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jasim N. Jasim[1*]
Hassan T. Zanzal[2]

1-Ministry of Agriculture, Directorate of Agriculture in Diyala Governorate

2- Collage of Agriculture, Tikrit University, Iraq

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Estimating the economic efficiency of cucumber crop the protected houses in Diyala governorate (Baquba an Applied model) for the 2021 agricultural season

ABSTRACT

The cultivation of vegetable crops the protected houses is one of the important foundations in increasing productivity due to the control of the environmental conditions of the farm. A random sample of cucumber crop producers was relied upon, represented by (60) products, to achieve the research objectives of studying economic efficiency and its components (technical and allocative). and estimate of the amount of surplus and deficit of economic resources used in the production process for the 2021 production season. The results of the efficiency analysis show that the average technical efficiency in light of the stability and change of scale returns (89%, 97%) respectively, while the average scale efficiency amounted to (92%) and the value of the average scale efficiency shows that the sample farmers can increase their production by (8%) by using the same amount of productive resources. The average economic, technical and allocative efficiency reached (80%, 97%, 82%) respectively. The average economic efficiency shows that cucumber farmers can reduce production costs by (20%) and achieve the same level of production. The amount of surplus and deficit of the economic resources involved in the production process was estimated, and it was found that some variables achieved a deficit in use and others achieved a surplus in their use of resources, This is due to the misuse of resources by some producers. The research recommended educating farmers about the optimal quantities that should be used optimally through the guidance courses provided by the Guidance Center, providing government support for production requirements and reducing their prices, and supporting the selling prices of the crop.

INTRODUCTION

the protected houses projects that produce vegetable crops in general and cucumbers in particular are among the most profitable projects, as these projects bridge the gap between supply and demand of crops produced in local markets (Al-Badri, 2021). Agricultural production in most third world countries is characterized by low productivity and high production costs, due to several reasons, the most important of which is the lack of optimal use of agricultural resources. Vegetable crops, including cucumbers, are of great importance to most farmers because of their short production time and quick profits, when farmers overcome the problems facing the cultivation of these crops (Mahmoud, 2018). The original home of the cucumber is the areas of Southeast Asia, especially India and southern China. The nutritional value of the cucumber is not high, as its fruits contain 95% water, 2.2% carbohydrates and proteins, and about 5% mineral compounds, including phosphorous, potassium and iron, and its fruits contain small amounts of carotene and vitamin B_2 , B, C. Cucumbers are consumed in the form of fresh green fruits or in the form of pickled fruits. (Al-Samarrai, 2011). In addition, cucumber fruits are characterized by containing a quantity of enzymes that help digest and represent fatty and protein substances, as well as by their alkaline-effect mineral

* *Corresponding author: E-mail*: jasim_n_jasim@st.tu.edu.iq

salts. Despite its nutritional importance, the crop faces many problems related to production efficiency in Iraq.(althaamir, 2016)

Research problem

The protected houses projects are among the important projects in increasing agricultural production and mitigating the phenomenon of seasonality of agricultural production, and despite the high productivity achieved by these farms, in light of the high costs of production requirements, these projects are still limited. And the production of the cucumber crop does not cover the local demand.

Important of the Search

Iraq suffers from a situation represented by the misuse of available resources, which leads to a low level of economic efficiency at the level of the agricultural sector, and therefore this will lead to the failure to achieve the objectives of the agricultural policy and since the low rates of agricultural productivity in Iraq necessitate the efficient use of economic resources, and then knowing the extent of approaching Or agricultural producers move away from achieving economic efficiency.

Hypotheses of the Search

The research assumes the low economic efficiency of the cucumber crop production farms due to the producers not exploiting the productive resources in an optimal way, as well as the high production costs.

Search objective

1.The research aims to estimate the economic efficiency and its components (technical and allocative) for the cucumber crop using the data envelope analysis method.

2.Determining the factors affecting the production of the crop, calculating the amount of surplus and deficit of the productive resources used in the production of the crop for the agricultural season 2021.

MATERIALS AND METHODS

Economic efficiency estimation model and its components according to production function variables.

In order to estimate the technical efficiency on the part of the inputs for the cucumber crop, as the environmental conditions surrounding the farm make the farmer control his inputs more than his outputs, in other words, the amount of inputs can be reduced in a way that is more secure than increasing production and with the presence of field statistical data represented by (K) of inputs, which It included (area/dunm, seeds/gm/dunm, organic fertilizer/kg/dunm, chemical fertilizer/kg/dunm, pesticides/liter/dunm, hand work/hour/dunm, automated work/hour/ dunm, irrigation process/hour/dunm), which are independent variables affecting the dependent factor (M). Represented by the total production of the farm under study (N) and by using the binary theory (Duality) in linear programming, the data envelope analysis (DEA) model used to estimate the technical efficiency on the part of the inputs in light of the change in returns to scale (VRS) becomes as follows:

$\mathrm{Min}_{\theta,}\lambda^{\theta}$

Subject to :

$-yi + y\lambda \geq 0$

$\theta_{xi} - X\lambda \geq 0$

$N_i\lambda = 1$

$\lambda \geq 0$

Xi = the input vector.

Yi = the output vector.

λ = resultant vector.

Ni = expresses the constants and weights associated with efficient farms.

θ = represents the value of the technical efficiency of the farmer and it is between (0 - 1).

Model for estimating economic efficiency according to the variables of the cost function.

Economic efficiency estimation model from the cost function. Technical efficiency, allocative efficiency and economic efficiency will be estimated using production input prices for the purpose of reducing costs for the sample farms and assuming a change in scale returns, the linear programming model becomes in the following form:

Min λ , Xi*wiXi

Subject to :

- $y_i + y\,\lambda \geq 0$

θ Xi* − Xλ ≥ 0

λ ≥ 0

Xi = vector of unit cost minimization i.

Wi = vector of input prices.

yi = the output vector of the productive unit i.

The specific economic efficiency (EE) is calculated by the ratio of the minimum cost to the actual cost and through the following equation:

$$\mathbf{EE} = \frac{\boldsymbol{Wi\ Xi^*}}{\boldsymbol{Wi\ Xi}}$$

EE = TE * AE

The allocative efficiency can also be calculated by dividing the economic efficiency by the technical efficiency.

AE = EE / TE

Scale efficiency

It means that the production unit operates at increasing, constant or decreasing volume yields. If the inputs increase by a known percentage, the production increases by the same, greater or lesser percentage, respectively, and that the volumetric efficiency provides quantitative information about the characteristics of volume. (Al-Muhammad et al., 2018). The use of the inputs of the factors of production increased by a certain percentage and the production increased in the same proportion. Here we have a case of a constant volume return, and if the percentage increase in the use of the factors of production is greater than the percentage of the increase in production, then we have a decreasing volume return. growing (Ahuja, 2009).

The scale efficiency (SE) of the production unit is calculated as it represents the ratio between the technical efficiency of the unit in light of the stability of volume yield (CRS) on the indicator of the technical efficiency of the same production unit in light of the change in yield of volume (VRS), as follows:

$$\mathbf{SE} = \frac{\boldsymbol{TEi^{CRS}}}{\boldsymbol{TEi^{VRS}}}$$

If SE = 1 means that there is scale efficiency, while if SE <1 means that there is no scale efficiency **(Qassem et al, 2020).**

RESULTS AND DISCUSSION

Estimation of technical efficiency in VRS and CRS and scale efficiency of cucumber crop.

Table (1) shows that the scale efficiency fluctuated between an upper limit of (1) and a minimum of (0.64), while the average scale efficiency was (0.92) and that this value shows that the sample farmers can increase their production by 8% by using the same amount of resources involved in the production process or they can reduce their production costs by 8% while maintaining the same level of production. As for the number of farms that achieved an efficiency of 100% scale, it reached (23) and constituted 38.3% of the total sample. These farms can be considered as reference farms for the rest of the sample farms that have not reached full efficiency and can continue according to the used combination of elements despite the lack of economies of scale It has and is working at the optimum size as shown by the volume returns index. This means that the total production increases by the amount of the addition of the same variable production factors. In this case, there is a stability in the rate of increase in total production, which indicates the fixed percentage of the production factors used in the production process. The sample farms that did

not reach full efficiency amounted to (37) farms, which constituted 61.7% of the total sample farms, which were operating with increasing scale returns, and only (2) farms operated with diminishing scale returns. As for the technical efficiency, which was the basis for calculating the efficiency of scale, it was found that, in light of the stability of the return on scale, its average was (0.89). Therefore, the sample farmers could increase their production by 11% and use the same amount of resources or reduce costs by 11% while achieving the same level of production, in When the average technical efficiency with a change in yield was (0.97), the number of farms that achieved 100% efficiency in light of the stability and change in yield was (23, 47), which constituted a percentage (38.3%, 78.3%), respectively. As for the farms that did not reach 100% efficiency In light of the stability and change in the yield, it reached (37, 13) farms, which constituted (61.7%, 21.7%), respectively.

Table (1): The Scale efficiency and technical efficiency of CRS and VRS of cucumber crop

Efficiency level	Technical efficiency CRS		Technical efficiency VRS		Scale efficiency	
	Frequency	%	Frequency	%	Frequency	%
0.60 – 0.69	4	6.7	1	1.7	2	3.3
0.70 – 0.79	11	18.3	2	3.3	8	13.3
0.80 – 0.89	9	15.0	5	8.3	6	10.0
0.90 – 0.99	13	21.7	5	8.3	21	35.0
1.00	23	38.3	47	78.3	23	38.3
Total	60	100	60	100	60	100
Mean	0.899		0.971		0.927	
Minimum	1.000		1.000		1.000	
Maximum	0.642		0.691		0.642	

Source: Prepared by researchers based on data envelope analysis results.

Estimating the economic efficiency and its components (technical and allocative) for the cucumber crop using the variables of cost functions.

Table (2) shows the estimation of the economic efficiency, technical efficiency and allocative efficiency of the cucumber crop for the agricultural season (2021), which can be obtained through the use of the quantities of resources and the prices of the resources involved in the production process, assuming a change in yield to scale, as the average technical efficiency was (0.97), which was estimated In measuring the efficiency of scale according to the change in return, since technical efficiency is included in the calculation of scale efficiency and economic efficiency, as if the number of farms that achieved 100% efficiency within the sample reached (47) farms, which constituted (78.3%) of the total sample. As for the allocative efficiency, its values ranged between the highest efficiency of (1) and the lowest efficiency of (0.51), while the average sample efficiency was (0.82) as farmers use the optimal quantities of resources, which reflects the efficiency of the average sample that farmers can increase their production by 12% without adding Any quantities of used resources or obtaining the same level of production by reducing costs by 26%, and that the farms that achieved full allocative efficiency at the sample level are only two farms. As for the economic efficiency, it fluctuated between an upper limit of (1) for the two farms No. (1 and 43) and the A minimum of (0.41) for farm No. (57) and an average of (0.80). This value indicates that these farms can reduce their costs by 20% and achieve the same production level, meaning that the sample is able to achieve the current production using 80% of the resources used to reach efficiency Complete (economic efficiency).

It shows through the obtained estimates that the farms that were able to achieve economic efficiency are the same ones that have achieved allocative and technical efficiency together at the same time, and they are the ones that work within the equal output curve. Therefore, they must follow the applied method of work and continue production. The results show that the farms that achieved technical efficiency, which amounted to (78.3%), and the reason for this is attributed to the optimal use of quantities of production elements, which led to achieving technical efficiency, which is more than farms that achieved allocative efficiency. Between the economic resources used

and the pursuit of optimal use of the quantities of resources depending on the prices of these resources, especially seeds, fertilizers and pesticides, which is directly reflected on the economic efficiency, which reached the percentage of farms that achieved economic efficiency (3.3%), and the reason for this is due to the high costs of production requirements that lead to The cost line is higher than the boundary efficiency curve, so the desired curve will not be tangent to the cost line..

Table (2): Economic, Technical and Allocative Efficiency of Cucumber Crop

Efficiency level	Technical efficiency		Allocative efficiency		Economic efficiency	
	Frequency	%	Frequency	%	Frequency	%
0.40 – 0.49	-	-	-	-	2	3.3
0.50 – 0.59	-	-	2	3.3	2	3.3
0.60 – 0.69	1	1.7	5	8.3	8	13.3
0.70 – 0.79	2	3.3	15	25.0	14	23.3
0.80 – 0.89	5	8.3	26	43.3	23	38.3
0.90 – 0.99	5	8.3	10	16.7	9	15.0
1.00	47	78.3	2	3.3	2	3.3
Total	60	100	60	100	60	100
Mean	0.971		0.823		0.801	
minimum	1.000		1.000		1.000	
maximum	0.691		0.517		0.418	

Source: Prepared by researchers based on data envelope analysis results.Estimating the surplus or deficit of the actual and efficient economic variables and calculating their percentage.

The amount of surplus and deficit in the economic resources used in the production of cucumber crop can be calculated by comparing the amount of resources that have achieved economic efficiency and the amount actually used, as:

Amount of resource surplus or deficit = (the amount of resources actually used on each farm – the amount of resources at the lowest point of average total costs)

Where it becomes clear to us if the difference is positive, representing the surplus of the resources used, and the farmer must reduce the quantities used of these resources in order to reach the optimal use achieved for economic efficiency. optimum economic resources.(**Al-Hadidi, 2012**)

Surplus or deficit ratio = (the amount of increase or decrease in economic resources)/(the amount of actual use of economic resources)

The amount of the actual and achieved amount of economic efficiency, surplus and deficit of productive resources.

Table (3) shows that the total area exploited at the sample level is (91) dunam, and the area achieved for economic efficiency is (86.54) dunam, as it becomes clear that there is an overuse of the resource (4.46) dunam, and therefore the sample farmers must reduce the cultivated area by (4.9 %) in order to reach the optimum use of the resource. As for the seed resource, the total amount used at the sample level amounted to (13920) g, while the amount achieved for economic efficiency amounted to (16038.31) g, so the difference between the two values is the amount of deficit amounting to (2118.3) g, and the form of the deficit is (15.21%) of the total actual amount Accordingly, farmers should increase the use of the resource by (15.21) to reach an optimal use of the resource. The total amount of organic fertilizers actually used was (104120) kg, and their quantity achieved for economic efficiency amounted to (134329.49) kg, and this shows that the sample farms suffer from a deficit in the use of the resource amounted to (30209.4) kg, and the sample farmers have to increase the use of the resource by (29.01%) to reach to the optimum use of the resource, As for the chemical fertilizers resource, the total amount actually used amounted to (35049) kg, and the quantity achieved for efficiency amounted to (40823) kg, and the difference between the two values shows the amount of the deficit of chemical fertilizers, as it reached (5774) kg. It is clear that the sample farmers should increase their use of the resource by (16.47%) to optimally use the resource, and the reason for this deficit in these resources is the lack of

government support and the high prices, which force farms to rely on private markets to secure them. Table (3) shows that the total amount of pesticides used at the sample level amounted to (1400) liters, while the quantity achieved for efficiency amounted to (1290) liters, and thus there is a surplus in the use of the resource amounting to (110) liters, so the amount used from the supplier must be reduced by (7.85%). To achieve an optimal use of the resource, the reason for using the resource in large quantities is due to the large number of fungal and insect infections that affect the cucumber crop, as it is a crop with high sensitivity to disease, so most farmers resort to adopting a control schedule submitted by the supervising agricultural engineer in the study area, As for the resource of manual labor, the total number of actual hours of work at the sample level amounted to (102235) hours, while the total number of hours of manual work at the lowest point of costs amounted to (74743) hours, as the difference between the two values showed that there is a surplus in the use of the resource amounted to (27,492) hours. Optimum use of the resource The sample farmers should reduce the manual work hours by (26.89%), as the sample farmers depend on manual work in all agricultural operations (planting seedlings, watering, combating and harvesting), except for the plowing process, which depends on automated work, and the total automated work hours actually used (1015) hours, while the total working hours achieved for economic efficiency was (1028), as it shows that there is a deficit in the use of the resource amounted to (13) hours. And the reason for the deficit in the use of the resource is due to the fact that work in greenhouses does not require mechanical work, and operations are limited to manual work. In order to achieve optimal use of the resource, the use of the resource must be increased by (1.28%). As for the irrigation resource, the actual total irrigation hours were (14816) hours and the total irrigation hours achieved for economic efficiency (14348) hours. The difference between them shows that there is a surplus in irrigation hours amounted to (467) hours. The reason for using hours that exceed the optimal need is due to the environmental conditions during the production period.

Table (3): The sum of the actual and achieved quantities of economic efficiency and the amount of surplus and deficit of economic resources

Productive Resources	Unit	Total actual used quantity	The total amount achieved for economic efficiency	Amount of surplus and deficit	%	the condition
Area	Dunam	91	86.54	4.46	4.9	Surplus
seed quantity	Gm	13920	16038.31	-2118.3	-15.21	Deficit
Organic fertilizers	Kg	104120	134329.49	-30209.4	-29.01	Deficit
chemical fertilizer	Kg	35049	40823	-5774	-16.47	Deficit
Pesticides	Liter	1400	1290	110	7.85	Surplus
Handwork	Hours	102235	74743	27492	26.89	Surplus
Automation	Hours	1015	1028	-13	-1.28	Deficit
Irrigation	Hours	14816	14348	467	3.15	Surplus

Source: Prepared by researchers based on questionnaire data and data envelope analysis results.

Productive problems and constraints faced by farmers.

1-Prices of agricultural inputs are high.

2-Lack of counseling services.

3-The spread of fungal and insect diseases and the high prices of pesticides.

4-The fluctuations and instability of crop prices..

Solutions proposed by farmers.

1-Supporting production requirements and providing them at reasonable prices, which leads to a reduction in production costs, which is reflected in the improvement of economic efficiency.

2-Carrying out periodic control by the Prevention Department to prevent the transmission of diseases between farms.

3-Organizing extension seminars for farmers by the extension center and directing them to use the optimum quantities of resources.
4-Granting subsidized loans to purchase the protected houses and expand their cultivation.
5-Supporting the prices of the crop and limiting the import of the crop during the production period.

CONCLUSIONS

Through the findings of the research, we conclude
1-The efficiency of the scale that was estimated through the production function averaged 92%, which means that the sample farms can increase production by 8% using the same amount of resources, and most of the farms were working with increasing scale returns, except for two farms that work with diminishing scale returns. As for the farms that achieved efficiency Complete 100%. They numbered (23) farms. These farms are considered references to inefficient farms, and they can continue according to the current combination of resources while working at their optimum volumes.
2- The economic efficiency rate reached 80%, and this means that the sample farms can reduce production costs by 20% and achieve the same amount of production. The technical and allocative efficiency reached (97%, 82%) respectively, and the farms that achieved are the same economic efficiency Which has achieved both technical and allocative efficiency at the same time, and this is the one which works within the equal output curve, so it must continue to work.
3-We conclude by estimating the surplus and deficit quantities of economic resources, as it turns out that the resources that suffered from a deficit in use are (seeds, organic and chemical fertilizers) and the reason for this is due to the high prices of these materials, which makes it difficult for the farmer to secure them in sufficient quantities, as well as automated work, as most Agriculture operations in protected houses is Done manually, with the exception of plowing in automated work, so the resource is used sparingly, while the resources that have achieved a surplus in their use are (area, pesticides, manual work and the irrigation process).

RECOMMENDATIONS

Through the conclusions reached by the research recommend the following:
1-Take advantage of the sample farms that have achieved full efficiency and try to take it as an applied model that can benefit from the operating patterns and experiences possessed by the owners of efficient farms.
2-The necessity for the agricultural extension system to play an important role in training and guiding farmers to use the optimum quantities of economic resources to achieve optimal production that reduces costs, through holding seminars and field visits to farmers' fields, especially during the farming process.
3-Providing government support to farmers by providing production requirements at reasonable prices, as well as protecting local production during the production period, limiting imported quantities, supporting product prices, and setting a minimum output price that guarantees a rewarding income for farmers.
4-The research recommends providing subsidized soft loans to farmers in the research area to buy greenhouses and expand their spread, as they are projects that guarantee farms a remunerative economic return.

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تقدير الكفاءة الاقتصادية لمحصول الخيار في البيوت المحمية في محافظة ديالى (قضاء بعقوبة انموذجاً) للموسم الزراعي 2021

جاسم نصيف جاسم **حسن ثامر زنزل**

وزارة الزراعة محافظة ديالى
جامعة تكريت - كلية الزراعة

الخلاصة

ان زراعة محاصيل الخضر في البيوت المحمية تعتبر من الأسس المهمة في زيادة الإنتاجية بسبب السيطرة على الظروف البيئية للمزرعة وتم الاعتماد على عينة عشوائية من منتجي محصول الخيار تمثلت بـ (60) منتج لتحقيق اهداف البحث المتمثلة بدراسة الكفاءة الاقتصادية ومكوناتها (التقنية والتخصيصية) وتقدير كمية الفائض والعجز من الموارد الاقتصادية المستعملة في العملية الإنتاجية للموسم الإنتاجي 2021. وتُبين نتائج تحليل الكفاءة ان متوسط الكفاءة التقنية في ظل ثبات وتغير عوائد الحجم (89%، 97%) على التوالي، اما متوسط كفاءة الحجم بلغ (92%) وتوضح قيمة متوسط كفاءة الحجم ان مزارعي العينة يمكنهم زيادة انتاجهم بنسبة (8%) باستعمال القدر نفسه من الموارد الإنتاجية. أما متوسط الكفاءة الاقتصادية والتقنية والتخصيصية بلغ (80%، 97%، 82%) على التوالي، إذ يُبين متوسط الكفاءة الاقتصادية ان مزارعي محصول الخيار بإمكانهم خفض تكاليف الإنتاج بنسبة (20%) وتحقيق مستوى الإنتاج نفسه. وتم تقدير كمية الفائض والعجز للموارد الاقتصادية الداخلة في العمية الإنتاجية وتبين بعض المتغيرات حققت عجزاً في الاستعمال واخرى حققت فائض في استعمالها للموارد وهذا يعزى الى سوء استعمال الموارد من قبل بعض المزارعين. واوصى البحث الى توعية المزارعين حول الكميات المثلى التي يجب استعمالها بصورة مثلى من خلال تقديم الدورات التدريبية والارشادية لهم وكذلك تقديم الدعم الحكومي لمستلزمات الإنتاج وخفض أسعارها، ودعم أسعار بيع المحصول.

الكلمات المفتاحية:
الكفاءة التقنية، الكفاءة التخصيصية، تحليل مغلف البيانات. محصول الخيار.