Estimating Of The Volumetric Efficiency Of Lambs Breeding And Fattening Projects In The Northern Plain –Nineveh Governorate For The Production Season Of 2024 AD

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Abstract

Due to the continuous increase in the income rates available to individual consumers in Iraq and the increasing local demand for protein food sources, including red meat, the levels of technical efficiency of its production units has become a realistic necessity; Especially in light of the problem of waste in the unwanted use of economic resources, hence the importance of research emerged in identifying the technical levels and the extent of optimal use of economic resources in the fattening process, and assuming the existence of a gap in the level of volumetric efficiency between production units, and from it came the objectives of the research in measuring the levels of technical efficiency using the statistical analysis method through the DEA data envelope program and according to the variables of the production function, and to achieve these objectives, the primary field data for a stratified sample consisting of 15 production fields were relied upon, and on the secondary theoretical office data, and it became clear from the analysis results that field (1) achieved the highest volumetric efficiency estimated at about (100%), while field (6) achieved the lowest volumetric efficiency estimated at about (0.624%), and the average volumetric efficiency for the total research sample was about (0.846%), which means that there is a waste of economic resources at about (0.154%) from the optimal volume level, and the proposals came with the necessity of adopting a marketing and pricing policy for feed Veterinary vaccines and treatments, and controlling the mechanism of random import of un fattened animals (free-range lambs), and their fresh meat, in accordance with health and legal supervision.

Keywords: Economic efficiency, volumetric efficiency, lamb fattening, data envelope.

Introduction:

The increase in food needs for the commodity red meat,. And since the practice of sheep farming and fattening lambs is one of the most important sources of providing red meat, and to reach the required levels of local production, it is necessary to use economic resources in the best and most optimal way to achieve levels of efficiency in use،Therefore, it has become necessary to study this important activity and identify the levels of technical efficiency (when the returns to scale change, and the returns to scale are constant) as the most important measure of the efficiency of the performance of production units, and from it the efficiency of the optimal size of production can be estimated.

Research problem: 1-The Research problem it is a deviation in the use of economic resources scarce , from the optimal level of use.2- and an increase in the undesirable use of these

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resources, and an increase in costs at the expense of profitability.

Importance of the research:

The importance of the research comes from the economic and nutritional importance of red meat as it the main source of animal protein the consumer basket.

Research hypothesis:

The economic (volume) efficiency is affected by a gap reinforced by waste in the economic resources used in the breeding and fattening process at the level of the production unit (field.(

Research objective:

-1Measuring the effectiveness of the technical economic performance of the owners of lamb breeding and fattening fields in Nineveh Governorate for the production year 2024 by measuring the economic volumetric efficiency, and using the data envelope analysis program method DEA.

-2measuring and estimating the surplus and deficit in the amount of feed resources consumed, and relying on the production function represented by the total weight gain rate in those fields.

-3Obstacles to raising and fattening lambs in the research sample:

Research Methodology :

To achieve the objectives, the research was based on the descriptive economic method and the quantitative statistical economic method through statistical and standard methods in evaluating the results obtained from the data.

Data sources:

-1 The primary basic data from the field questionnaire form designed by the researcher and in line with the clear questions and inquiries of the periodic personal interviews for a sample of owners of lamb breeding and fattening fields amounted to (15) and constituted (20%) of the research community of about (75) breeders in the Gogjali area in Nineveh Governorate for the production year 1/ 8/ 2024- 30 /12 / 2024

-2Secondary data from theses, dissertations, research, Arabic and foreign books and reports issued by the Iraqi Ministry of Agriculture and the Nineveh Agriculture Directorate, in addition to other official reports related to the research topic.

Theoretical framework:

Efficiency is defined as the technical process between inputs and outputs during a specific period of time. It is efficient when the output increases by a greater percentage than the increase in inputs or obtaining the same level of output by reducing the cost of inputs relative to the value of production [21]. Farm efficiency and the methods and ways to measure it are an important goal of agricultural development and food security for any country[9]. Efficiency analysis can be used to determine general interventions to improve agricultural productivity and farm income [22]. Most recent studies indicate that efforts to increase production by improving efficiency are more effective than introducing new technology because most farmers do not have sufficient knowledge and experience in using and managing modern technology. The success of production units depends on their economic efficiency. Efficiency is a relative term whose value is between zero and one. It must be understood that there is no absolute efficiency, but rather it is always relative. The criterion for economic efficiency is value. Any change that leads to a decrease in value is an inefficient change. Many economic studies have been based on Pareto's optimization [16]. Optimization requires many conditions: including reciprocal efficiency, which includes the impossibility of redistributing a

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combination of goods and services to increase the benefit of an individual without reducing the benefit of others [4], and productive efficiency, which is achieved when the elements of production cannot be distributed in any way that leads to increasing the outputs of a product without reducing the outputs. From another product [7.[

Also, among the conditions of Pareto optimality are the so-called peak conditions, which require achieving the exchange and production efficiency immediately, as well as determining prices in a competitive market and the ratio equal to the price ratio of any two goods with their marginal substitution rates when the economy is on the curve of optimal production possibilities. Whereas the concept of economic efficiency embodies the technical and distributional efficiency that achieves the sustainability of economic resources by ensuring the optimal use [20] of economic resources to reach the maximum profits and knowing the obstacles that cause a decrease in the level of economic efficiency, including the lack of sufficient knowledge about the technical and specialized relations between production resources among the owners of production units, and the small amount of financing necessary for agricultural production projects (animal - plant) [6.[

Non-parametric models assume that all deviations (the difference between the estimated and actual value) from the frontier efficiency curve can be controlled by the farm. One of their advantages is that non-parametric models use linear programming methods to solve them [13]. DEA is also an independent linear program for calculating the efficiency

Components of economic efficiency:

Components of economic efficiency according to the concept [17] are divided into technical efficiency, which was used by the majority of agricultural studies [3], while [13] divided efficiency into three basic rules, which are specialized efficiency (AE), technical efficiency (TE), and economic efficiency (EE) [19]. Technical efficiency from the input side refers to the ability to reduce the use of material inputs for a given level of production; technical efficiency from the output side is the ability to obtain the highest amount of production at a given level of inputs. The value of technical efficiency lies between zero and one. When the value of technical efficiency is equal to one, the farm is technically efficient. When the value of technical efficiency is less than one, the farm is technically inefficient and has two options: either to reduce the percentage of inputs that achieve the previous production, or to obtain a higher production with the same percentage of previous inputs [1]. Note that all of these three measures TE0, AE0, EE0 range between zero and one, and the values of technical efficiency indicators are equal only in the case of CRS. Since :

EE0 = economic efficiency.

Material and Methods

frontiers of each decision-making unit (DMUs) by the ratio of similar or close weights for all similar units that have the same inputs and outputs, so the goal is to maximize the ratio of outputs to inputs [8]. The efficiency curve can be illustrated according to the data envelopment analysis (DEA) method as shown in the following figure (1):

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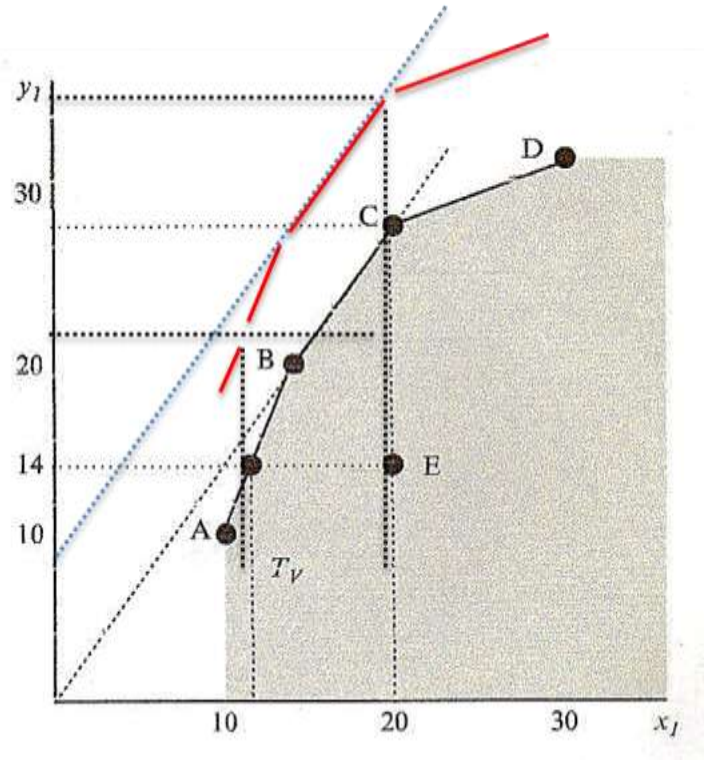

Source: [5] and[6[

In light of the concept of DEA analysis, production units ABCD are efficient, while unit E is considered an inefficient unit. The amount of inefficiency can be determined by knowing the horizontal or vertical distance between the efficiency curve and point E. We notice from Figure (1) that production unit E uses more inputs to produce the same other units. If we assume that we have one input, which is X, then the DEA model aims to achieve the highest value (efficiency degree = 1), meaning that the efficiency degree is between zero and one, so the production unit that uses the least inputs and produces the most represents the most efficient unit [14]. The aforementioned DEA method is characterized by not needing a prior functional description, but rather the efficiency is calculated directly from the observations [2] that together form the frontier curve of performance (or the frontier efficiency curve) that covers all the observations, and the production units that fall on the frontier efficiency curve enjoy efficiency in the process of distributing their inputs and producing their outputs. While the production units that do not fall on the frontier curve are considered inefficient [3] and [13.[

Basic models and trends of the Data Envelopment Analysis (DEA) method:

The Constant Returns to Scale (CRS) model and the Variable Returns to Scale (VRS) model. In both models, efficiency indicators can be found [18], either from the input side, called the input-oriented model, or from the output side, called the output-oriented model [14.[

Scale Efficiency (SE:(

Scale efficiency is defined as a measure of the degree to which a production unit can expand according to the size of its operations. The organization may operate at increasing,

constant, or decreasing returns to scale. The SE of decision-making units (DMUs) is measured in the DEA method either through the constant returns to scale (CRs) model or the variable returns to scale (VRs) model. The technical efficiency (TE) of decision-making units is also measured in the DEA method either through the CRs or VRs model. However, the TE estimate in the CRs model is by estimating the total technical efficiency, but this total technical efficiency must be divided into pure technical efficiency and scale efficiency [23]. To separate technical efficiency TE and scale efficiency SE in measuring efficiency, Banker, Garniss and Cooper (1984) suggested modifying the constant returns to scale CRs model to represent variable returns to scale VRs [13]. Thus, the pure TE score for decision-making units can be obtained according to the VRs model. As for the scale TE score, we obtain it as in the following formula: Sei = (TE_1^CRs)/(TE_1^VRs), and the value of the Sei score = 1 when TECRs = TEVRs [3]. In other words, the scale efficiency (Sei) of the production unit is calculated by dividing the technical efficiency index under constant returns to scale TECRs by the technical efficiency index under changing returns to scale TEVRs for the same unit. Productivity: If Sei = 1, this means that there is volumetric efficiency for the production unit that uses inputs and outputs in a harmonious and

Table (1) shows the results of estimating the volumetric efficiency of lamb fattening fields in the research sample according to the production function variables, and under the assumption of changing volume returns, and the stability of volume returns, and by adopting the data envelope analysis method.

SE%	TE% VRS	TE% CRS	Farm number	SE%	TE% VRS	TE% CRS	Farm number
0.999	0.795	0.794	9	1.000	1.000	1.000	1
0.936	0.924	0.864	10	0.819	1.000	0.891	2
0.906	1.000	0.906	11	0.906	1.000	0.906	3
0.690	1.000	0.690	12	0.947	0.816	0.772	4
1.000	1.000	1.000	13	0.998	0.834	0.833	5
0.624	0.714	0.445	14	0.844	0.860	0.757	6
0.850	1.000	0.850	15	0.997	0.908	0.905	7
0.846	0.927	0.815	Average	0.983	0.980	0.963	8

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efficient manner through both CRs and VRs models. If Sei < 1, this means that the production unit is volumetrically inefficient and that it performs its series of production operations under diminishing returns to scale [11]. [13] indicated that the degree of inefficiency obtained by the production unit is either due to technical inefficiency or volumetric inefficiency. God willing, in our research, we will address the economic criteria for volumetric efficiency using the Data Envelope Analysis program (DEAp) and in terms of outputs, assuming a change and stability in volumetric returns for lamb fattening fields in Nineveh Governorate for the production season 2024 AD.

Results and discussion:

The volumetric efficiency values were estimated and measured based on the technical efficiency values, and by collecting, tabulating and analyzing field data using the statistical method in the data envelopment analysis program DEAP, and according to the explanatory variables of the production function (x1= wheat ,x2= barley ,x3= yellow corn ,x4= Green fodder ,x5= working hands ,x6= herd size), and on the input side, and under the assumption of changing volume returns VRS sometimes, and other times under the stability of volume returns CRS, for a sample of lamb fattening fields in the town of Kokjali - Mosul District - Nineveh Governorate for the production season of 2024 AD, as follows:

Source: Data from field questionnaires in the study area by the researcher.

It is clear from the results of Table (1) above that the average amount of technical efficiency under conditions of stable returns to scale reached about (0.815%). This means that the owners of lamb fattening fields in the study area are good at using the optimal combination formula by (0.815%) and that with this combination (compound feed) they work outside the optimal potential curve by (0.185%) and have a surplus in use by (0.185%) and that they can obtain the same current production level by reducing the amount of feed used by (0.185%) and that they can increase the current production level by (0.185%) without any increase in the use of the feed used. The average technical efficiency under the conditions of changing returns to scale was about (0.927%), which means that the owners of lamb fattening fields in the study area have experience in using the optimal combination formula by (0.927%) and that with this combination of compound feed they are working outside the optimal potential curve by (0.073%) only and have a surplus in use by (0.073%) and they can obtain the same current production level by reducing the amount of feed used by (0.073%) or they can increase the current production level by (0.073%) without any increase in the use of feed used in the fattening process. From the results of the technical efficiency values when the returns to scale are constant and the returns to scale change as in Table (1), it is clear that the average volumetric efficiency of all fields reached about (0.846%). This shows that the owners of lamb fattening fields in the study area work under the law of diminishing returns to scale, i.e. when adding one unit of feed, the total production will increase by a lower percentage of about (0.154%) and not in proportion to the unit of added feed, and that they can obtain the same current volumetric capacity by reducing the amount of feed used by (0.154%) or they can increase the current volumetric efficiency level by (0.154%) without any increase in the use of feed used in the fattening process. It was found that field (1) from the table above achieved the highest

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level of volumetric efficiency, which reached about (100%), which indicates that the owner of field (1) is skilled at using the optimal feed formula, and that with this economic resource combination he works on the curve of optimal production potential and achieves fixed volume returns (he has no deficit or surplus in use), meaning that when he adds one unit of fodder, he will obtain an increase of one unit in total production, in proportion to the quantity of fodder; While field No. (23) achieved the lowest level of technical efficiency under conditions of constant volume returns of about (0.445%), and also under conditions of variable volume returns of about (0.714%), thus achieving the lowest level of volumetric efficiency, which amounted to about (0.624%), which indicates that the owner of field (23) does not have sufficient experience in using the optimal feed formula, and that with this economic resource combination he works below the level of the optimal production potential curve by (0.376%) and achieves decreasing volume returns, and that when adding one unit of fodder he will obtain a smaller increase of about (0.376%) in total production, which is not proportional to the amount of fodder used in the production process.

Obstacles to raising and fattening lambs in the research sample:

Through periodic meetings and interviews with stakeholders, it became clear that the main obstacles are:

.1High prices of various types of fodder and fluctuations in their availability between production seasons due to the control of black market traders over them and setting a price ceiling for them to serve their profits

.2High costs of veterinary medicines and their ineffectiveness in treatment and their import under an illegal cover and at profitable prices determined by traders, especially when sudden and chronic epidemic diseases attack.

.3Random import of free-range lambs (not fattened) and fattened lambs without health control increased their negative impact on producers' profits and their reluctance to practice the profession.

Recommendation

.1Establish a pricing policy for various types of fodder and set a price ceiling for them to serve their profits and provide them between production seasons, neutralize black market traders in providing them, and establish feed factories for ruminants.

.2Support and provide highly effective veterinary treatments, vaccines and medicines and import them from reliable sources with legal cover and prices.

.3Follow a feasible economic policy in the import process, especially fattened lambs or their fresh meat, with strict health control to encourage producers and increase the local product.

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