


**MEASUREMENT THE ECONOMIC EFFICIENCY AND RISK MANAGEMENT STRATEGY
FOR PROJECTS OF TABLE EGGS PRODUCTION IN DIYALA GOVERNORATE**

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ARTICLE INFO	ABSTRACT
<p>Article history:</p> <p>Received 20 January 2023</p> <p>Accepted 16 March 2023</p>	<p>Purpose: The aim of the research is to estimate the cost efficiency and technical and Allocavtive components of egg production projects and to identify risk management strategies.</p>
<p>Keywords:</p> <p>Cost Efficiency; Management Strategy; Breeding Chickens; Risk.</p>	<p>Theoretical framework: These include Data Envelopment Analysis Program (DEAP), a method of linear programming in estimating the economic efficiency in addition to strategic use in risk management.</p>
	<p>Design/methodology/approach: The data was collected from 44 egg chicken projects, collected randomly from Diyala county districts for 2018, for achieving economic efficiency of agriculture and risk management strategic for projects of table egg production .</p>
	<p>Findings: by using of Data Envelopment Analysis with a input orientation. technical efficiency about averaged 0.995, which is highly efficient,. Allocavtive efficiency was 0.99. By linking the relationship between economic efficiency and some administrative variables, some of which are direct and inverse.</p>
	<p>Practical & Social implications: The study benefits table egg producers, including their knowledge of the optimal use of resources for the actual use of resources through the study of economic efficiency. The study showed how to deal with risks in their projects. Outside the farm, the coping strategy to face risks is in lending, and thus this study is used at present and in the future in these investment projects..</p>
	<p>Originality/value: That the poultry sector is an investment and commercial sector, it is necessary to study the resources efficiency used and because it contains risks, so a strategy must be developed to protect the product from these risks.</p>
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**MEDIR A EFICIÊNCIA ECONÔMICA E A ESTRATÉGIA DE GESTÃO DE RISCO PARA
PROJETOS DE PRODUÇÃO DE OVOS DE MESA NA PROVÍNCIA DE DIYALA**

RESUMO

Objetivo: O objetivo da pesquisa é estimar a eficiência de custo e os componentes técnicos e alocativos dos projetos de produção de ovos e identificar estratégias de gerenciamento de risco.

Estrutura teórica: Estes incluem o Data Envelopment Analysis Program (DEAP), um método de programação linear para estimar a eficiência econômica, além do uso estratégico no gerenciamento de riscos.

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Design/metodologia/abordagem: Os dados foram coletados de 44 projetos de frangos de ovos, coletados aleatoriamente dos distritos do condado de Diyala para 2018, para alcançar a eficiência econômica da agricultura e a gestão estratégica de risco para projetos de produção de ovos de mesa .

Conclusões: usando a Análise de Envolvimento de Dados com uma orientação de entrada. eficiência técnica sobre a média de 0,995, que é altamente eficiente,. A eficiência da alocação foi de 0,99. Ligando a relação entre a eficiência econômica e algumas variáveis administrativas, algumas das quais são diretas e inversas .

Implicações práticas e sociais : O estudo beneficia os produtores de ovos de mesa, incluindo seu conhecimento do uso otimizado dos recursos para o uso real dos recursos através do estudo da eficiência econômica. O estudo mostrou como lidar com os riscos em seus projetos. Fora da fazenda, a estratégia para enfrentar os riscos está nos empréstimos, e assim este estudo é utilizado no presente e no futuro nestes projetos de investimento...

Originalidade/valor: Que o setor avícola é um setor de investimento e comercial, é necessário estudar a eficiência dos recursos utilizados e, como contém riscos, é necessário desenvolver uma estratégia para proteger o produto contra esses riscos.

Palavras-chave: Eficiência de Custos, Estratégia de Manejo, Frangos de Reprodução, Risco.

MEDICIÓN DE LA EFICIENCIA ECONÓMICA Y ESTRATEGIA DE GESTIÓN DE RIESGOS PARA PROYECTOS DE PRODUCCIÓN DE HUEVOS DE MESA EN LA GOBERNACIÓN DE DIYALA

RESUMEN

Objetivo: El objetivo de la investigación es estimar la eficiencia económica y los componentes técnicos y de asignación de los proyectos de producción de huevos e identificar las estrategias de gestión de riesgos.

Marco teórico: Se incluyen el Programa de Análisis Envolvente de Datos (DEAP), un método de programación lineal en la estimación de la eficiencia económica además del uso estratégico en la gestión de riesgos.

Diseño/metodología/enfoque: Los datos fueron recogidos de 44 proyectos de gallinas de huevo, recogidos al azar de los distritos del condado de Diyala para 2018, para el logro de la eficiencia económica de la agricultura y la gestión de riesgos estratégicos para los proyectos de producción de huevos de mesa.

Conclusiones: mediante el uso de análisis envolvente de datos con una orientación de entrada. eficiencia técnica sobre un promedio de 0,995, que es altamente eficiente,. La eficiencia asignativa fue de 0,99. Al vincular la relación entre la eficiencia económica y algunas variables administrativas, algunas de las cuales son directas e inversas .

Implicaciones prácticas y sociales: El estudio beneficia a los productores de huevos de mesa, incluido su conocimiento del uso óptimo de los recursos para el uso real de los recursos a través del estudio de la eficiencia económica. El estudio mostró cómo hacer frente a los riesgos en sus proyectos. Fuera de la granja, la estrategia para hacer frente a los riesgos está en los préstamos, por lo que este estudio se utiliza en la actualidad y en el futuro en estos proyectos de inversión..

Originalidad/valor: Que el sector avícola es un sector de inversión y comercial, es necesario estudiar la eficiencia de los recursos utilizados y porque contiene riesgos, por lo que se debe desarrollar una estrategia para proteger el producto de estos riesgos.

Palabras clave: Eficiencia de Costes, Estrategia de Gestión, Cría de Pollos, Riesgo.

INTRODUCTION

Measurement efficiency in agricultural production has become an important wide of research both in the developed and developing world as it is an important issue in the development of the agricultural sector if decisions can be reached related to the country's agricultural policy (Ehirim and others,2019) , represents the efficiency of farm production on its ability to produce a certain level of production using the lowest amount of resources, Efficient farms are better used for current resources to produce maximum production or incur less cost to achieve the goal of food security. The active farm has six features: No waste, less

cost, minimum risk, maximum production, best product quality, and profit maximization (Saliu and others, 2015).

Projects poultry production for meat or eggs are important commercial agricultural activities that need sufficient knowledge and experience in their management, to guide farmers in the optimal use of resources in order to maximize profit and encourage potential public and private entrants to increase production (Helen&Olushola,2020) especially since poultry projects constitute a large proportion of the risk of being part of them (Ayinde and others, 2012) Risk management in farming poultry is very important as it represents its products as one of the requirements for achieving food security in the world because failure to manage risk has direct negative effects on the income of producers, market stability and food security potential, risk management can be described as involving the use of risk assessment techniques to initially determine the level of risk, and a strategy must be developed to mitigate risks in general in order to reduce the level of risk to an acceptable level (Obike and others,2017) The risk management strategy of hedging method is a significant method and used by different companies within the global marketplace (Shakatreh and others ,2023).

Farmers are involved in some risk management strategies that may have social and economic implications not only for the farm family, but for the entire economy. This study identified the sources of risk and management strategies used by projects poultry production in Diyala province, which is an important aspect of agribusiness. This is the result of weather returns, prices, government policies, global markets and other factors that can cause wide fluctuations in farm income (Dismukes ,2006) This is due to three main reasons: environmental changes that cause uncertainty in production and return, price changes that cause market uncertainty, and lack of information, risk management can then be defined as a choice of alternatives to reduce risk impacts. Farmers with access to risk management information and knowledge to use have the key to profitable and competitive agricultural operations (Salimonu & Falus , 2009). I all this is important in agriculture, especially since the products of projects poultry provide animal protein, whether meat or table eggs, which is one of the requirements for achieving food security in the world, hence the motivations of researchers to study the evaluation of the performance of producers and to find out the level of efficiency achieved for table egg projects Because it has a large risk ratio and therefore the development of strategies in managing its risks, selected of Diyala province as a case study , therefore the research aimed to measure cost efficiency and its components for table egg production projects through the use of Data Envelopment Analysis (DEA) method, which is a common task method to assess the

efficiency of the performance of farms that work to achieve economic efficiency requirements in addition to studying the risk management strategy for studied projects .

Measurement economic efficiency through DEA and risk management strategy has been of interest to economic researchers [(Olushola & Helen,2020) (Obike and others,2017) (Zaidan and others,2016) (Ehirim and others,2019) (Saliu and others, 2015)(Dagar and others ,2020) (Singh and others,2012)]

MATERIAL AND METHODOLOGY

Cross-sectional data were used by a comprehensive inventory method, The data was collected from 44 egg chicken projects, collected randomly from Diyala province for 2018, if statistical data were collected through product interviews that included different information on production, costs, number of fields and number of productive birds unloaded and analysed, the research in achieving its objectives was based on :-

- 1- Using appropriate of the Data Envelopment Analysis Program (DEAP), a method of linear programming in estimating the economic efficiency of egg chicken projects.
- 2- Determining its the risk management strategy for studied projects.

RESULTS AND DISCUSSION

First: Cost efficiency and its components

Technical efficiency and scale efficiency in the fields of table egg production

Here we estimate the technical efficiency that means the field's ability to produce a certain level of egg quantity with the lowest amount of resources used assuming the stability of the technological factor (Ogundari & OJO , 2006: 425)(Singh, 2012), This is regardless of the price relationships between input prices and output prices from the product, which is an important indicator by which management can be identified in guiding the optimal use of different economic resources. Technical efficiency is estimated using data envelope analysis method using input-oriented guidance, which reflects the field's ability to reduce the use of physical inputs for a certain level of egg production, this is consistent with Farrell's proposal that the facility's ability to obtain as much output as possible using available quantities of inputs(Al-Msary and others ,2023) (Farral, 1957:254) (Singh and others,2012) , This is because risk,environmental conditions and production make input control more realistic, and it has not relied on the characteristic of stability of the return for size because it is appropriate when all units to measure their efficiency work at their optimal sizes and this may not be achieved because of obstacles such as incomplete competition, financing restrictions and others, so the

research resorted to applying the variable size return property in its three cases to separate the impact of technical efficiency and scale efficiency, The inputs were (the amount of feed, which averaged 453.5 tons, the size of the herd with an average of 10,574 chickens, and the number of working hours, which averaged 6,363.4 hours), while the output was the amount of eggs produced during a productive year, which averaged about 3838028 eggs at the research sample level. DEAP2.1 was used table 1. Shows the results of technical efficiency in the shadow of change and stability of scale as well as the efficiency of scale through which the nature of the return can determine scale to a production unit by measuring scale efficiency and the main reason for this method is that economies of scale can directly determine the efficient and inefficient production unit and requires measuring scale efficiency to measure technical efficiency In the absence of stability and change in scale yield, which mean. the efficiency scale of the production unit represents the ratio between the technical efficiency of the production unit in the shadow of stability remained due to the scale and technical efficiency of the same production unit in light of the change of yield, technical efficiency in the kept of the change of return reached an average of 0.99, which is high efficiency approaching full efficiency It indicates that egg producers in Diyala province are efficient and produce at efficiency curves and that the current production of eggs can be produced using 99% of the resource combination and resources can be reduced by 1% which is relatively small, and that this efficiency came from the good exploitation of resources and blending them in a scientific way, especially since chicken breeders and egg producers work according to a technical program And veterinary helped them a lot to reach the optimal quantities, but the efficiency of scale reached an average of 0.98 and it is also relatively high, we also note that projects that work at fixed volume yields and therefore economies of scale equal to zero or no and at this level of production equal to the size efficiency index and the technical efficiency index and achieve the degree of one Thus, the principle of optimal exploitation of resources is achieved and they account for 59% of the sample. 2.2% of the projects were operating with declining rate returns, and this applies to the law of declining production ratios, which the increase in the size of total output is lower than the increase in the production component used in the production process, while only 17 projects from the sample have operated with increased returns

Table 1. Technical efficiency, Scale efficiency and Size yield for farms table egg production.

firm	crste	vrste	scale	
1	0.974	1	0.974	irs
2	0.975	1	0.975	irs
3	0.974	1	0.974	irs
4	0.991	1	0.991	irs
5	0.975	1	0.975	irs
6	0.974	1	0.974	irs
7	0.974	1	0.974	irs
8	0.986	1	0.986	irs
9	0.991	1	0.991	irs
10	0.974	1	0.974	irs
11	0.991	1	0.991	irs
12	0.991	1	0.991	irs
13	0.991	1	0.991	irs
14	0.974	0.999	0.976	irs
15	0.974	0.997	0.977	irs
16	0.974	0.998	0.977	irs
17	0.974	0.997	0.977	irs
18	0.991	1	0.991	irs
19	0.995	1	0.995	irs
20	0.974	0.992	0.983	irs
21	0.975	0.983	0.992	irs
22	0.975	0.983	0.991	irs
23	0.975	0.979	0.996	irs
24	0.975	1	0.975	irs
25	0.974	0.978	0.996	irs
26	1	1	1	-
27	0.975	0.977	0.997	irs
28	0.952	0.989	0.963	irs
29	0.959	0.96	0.999	irs
30	1	1	1	-
31	1	1	1	-
32	1	1	1	-
33	1	1	1	-
34	1	1	1	-
35	0.988	0.991	0.998	drs
36	0.994	1	0.994	irs
37	0.988	0.988	1	-
38	0.988	0.988	1	-
39	0.988	0.989	1	-
40	0.988	0.988	1	-
41	1	1	1	-
42	1	1	1	-
43	1	1	1	-
44	0.994	0.995	0.999	irs
mean	0.984	0.995	0.989	

Source:- from researchers' work using DEAP.

Cost efficiency and its components

Technical efficiency is estimated in the absence of data on the prices of resources used in production, the efficiency indicator in this case does not take into account the actual cost of resources and therefore the method of analyzing the efficiency of use of economic resources needs to be developed to include all the cost of the combination of economic resources used

and therefore can be compared the technical efficiency calculated once to measure scale efficiency and again to measure cost efficiency and allocative efficiency directly exposed to production costs ,This is in light of the prices of resources and the cost of production, and therefore cost efficiency and allocative efficiency have been estimated after the introduction of the prices of the elements of production (feed price, price of chicken, hourly wage). Which averaged 527,900 dinars per ton, 8,000 for chicken and 3,000 dinars for work .

As for estimating the Allocative efficiency at the sample level, the average sample level was 0.96, which indicates that the egg production fields in Diyala province bear an additional cost of 4%, so it can produce current production using 96% of its resources, which helps it reduce production costs, especially feed, which constitutes a large proportion of the total variable cost, but in general the Allocative efficiency is high and close and indicates the efficiency of the use of resources used in egg production. And that there is little waste in These fields, as these fields follow the scientific and technical method of managing the fields and do not add additional quantities as there are specific quantities working according to them.

The cost efficiency obtained from the result of multiplying the Allocative efficiency with technical efficiency was 0.96 at the sample level, ranging from the correct one to 82 at field 33 and this field is about 18% away from the full efficiency and there is a waste of its resources, but in general 29.5% of the sample fields achieved full efficiency and work on the curve of the envelope and are reference fields for other fields, Sixteen percent of the sample is nearing full efficiency

Table 2. Technical efficiency, Allocative efficiency, and Cost-efficiency for projects table egg production.

firm	TE	AE	CE
1	1	1	1
2	1	1	1
3	1	1	1
4	1	1	1
5	1	1	1
6	1	0.984	0.984
7	1	1	1
8	1	1	1
9	1	1	1
10	1	1	1
11	1	0.985	0.985
12	1	1	1
13	1	0.983	0.983
14	0.999	0.996	0.995
15	0.997	0.97	0.967
16	0.998	0.993	0.99
17	0.997	0.965	0.962
18	1	1	1
19	1	0.945	0.945
20	0.992	0.926	0.918

21	0.983	0.9	0.884
22	0.983	0.968	0.952
23	0.979	0.88	0.861
24	1	0.88	0.88
25	0.978	0.981	0.959
26	1	0.978	0.978
27	0.977	0.964	0.942
28	0.989	0.967	0.956
29	0.96	0.983	0.943
30	1	0.992	0.992
31	1	1	1
32	1	0.95	0.95
33	1	0.827	0.827
34	1	0.839	0.839
35	0.991	0.955	0.946
36	1	0.922	0.922
37	0.988	0.894	0.883
38	0.988	0.965	0.954
39	0.989	0.945	0.934
40	0.988	0.929	0.918
41	1	0.98	0.98
42	1	1	1
43	1	1	1
44	0.995	0.999	0.994
mean	0.995	0.965	0.96

Source:- from researchers' work using DEAP.

Secondary - Studying the relationship of economic efficiency with some of the variables of management

Cost efficiency has been linked to a number of management variables, including education, for its important role in the development of the social structure and the development of the ability to manage resources as well as its role in enabling field owners to apply the scientific program in education and the use of technological methods that contribute to increased productivity and lower average costs, table. 3 show The level of competence increased with the increase in the level of education, averaging 0.84 at the lowest level of education and 0.96 at the highest level of college. The relationship of age was also positively linked to economic efficiency, as we note that the youth group achieved an average cost efficiency of 0.91 while the category of educators over the age of 43 had a lower efficiency of 0.91 his confirms that young people are able to adopt new ideas and rely on the recommended technical methods in raising chickens. Experience also coincided with the economic logic that as experience increased, efficiency increased and production increased, and this was clear in the research sample that producers with more than 10 years of experience achieved higher efficiency levels on average 0.96 This is proof of the importance of the factor of experience in farming poultry, as poultry farming is similar to industry and has a high risk factor, experience

with the practical side improves the qualities of management and increases levels of efficiency and thus increases the amount of eggs produced .

Table 3. The Relationship of Economic Efficiency to Some Management Variables for Table Egg Production Projects.

Variables	Level	Cost efficiency
Education	primary	0.84
	medium	0.93
	Preparatory	0.95
	High	0.96
old	Less than 43	0.95
	More than 43	0.91
Experience	Less than 10 years old	0.89
	More than 10 years.	0.96

Source: From the work of researchers based on the questionnaire form.

Third - Risk management strategy in projects table egg production: -

Risks are an integral part of agriculture, including the poultry sector, and producers often use different risk management strategies as an important aspect of agribusiness because the poultry sector is usually high-risk, and the main risks faced by producers are classified into five forms such as production, marketing, finance, human capital and environmental risks (Adnan and others, 2020) ,egg producers make their decisions according to the risk they face, which is many and inherent to agricultural production, and therefore they take a range of risk strategies, the most important of which may have economic and social implications and depend on the nature and source of the risk. This in turn reflects on the amount of production and therefore profits and product well-being, and there are a range of strategies taken by producers to face the risk, including preventive, mitigating and adaptive. when the producers survey on the application of these strategies, it is clear what follows:

Prevention strategy

Table 4. It is noted that egg producers in Diyala province implement a well-known veterinary health program prepared from a scientific point of view to counter risk, while 9% receive information on risk and confiscation of agricultural extension and only 6% have coordination with scientific departments and centers such as the faculties of agriculture or the department of animal production, which is a small percentage, while we noted that 14% of producers receive training courses in raising egg chickens to help them prevent risk

Table 4. Risk Prevention Strategy

Strategy	rate %
Guidance	9
training	14
Coordination with research centers	6
Applying a healthy veterinary program	71

Source: - From the work of researchers based on the questionnaire form.

Risk Mitigation Strategy

There are several strategies that sample producers can apply to mitigate the risk effects and when observing these strategies we found that their application is weak and indicates that egg producers are left to face risk as it turns out that there is no support for prices but there is a rationing of imported quantities and this helped to lower prices and thus reduced the risk. It also found that the off-farm work strategy was largely applied in the sample, while the strategy of having refrigerated stores was also weak as schedule 5

Table 5. Risk mitigation strategy

Strategy	rate %
Price support	0
Off-farm work	87
Insurance	9
Having refrigerated stores	4

Source: - From the work of researchers based on the questionnaire form.

Risk Adaptation strategy

Risk is a phenomenon associated with agricultural production that cannot be eliminated, but can be reduced or coexisted with the least damage, including lending. It turns out that a large proportion of producers resort to lending, both private and government, and it turns out that the government has provided some loans to support animal production projects, particularly agricultural initiative projects launched in 2008. Thirty-nine percent of them sell their production directly on the market or marketing elsewhere. Forty-one percent of the sample employs their children to reduce costs, as schedule 6 .

Table 6. Risk Adaptation strategy.

Strategy	rate%
Lending	54
Expansion of production	34
Direct sale	39
Family work	41

Source: - From the work of researchers based on the questionnaire form.

CONCLUSION

The research concluded that egg production projects in Diyala province work at relatively high efficiency levels proof of their application of scientific programs in the management of their projects, especially on the technical side, which showed that their technical efficiency reached 99% which approaching one and that most of them produce with increased scale returns, although they bear an additional cost estimated at 4%, due to input prices or changing market conditions Cost efficiency has been associated with age and experience, which are management factors that have helped to adopt new ideas and improve previous productive information. Egg producers in Diyala province applied three important risk management strategies, the first of which was the prevention strategy, the most prominent of which was the application of a veterinary program and the second is the strategy of risk mitigation and the most important paragraphs of which work outside the farm, but the strategy of adaptation to meet the risks is lending .

The research recommends that local egg production should be supported by providing adequate support for inputs in the production process, particularly feed and fuel. The need to coordinate between the entrepreneurs veterinary and scientific centers to prepare a veterinary program and follow up its application, providing the means of protecting the local product while emphasizing the importance of providing financial loans and can be determined by the amount of eggs produced

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