MEASURMENT ECONOMIC AND MARKETING EFFICIENCY FOR CUCUMBER GROWING IN GREEN HOUSES SHATRAH AT DHIQAR PROVINCE IRAQ DURING PLANTING SEASON 2017

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ABSTRACT

This study was aimed to measure the production efficiency, cost efficiency, profit-maximizing production level, and net income at actual, cost-minimizing, and profit-maximizing production, as well as to calculate the minimum priced accepted by cucumber producers to supply their products, estimate supply function for cucumber producers, estimate the marketing efficiency of cucumber grown in greenhouses. A random sample of 45 cucumber growers from Dhi Qar governorate, Al-Shatra district/ Iraq during the agricultural season 2017 was selected. Due to its harmony with economic and statistical logic, cubic formula was used to estimate the cost function. Results showed that the optimal production of cucumber was 59.54 tons, and the efficiency percentage at the actual production size was 0.53. Price elasticity was about 0.24 at the minimum price accepted by the producers (127.78 dinars) to supply their products. That means when the farm prices increase by 10%, the quantity offered in the market increased by 2.3%. Cost efficiency was 1.5, while profit-maximizing production size in short-term was 77.44 tons. The net income for actual, cost minimizing and profit maximizing production were 10725.4 dinars, 16471.99 dinars and 19189.7 dinars respectively. Furthermore, the study revealed a marketing efficiency of 91.6%, which is a good indicator for marketing performance. Based on these results, the study recommends for adapting a production policy aiming at optimizing the use of available resources and improving the efficiency of cucumber production.

Key words: cost function, supply function، net income, profit-maximizing production.

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قياس الكفاءة الاقتصادية والتسويقية لمحصول الخيار في البيوت البلاستيكية في الشطرة – محافظة ذي قار –العراق للموسم الخريفي 2017

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المستخلص

هدف البحث إلى قياس الكفاءة الإنتاجية وكفاءة الكلفة وتقدير حجم الإنتاج الذي يعظم الربح وصافي الدخل عند مستوى الإنتاج الفعلي والامثل المدني للتكاليف والمعظم للربح وحساب الحد الادنى للسعر الذي يقبل به المزارعون لعرض انتاجهم من محصول الخيار ،ودالة العرض لمنتجي الخيار قياس الكفاءة التسويقية لمحصول الخيار المُنتج في البيوت البلاستيكية . وقد تم انتخاب عينة عشوائية من مزارعي هذا المحصول في محافظة ذي قار – قضاء الشطرة للموسم الزراعي الخريفي للعام 2017 بلغت 45 مزرعة. تم تقدير دالة الكلفة باستخدم الصيغة التكعيبية لانسجام المعلمات المقدرة مع المنطق الاقتصادي والاحصائي . أظهرت النتائج ان كمية الانتاج المدنية للتكاليف قد بلغت 59.54 طن وان نسبة الكفاءة في انتاج المحصول قد بلغت 0.53% عند حجم الإنتاج الفعلي لعينة البحث، بلغت مرونة العرض السعرية نحو (0.24) عند الحد الأدنى للسعر الذي يقبله المزارعون (127.78 دينار) لعرض إنتاجهم ، وهذا يعني أنه عندما تزداد الأسعار المزرعية عن الحد الأدنى لها بنسبة (10%) تزداد الكمية المعروضة في الاسواق بنسبة (2.4%) اما كفاءة الكلفة قد بلغت 1.5، كما تم حساب حجم الإنتاج المعظم للربح في الاجل القصير الذي بلغ 77.44 طن، وتم تقدير صافي الدخل اعتمادا على حجم الإنتاج الفعلي والمدني للتكاليف والمعظم للربح الذي بلغ 10725.4، 16471.99، 19189.70 الف دينار على الترتيب، كما أوضحت الدراسة ان الكفاءة التسويقية لمحصول الخيار بلغت 91.6 % وهومؤشر جيد لمستوى الأداء التسويقي. على ضوء النتائج توصي الدراسة باتباع سياسة إنتاجية تهدف الى الاستخدام الأمثل للموارد المتاحة وتحسين كفاءة انتاج الخيار.

الكلمات المفتاحية: دالة الكلفة، دالة العرض، صافي الدخل، الإنتاج المعظم للربح.

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INTRODUCTION

Agricultural production in most countries of the third world is characterized by low productivity and high production costs for a number of reasons; the most important of which is the lack of optimal use of agricultural resources. Vegetable crops are of great interest to most farmers because of their short production time and the rapid profit they generate, when farmers overcome the problems facing the growing of these crops (27). At the economic level of the country, these crops have a great value as they are an important source of food for the essential nutrients, and contribute to increase the national income of the country due to their high returns. Cucumber (*Cucumis sativus L.*) is one of the most common vegetables in the world including Iraq despite its low nutritional value. In fact, more than 95% of cucumber is water. The other constituents include carbohydrate, proteins, vitamins, minerals, fatty acids, trace amounts of pectin, essential oil, steroids and treponoid (18). Cucumber contributes quite a bit in the agricultural economy in Iraq. Recently, it can be provided throughout the year as protected agriculture in greenhouses instead of former seasonal production. Protected agriculture is an important tool for agricultural production in terms of the use of scientific methods and technological equipment that ensure the availability of climatic conditions suitable for crop growth and development outside production times. After 2010, the State has encouraged farmers and investors to expand the production of vegetables in greenhouses through facilitating agricultural loans specialized in this area of agriculture, as well as the provision of many components of production such as fertilizers, seeds, covers, building structures, irrigation systems and other requirements. The number of greenhouses in Iraq in 2016 was 22169 house. The province of Dhi Qar ranked ninth with 625 houses with a relative importance of 2.8%. The total national production of cucumber from these houses within this year was 156 thousand tons, of which Dhi Qar ranked eighth with 6.850 thousand tons represented about 4.4% of the total production (19). The decline in the cultivation of vegetable crops, especially the cucumber crop was due to the high costs of production requirements, lack of experience regarding the diagnosis and pest control, and low productivity compared to optimal volumes of production, especially in greenhouses. The research is based on the hypothesis that the cucumber farmers in Dhi Qar province are making economic profits that enable them to expand their production. The research aimed at measuring production efficiency, cost efficiency, profit-maximizing production and net income at the actual production level and optimal cost-minimizing production as well as marketing efficiency of cucumber produced in greenhouses. Several previous studies have addressed this issue using the cucumber crop in different geographical locations (4, 7, 9, 17, 20).

MATERIALS AND METHODS

Data were obtained from field sources in Dhi Qar province for the autumn season of 2016 through the field survey carried out by the researcher according to a questionnaire prepared for this purpose. The study included a sample of 45 farmers representing 8% of the total farmers. The analysis was done using Eviews10, Excel

Descriptive Analysis of the Cost Components of Cucumber Production in Greenhouses Fixed and variable costs for cucumber farms were analyzed to elucidate each item in these costs (Table 1).

Table 1. Relative importance of fixed and variable costs from total costs of Cucumber planting season 2016 sample study

Total costs items	Total value (thousand dinars)	One greenhouse value (thousand dinars)	Relative importance %
Variable cost	8670.21	1734.04	62.80
Fixed cost	5135.9	1027.18	37.20
Total cost	13806.1	2761.22	%100

Source: calculated based on the questionnaire form

Table 2 shows the contribution of each variable cost items in the total cost. The highest cost for cucumber production in the greenhouses in the study sample is the rented work, representing 38.20% of the total variable costs, which is very high because the cucumber harvesting continue throughout the season. The cost of seeds was as high as 17.61% due to the high costs of imported seeds. The price of the envelope is $100- $150, with each envelope contains 500 seeds, and each greenhouse needs for an average of 3.5 envelopes.

Table 2. Relative importance of items of variable costs cucumber farm

Variable cost items	Total Value (thousand dinars)	One greenhouse value (thousand dinars)	Relative importance %
Rented labor	3312.02	662.40	38.20
Seeds(kg)	1526.54	305.31	17.61
Fertilizers	1205.16	241.03	13.90
Pesticides	1318.50	263.70	15.21
Automated work (day/house)	165.57	33.11	1.91
Other expenses	1142.42	228.48	13.18
Total variable costs	8670.30	1734.06	100%

Source: calculated based on the questionnaire form

Fertilizer (phosphate, organic, potassium and nitrogen) ranked third and accounted for 13.9% of total variable cost. Different fertilizers are used according to the age of the plant and the method of production (4). Fertilizers are usually added after the harvest operations. Therefore, the quantities of fertilizers are increased due to the length of the production season. Pesticides and other expenses (electricity, water, fuel, maintenance fees, Running water pumps, communications, municipal services fees, etc.), accounted for 15.21%. The cost of mechanical work represented 1.91%. Agriculture within households is not dependent on mechanical work, and it restricts to soil tillage at the beginning of the production season. Usually, a small hand machine is used, or in some farms, manual tillage is achieved.

Table 3. Relative importance of fixed costs items of cucumber crop

Fixed cost items	Total value (thousand dinars)	One greenhouse value (thousand dinars)	Relative importance %
Family labor cost	3389.69	677.94	66
Interest on invested capital	1129.89	225.98	22
Extinction	616.32	123.26	12
Total fixed cost	5135.9	1027.18	%100

Source: calculated based on the questionnaire

Fixed costs include family work, interest on capital and endowments. From the table (3), it can be noted that the fixed costs are low because there is no rent for the greenhouse. The family work is ranked first because the owner of the greenhouse and his family cultivate, harvest and service the crop. Regarding the cost of interest on capital, it is relatively high because of low financial capacity of most farmers and therefore they need for loans with consequent benefits. Finally, endowment came as the last item in fixed costs. Table 4 indicates that the average marketing costs for crop in the research sample amounted to about 1270 thousand dinars. So the average cost of a house is 234 thousand dinars, and by classifying these costs to the different marketing cost sections, it is clear that the cost of collection, packaging, transportation and agents' commissions accounted for 13.78%, 33.07%, 35.43% and 17.72% respectively of the total marketing costs (11). This indicates a higher percentage of transport compared to the rest of the items.

.Of note, marketing costs are not within production costs (24).

Table 4. Relative importance of marketing costs items of cucumber crop

Cost	Total value(thousand dinars)	One greenhouse value (thousand dinars)	Relative importance %
Collection	**175**	**35**	**13.78**
Packaging	**420**	**84**	**33.07**
Transportation	**450**	**90**	**35.43**
Commission	**225**	**45**	**17.72**
Total	**1270**	**234**	**100%**

Source: calculated based on the questionnaire.

RESULTS AND DISCUSSION

Econometric Estimation of Production Cost Function for Cucumber Produced in Greenhouses: This part of the study deals with cost function analysis, which is an important economic criterion that measures the economic and technical efficiency levels of agricultural projects. Through this analysis, the optimal production level at minimum level of cost, and economic production level, which maximizes the profit, were estimated and compared with actual production for the study sample. To achieve this objective, the relationship between the total costs for farm, as a dependent variable, with the total output of the cucumber in tons, as an independent variable, was measured. Several models were used for estimation of this relationship (linear, quadratic, and cubic). It was found that the cubic model was the most suitable model for the relationship in this study because of its consistent with econometrics, and economic tests (12). Based on the economic theory, the short-run total cubic cost function using the OLS method has taken the following formula (5):

$$c = a_o + b_1 Q + b_2 Q^2 + b_3 Q^3 + ui$$

According to test (t), the estimated parameters were found to be significant at 1% and 5%, and the value of the determination factor was 0.92 (table 5). This implies that the total production accounts for about 92% of the changes in the production costs of the cucumber, while the remaining changes (8%) are attributed to other factors not included in the mode (15). Studying the overall significance of the model reveals that calculated F value was 168; significant at 1% level, which is a proof that the model has a high statistical significance, and the explained variables within this model have an effect on the cost function.

Table 5: Estimation of cost function of cucumber

Dependent Variable: TC
Method: Least Squares
Date: 03/21/18 Time: 10:05
Included observations: 45

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1486.452	755.11030	1.968523	0.0758
Q	403.2202	47.59639	4.686268	0.0000
Q^2	-9.652302	4.281860	-2.254231	0.0026
Q^3	0.084586	0.001604	2.157824	0.0369

R-squared	0.924923	Mean dependent var	4213.356
Adjusted R-squared	0.919429	S.D. dependent var	6429.505
S.E. of regression	1825.011	Akaike info criterion	17.94125
Sum squared resid	1.37E+08	Schwarz criterion	18.10184
Log likelihood	-399.6781	Hannan-Quinn criter.	18.00111
F-statistic	168.3685	Durbin-Watson stat	1.828612
Prob(F-statistic)	0.000000		

Source: Calculated using Eviews.10

In order to demonstrate the efficiency of the estimates, the standard tests were carried out through the estimated model (Table 6). The results indicated that the model exceeded all econometrics tests such as lacking of autocorrelation using the LM test with a probability value of 0.8505 for two lag periods. Accordingly, the null hypothesis that the model free of auto-correlation is accepted (14). Breusch-Pagan-Godfrey test revealed that the model is free from heteroscedasticity at 0.0845 probability for two lag periods. The results of Ramsey RESET Test reject the hypothesis that there was a problem of error in model determination, and the estimated function could be used to derive the long-run cost function

Table 6. Diagnostic tests

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.141382	Prob. F(2,39)	0.8686
Obs*R-squared	0.323917	Prob. Chi-Square(2)	0.8505

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	4.741103	Prob. F(3,41)	0.0063
Obs*R-squared	11.59019	Prob. Chi-Square(3)	0.0845
Scaled explained SS	117.5361	Prob. Chi-Square(3)	0.0000

Ramsey RESET Test
Equation: TC
Specification: TC C Q Q^2 Q^3
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	4.783548	40	0.0000
F-statistic	22.88233	(1, 40)	0.0000
Likelihood ratio	20.35736	1	0.0000

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	49692019	1	49692019
Restricted SSR	1.37E+08	41	3330667.
Unrestricted SSR	86865314	40	2171633.

LR test summary:

	Value
Restricted LogL	-399.6781
Unrestricted LogL	-389.4994

Source: Calculated using Eviews.10

The Production Size for Economic Efficiency

Economic efficiency is the base for achieving a maximum possible output at a minimum cost, and can be measured either by equalizing the marginal cost with the average total cost at its lowest point or by finding the minimum end of the average total cost function (8). In this study, however, it was obtained by finding the minimum end of the average total cost function by deriving the first function differential and equalizing it with zero, as follows:

$$TC = 1486.453 + 403.2202Q - 9.652302Q^2 + 0.084586Q^3 \ldots\ldots(1)$$

$$ATC = \frac{TC}{Q} = 1486.452Q^{-1} + 403.2202 - 9.652302Q + 0.084586Q^2 \ldots\ldots(2)$$

$$ATC = \frac{\partial SRATC}{\partial Q} = -1486.452Q^{-2} - 9.652302 + 0.169172Q \ldots\ldots(3)$$

Multiply equation 3 by Q^2 results that:

$$-1486.452 - 9.652302Q^2 + 0.169172Q^3 = 0 \ldots\ldots(4)$$

The approximation method was adapted to obtain the volume of production (20)**,** which minimizes the average total cost, i.e., reaching the achieved productivity efficiency (the optimal production level) by 59.54 tons keeping in mind that the actual production of the sample was 57.06 tons. This was indicated by the economic index (the cost elasticity) which results from dividing the marginal cost of 127.90 dinars on the average production cost of 242 dinars that amounted to 0.53 at the actual production rate of the sample research. Such result confirms that the production of the cucumber is subjected to increased yields, which means that a relative increase in production is achieved at a relatively lower cost. This implies that the production occurs in the first stage of production function (1), which reflects the need for more efficient use of productive resources and improved efficiency of cucumber production. Furthermore, cucumber production process still far away from the level that can maximizes the farmer's profit. Thus, there is a need for a vertical expansion in the production of this crop (6).

Measuring the Technical Efficiency of Cucumber Production

Technical efficiency, in general, means the production of as much as possible net output using a certain amount of resources, or achieve the same amount of output with the minimum possible resources. Technical efficiency can be measured as follows(13).

Technical Efficiency = (Actual Output / Optimum Output) * 100

= (57.06 / 59.54) * 100 = 0.95%

It is evident by measuring technical efficiency that about 5% of the economic resources have not been optimally exploited.

The Prodduction Size that Maximizes Profit

The maximum profit can be found when the marginal cost is equal to the price (5):

$$MC = P$$

$$MC = \frac{\partial TVC}{\partial Q} = 403.2202 - 19.3046Q + 0.253758Q^2 \dots\dots (5)$$

Note that the average price of cucumber is about 430 dinars/kg:

$$403.2202 - 19.3046Q + 0.253758Q^2 = 430 \dots\dots\dots\dots (6)$$

Constitution approach was used to solve this quadratic equation according to the following formula:

$$\boldsymbol{Q = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}}$$

For a=0.253725, b=-19.3046, c= 403.2202:

$$\boldsymbol{Q = \frac{-(-19.3046) \pm \sqrt{(-19.3046)^2 - 4 * 0.253725 * 403.2202}}{2 * 0.253725} = 77.44\ ton}$$

It was found that the level of profit-maximizing output reached about 77.44 tons, which is more than the average production size of 59.54 tons by 17.9 tons.

The Minimum Accepted Price By Cucumber Growers To Supply Their Crop.

This price (which equals the lowest point of average variable costs) is determined according to the following steps:

Total variable cost function is derived from the total cost function (7) as follows:

$$TVC = 403.2202Q - 9.65230Q^2 + 0.084586Q^3 \dots\dots\dots (7$$

The equation (8) is divided by the production Q to obtain the average variable cost function:

$$AVC = 403.2202 - 9.65230Q + 0.084586Q^2 \dots\dots\dots (8)$$

Production size at the lowest point of average variable cost is calculated by taking the first differential of equation (9) for production and equalizes it to zero as follows (26):

$$\frac{\partial AVC}{\partial Q} = -9.65230 + 0.169172Q = 0 \dots\dots (9)$$

The production size which minimizes the average variable costs was estimated from equation (8) to be 57.06 tons Substitution this value in the average variable cost function results in minimum price accepted by cucumber growers which is 127.78 thousand dinars, and this is the minimum price at which the producers sell their products or continue to produce cucumber according to the economic logic.

Supply Function For Cucumber Producers:

In order to determine the reaction of cucumber

producers to the possible change in price, supply function should be derived via equalizing the marginal cost with the production price i.e. supply function is derived from the necessary condition of the profit function as follows (3):

$\pi = TR - TC$

$\frac{\partial \pi}{\partial Q} = P - \frac{\partial LRTC}{\partial Q} = 0$

$P = LRMC$

Substitution of marginal cost equation in

Price(dinars/tons)	Supplied quantity	Price elasticity
127.78	57.04	0.24
130	57.28	0.22
150	59.23	0.23
170	61.01	0.23
190	62.67	0.23
210	64.22	0.24
230	65.68	0.23

supply above supply equation:

$403.2202 - 19.3046Q + 0.253758Q^2 = P \ldots\ldots (10)$

$0.253758Q^2 - 19.3046Q + 403.2202 - P = 0 \ldots\ldots (11)$

This equation can be solved by constitutional approach and the resultant equation (12) represents the long-term supply of cucumber :

$S = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ *for a= -0.253758 b=19.3046 c=P-403.2202*

$S = \frac{-19.3045 \pm \sqrt{(-19.3045)^2 - 4(0.253758)(403.2202 - P)}}{2(-0.253758)} \ldots$

….. if P≥127.78

$S = 0$

if P ≤127.78

To determine farmers' response to different price levels based on the estimated supply function, different price levels were assumed as shown in table (7), from which the supply curve can be plotted for sample farmers in the long-term as shown in Fig1.

Table7. Quantities of cucumber yield and price supply elasticity for farmers of the research sample

Source: Based on the long-term supply function

The Price supply elasticity was calculated according to the following relationship (1):

$$\varepsilon s = \frac{\partial Q_S}{\partial P} * \frac{P}{Q}$$

The price elasticity of supply is about 0.24 at the minimum price accepted by farmers to supply their production. So when farm prices increase from their minimum level by 10%, the quantity supplied to the market increases by 2.4 %. Generally, the price supply elasticity is low which means that producers' supply decisions are not only due to changes in crop prices, but also to other factors affecting the decision, such as the risk of price fluctuations, environmental conditions, access to production resources, etc.(10).

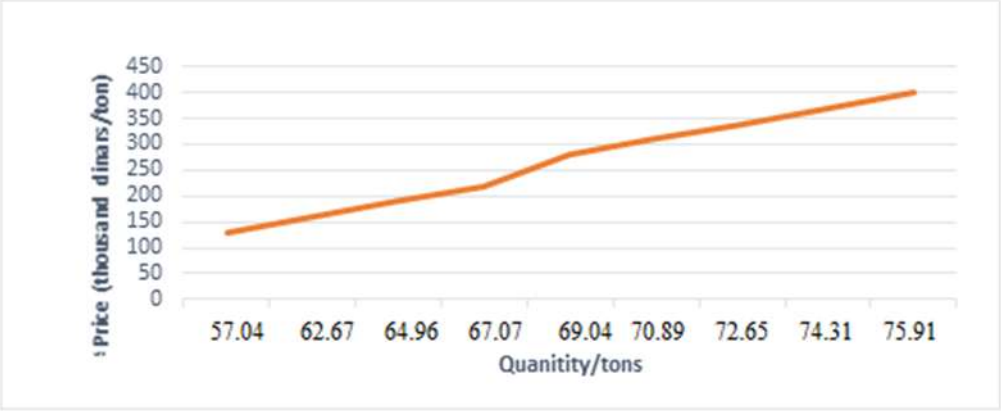

Figure 1. Cucumber long-run supply curve

Source: From the work of the researcher depending on the Excel, program

Elasticity Cost

Elasticity costs can be found by dividing the marginal cost on the average total cost of the cucumber at cost-minimizing productive level which is 57.06 tons and the profit-maximizing production level which is 77.44 tons as follows

:$\boldsymbol{MC = 403.2202 - 19.304Q + 0.253758Q^2 \ldots\ldots (13)}$

$\boldsymbol{MC = MC = 403.2202 - 19.304(57.06) + 0.253758(57.06)^2 \ldots\ldots (14)}$

MC = 127.896

$$\boldsymbol{SRATC = \frac{1486.452}{Q} + 403.2202 - 9.652302Q + 0.084588Q^2 \dots\dots(15)}$$

$$\boldsymbol{SRATC = \frac{1486.452}{57.06} + 403.2202 - 9.652302(57.06) + 0.084588(57.06)^2 \dots\dots(16)}$$

SRATC =153.921

$$\boldsymbol{EC = \frac{MC}{ATC} = \frac{127.896}{153.921}}$$

EC = 0.82

That means a 83% increase in cost results in a greater increase in production, which implies that the production of these farms are subjected to increased yield.. At the profit-maximizing production level of 77.44 tons, the cost elasticity will be :

EC = MC/ATC =430.04693/182.21129 =2.360

So, at the profit-maximizing production level of 77.44 tons, a relative increase in production can be achieved with a relative increase in costs. This implies that the production of these farms is subjected to the decline in yields.

Cost Efficiency of of Cucumber

Cost efficiency can be obtained by dividing TC at actual production level on TC at optimal production level, and calculated according to the following formula (21):

$CE = \left(Ci^{bi} \div Ci^{min}\right)$

Where:

CE: cost efficiency

Ci^{bi}: TC at actual level

Ci^{min}: TC at optimal production level$CE = \frac{13806.1}{9130.21} = 1.5$

Cost efficiency may take more or less than the correct one. It is achieved when it takes the correct one value (26). Cost efficiency has reached 1.5, which indicates that the crop did not achieve the required level

Estimation of Net Income

The study involved the calculation of some economic indices such as net income for three production levels (actual, optimal and profit maximizing) depending on profit equation (2). These levels were respectively found to be 57.05, 59.54 and 77.44 keeping in mind that 430 thousand dinars is the price of cucumber(16) (equation 17).

$\pi = TR - TC - - - \pi = 430 * Q - (1486.453 + 403.2202Q - 9.652302Q^2 + 0.084586Q^3) \dots\dots(17)$

The net estimated income from this substitution were19189.70, 16471.97 , 15750.72 thousand dinars respectively, which suggest that the profit achieved at the actual average is decrease by about 721.26, 3438.99 thousand dinars from its estimated counterpart at both the optimal and profit-maximizing production, respectively. Accordingly, the economic indices can be summarized in Table 8.

Table 8. Economic indicators of Cucumber crop. Source: calculated based on the estimated costs and the profit function

Index	Total Product			One greenhouse product		
	Actual product	Optimal Production size	Product max. Profit	Actual product	Optimal Production size	Product max. Profit
Product size (tons)	57.06	59.54	77.44	11.41	11.91	15.49
Total revenue (thousand dinars)	24531.5	25602.2	33299.2	4906.30	5120.44	6659.84
Total costs (thousand dinars)	13806.1	9130.21	14109.50	2761.22	1826.44	2821.90
Net profit (thousand dinars)	10725.4	16471.99	19189.70	2145.08	3294.40	3837.94
Average total costs (thousand dinars / ton)	242	153.34	182.20	48.4	30.67	36.44
Return dinar	1.78	2.80	2.36	0.36	0.56	0.47
Profitability efficiency	0.78	1.80	1.36	0.16	0.36	0.27

It is clear from the above table that the highest net income is achieved by the farmer at profit-maximizing level which was 19189.70 thousand dinars, but the cost-minimizing production level is characterized by producing the ton at the lowest cost compared to other

levels, the average cost optimum production level was 153.34 thousand dinars/ton, profit-maximizing production and actual production was 182.20, 242 thousand dinars / ton respectively. For dinar return index, it is shown that for each thousand dinars spent on the actual, profit-maximizing, and optimal production achieves a relative increase of 0.78, 1.36 1.80 respectively. The level of profitability of cucumber, which can be measured by dividing the net income (profit) on total production costs (22) it has been found that the optimum production size is more efficient compared to actual production and profit-maximizing. One dunum contains 5 greenhouse each with 494 m^2. The remaining area is for the purposes of the services. Thus, an actual production of 11.41 tons of cucumber in the single greenhouse is achieved with a total revenue of 4906.30 thousand dinars, a total cost of 2761.22 thousand dinars and a net profit of 2145.08 thousand dinars. Many factors contribute to increase in the percentage of total production in a greenhouse: the use of seeds with abundant production, scientific methods of soil exchange and fumigation in order to get rid of the fungus and bacteria, which hamper the cultivation of this crop.

Measuring Marketing Efficiency

Marketing efficiency is one of the most important economic criteria used to measure the performance of the market. Improving marketing efficiency is a common goal for all producers, consumers and marketing firms for agricultural food commodities and the society in general. It can be estimated according to the following formula (10):

$$ME = 100 - \left(\frac{MC}{MC + PC}\right) * 100$$

ME: Marketing efficiency

MC: Marketing costs:

PC: Total production costs

Thus, there is a concept that connects the productive and marketing activities through the costs. When marketing costs equal production costs, the marketing efficiency is 50% and it less than that if the marketing costs are greater than the production costs. If the marketing efficiency is more than 50%, this means that the marketing costs are less than the production costs (23). It should be noted that the production and marketing costs of the research sample were 13806 thousand dinars, 1270 thousand dinars, respectively. Then, the marketing efficiency of cucumber can be calculated as follows:

$$ME = 100 - \left(\frac{1270}{1270 + 13806}\right) * 100$$
$$= \%91.6$$

This can be considered a good indicator of the marketing performance of this crop, which means that the marketing costs afforded by farmers less than the production cost. That is because most farmers sell their production in their places of residence for traders as there are no marketing centers receiving these products and the traders afford most of the marketing costs and control the prices of the crop (10). From the aforementioned results, it can be concluded that the economic resources used in the production process have not been effectively exploited, resulting in low production efficiency and higher crop production costs. Through the calculation of a price that achieves the optimum production volume (430 dinars / kg) and comparing it with the average final consumer price (800 dinars / kg), it seems that the final consumer price is rewarding for trader and achieves economic profits that encourages farmers to continue and expand their production. The low price elasticity is due to farmers' reluctance to cultivate cucumbers due to low prices due to the competition of the imported cucumber. It has been shown by measuring the marketing efficiency that the marketing costs afforded by the farmers are less than the production costs. That is because most farmers sell their production in their places of residence for traders as there are no marketing centers receiving these products and the traders afford most of the marketing costs and control the prices of the crop. The study recommends adopting a production policy aimed at increasing economic efficiency and optimizing the use of available resources, as well as establishing agricultural plans and price policies for cucumber, and developing the marketing system to alleviate the burdens of farmers. Loans should be facilitated and the guarantees required for obtaining loans should be as easy as possible in order to increase crop growth in greenhouses

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