 2 | 1.22 | .417 | .174 | -.118 | .541 |
| Valid N (list wise) | 77 | | | | | | | | |

*Source: Based on the questionnaire and the outputs of the statistical analysis program SPSS V26.*

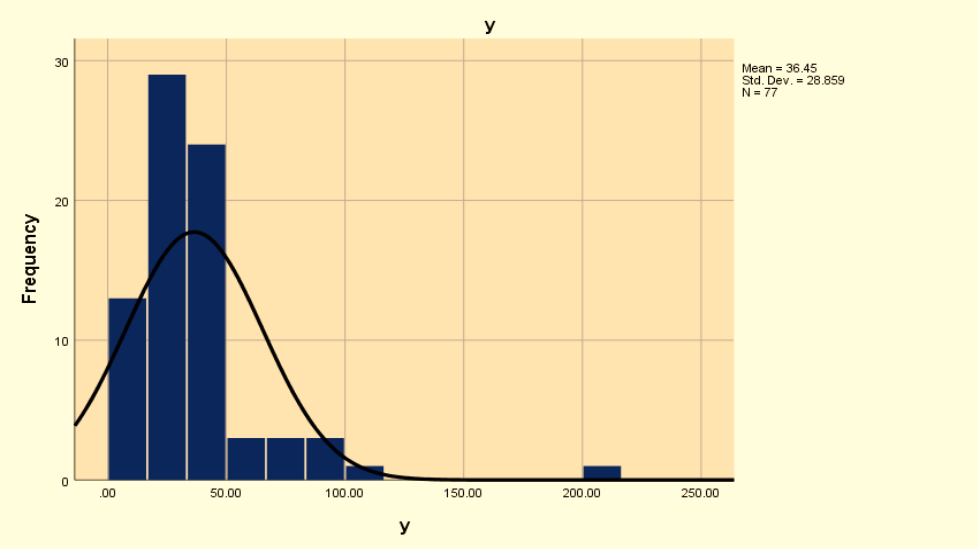


Figure 2 – Frequencies of the dependent variable for efficiency

This result is good and is encouraging for breeders to increase their production and use its advanced technology and try to use resources in the best way, and they can reduce their production costs by 13 % while maintaining the same current production, and this brings us to the point of contact between the equal output curve and the budget line, i.e. reaching the optimum production point. The total fields that have achieved an optimal distribution efficiency of 100% are (3) fields, i.e., with a percentage of (3.9%) of the total sample fields. That is, these fields do not have any surplus inputs because of their optimal consumption of all inputs, that is, sufficiently to reach the optimal production.

Table 2 – Levels of Economic Efficiency and its Components

| CE | AE | TE | Firm |
|---|---|---|---|
| 0.841 | 0.841 | 1.000 | 1 |
| 0.749 | 0.749 | 1.000 | 2 |
| 0.932 | 0.932 | 1.000 | 3 |
| 0.700 | 0.912 | 0.768 | 4 |
| 0.647 | 0.772 | 0.838 | 5 |
| 0.712 | 0.712 | 1.000 | 6 |
| 0.612 | 0.612 | 1.000 | 7 |
| 0.717 | 0.834 | 0.860 | 8 |
| 0.879 | 0.879 | 1.000 | 9 |
| 0.742 | 0.851 | 0.872 | 10 |
| 0.830 | 0.942 | 0.881 | 11 |
| 0.774 | 0.934 | 0.829 | 12 |
| 0.759 | 0.878 | 0.864 | 13 |
| 0.872 | 0.872 | 1.000 | 14 |
| 0.817 | 0.879 | 0.930 | 15 |
| 1.000 | 1.000 | 1.000 | 16 |
| 0.871 | 0.871 | 1.000 | 17 |
| 0.983 | 0.983 | 1.000 | 18 |
| 0.835 | 0.970 | 0.861 | 19 |
| 0.795 | 0.795 | 1.000 | 20 |
| 0.869 | 0.997 | 0.872 | 21 |
| 0.857 | 0.857 | 1.000 | 22 |
| 0.712 | 0.712 | 1.000 | 23 |
| 0.885 | 0.930 | 0.952 | 24 |
| 0.850 | 0.946 | 0.898 | 25 |
| 0.845 | 0.909 | 0.930 | 26 |
| 0.884 | 0.884 | 1.000 | 27 |
| 0.877 | 0.929 | 0.944 | 28 |
| 0.871 | 0.871 | 1.000 | 29 |
| 0.885 | 0.885 | 1.000 | 30 |
| 0.840 | 0.840 | 1.000 | 31 |
| 0.731 | 0.731 | 1.000 | 32 |
| 0.941 | 0.941 | 1.000 | 33 |
| 0.869 | 0.869 | 1.000 | 34 |
| 0.889 | 0.889 | 1.000 | 35 |
| 0.862 | 0.988 | 0.872 | 36 |
| 1.000 | 1.000 | 1.000 | 37 |
| 0.857 | 0.986 | 0.869 | 38 |
| 0.862 | 0.862 | 1.000 | 39 |
| 0.921 | 0.921 | 1.000 | 40 |
| 0.860 | 0.860 | 1.000 | 41 |
| 0.913 | 0.913 | 1.000 | 42 |
| 0.871 | 0.871 | 1.000 | 43 |
| 0.842 | 0.952 | 0.884 | 44 |
| 0.868 | 0.945 | 0.919 | 45 |
| 0.968 | 0.968 | 1.000 | 46 |
| 0.931 | 0.931 | 1.000 | 47 |
| 0.862 | 0.963 | 0.895 | 48 |
| 0.800 | 0.800 | 1.000 | 49 |
| 0.834 | 0.961 | 0.868 | 50 |
| 0.948 | 0.948 | 1.000 | 51 |
| 0.559 | 0.627 | 0.891 | 52 |
| 0.743 | 0.743 | 1.000 | 53 |
| 0.885 | 0.990 | 0.894 | 54 |
| 0.808 | 0.808 | 1.000 | 55 |
| 0.823 | 0.823 | 1.000 | 56 |
| 0.712 | 0.929 | 0.766 | 57 |
| 0.843 | 0.981 | 0.859 | 58 |
| 0.833 | 0.833 | 1.000 | 59 |
| 0.806 | 0.806 | 1.000 | 60 |
| 0.866 | 0.866 | 1.000 | 61 |
| 0.875 | 0.875 | 1.000 | 62 |
| 1.000 | 1.000 | 1.000 | 63 |
| 0.747 | 0.747 | 1.000 | 64 |
| 0.701 | 0.849 | 0.826 | 65 |
| 0.801 | 0.801 | 1.000 | 66 |
| 0.800 | 0.800 | 1.000 | 67 |
| 0.789 | 0.789 | 1.000 | 68 |
| 0.803 | 0.936 | 0.858 | 69 |
| 0.803 | 0.866 | 0.927 | 70 |
| 0.753 | 0.971 | 0.776 | 71 |
| 0.734 | 0.895 | 0.820 | 72 |
| 0.761 | 0.761 | 1.000 | 73 |
| 0.833 | 0.992 | 0.840 | 74 |
| 0.899 | 0.899 | 1.000 | 75 |
| 0.764 | 0.764 | 1.000 | 76 |
| 0.808 | 0.808 | 1.000 | 77 |
| 0.559 | 0.612 | 0.766 | Min |
| 1.000 | 1.000 | 1.000 | Max |
| 0.829 | 0.876 | 0.949 | Men |

*Source: Based on the questionnaire and data envelope output DEA v2.1.*

It was found that the fields that achieved optimal technical efficiency did not achieve optimal allocative efficiency and this is due to the fact that the costs of their production elements are high at the level that led to a decrease in their allocative efficiency The optimum level and this indicates that the production was marketed at the point where it is technically efficient and technically inefficient, and when the production costs of the fields drop to the point where it allows a decrease in production costs. For costs to a level where this line is in contact with the equal output curve, then the field is distributive efficient and then economically because when the technical efficiency improves, it will lead to an increase in the distributive efficiency by one unit, and this leads to the continuation of the rate of technical change by increasing until it reaches its maximum. As for the economic efficiency or cost efficiency CE, it achieved an average capacity of (0.829), a lower level (0.559) and a higher level (1). Breeders can increase their efficiency, that is, they can reduce their costs at a level (18%) and achieve the same level of production, meaning that the sample produces the current amount of Products use only 82% or less and become economically efficient. And that the number of fields that managed to reach the optimum level of efficiency with a specific number of inputs is the one that achieved complete and specialized technical efficiency at the same time, and it is the one that operates within the limits of equal output and must continue production according to the way it works, as it turns out that the use of quantities of production elements in the form Optimization and access to technical efficiency and offset by high production costs, which results in a reduction in the level of allocative efficiency and thus is reflected in the cost efficiency (CE). Therefore, it turns out that the technically efficient fields numbered (49) fields, but not all of them are distributive efficient, and the number of distributed efficient fields reached (3) fields This is due to the rise in production costs, which leads to a rise in the cost line, and therefore this curve will not be equal to the cost line. The decline in economic efficiency is due to the reality and the system in which the breeder lives and follows due to the noticeable increase in feed at the base level and the rest of the input prices, as well as a section of the sample breeders do not depend The veterinarian should not take their advice from the agricultural engineer, and they are satisfied with the experiences they have, and this negatively affects the production process and also The almost complete absence of government support and the producer's fears of opening or closing imports.

## CONCLUSION AND RECOMMENDATIONS

With regard to the amount of resources that achieved economic efficiency, it was found that, in light of the change in the return on capacity, most of the sample farms achieved a surplus by using these resources. The high costs of production used (inputs) put the cost line above the equal output curve, and we are guided by that some of the projects were technically efficient, but not specialized and economically efficient at the level of the study sample in Salah al-Din. Through the results of the economic efficiency estimates that resulted in the convergence of averages, we conclude that educators use resources in a convergent manner and that they work in a production environment with almost identical conditions and costs. The results show that the average economic efficiency is 82%, the average technical efficiency is 94%, and the average allocative efficiency is 87%.

Establishing a strategic development policy for the agricultural sector in general and poultry production in particular, considering that the two complement the other in the agricultural economy. The necessity of conducting economic and scientific research and studies on meat production projects for chickens to guide breeders and guide them in using the variety, diet, effective medicines and vaccines, and creating profitable production conditions for them. To give an economic importance to the cultivation of the components of the bush used in the fodder and to encourage farmers to grow them (yellow corn and soybeans) to contribute to reducing the imported fodder and working to reduce the cost of feed, considering that its cost is high. Exempting production inputs, reducing the interest rate to the lowest possible on loans, and imposing high customs duties on imported chicken meat.

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