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RESEARCH ARTICLE

ECONOMICS OF CUCUMBER PRODUCTION UNDER PROTECTED AGRICULTURE IN BABYLON PROVINCE – IRAQ

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ABSTRACT

Protected agriculture is considered from the modern agricultural techniques that help increase production and fill the food gap, it provides crops in non off-season traditional, reduce losses resulting from the change in climatic conditions, Production early seedlings for exposed planting, produce good quality crops, reduce allocated area to cultivation the same crop compared with the exposed agriculture, and rationalization of irrigation water consumption. Because the style of protected cultivation of vegetable crops, including cucumber began receiving acceptance from farmers and increasingly support from the agricultural institutions in Iraq , so such style of agricultural production need to an economic evaluation .The aim of this study is to identify: costs of cucumber Production in protected agriculture, economics of cucumber Production in protected agriculture, and factors affecting the revenues of protected agriculture for cucumber. The study was conducted on a sample of (20) from owners of greenhouses in three regions : Al Talieah, AL Qasim and western Hamzah. The results showed that the average number of greenhouses (3.6 house), labor wages costs is the highest among the costs of production (36.8%), the average profit of the farms surveyed (24333 thousand dinars) it's good profit, compared with average costs (11990 thousand dinars), the farms protected class (5-6) house is the best in terms of economic criteria especially coefficient of profitability, return on costs and net profits.

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INTRODUCTION

Demand for vegetable crops is increasing day by day due to population growth, increased income and improved nutritional awareness. Which requires work to increase the production of these crops, increase agricultural production comes from three main sources: The expansion of the arable land area, intensive agriculture and Productivity Improvement (FAO, 2003) With little or no possibility of expansion of the arable land area , intensive agriculture still the best option to achieve the required increase in agriculture production . That any increase in agricultural production in the future needs to be done on the existing land area by intensifying sustainable production processes that use of land and water resources effectively and do not cause her any harm (FAO, 2011). So attention tended to maximize production per unit area, and this could be achieved through: create of new varieties of plants, changing the method of cultivation of certain crops, and to provide new production conditions or control those conditions. Protected agriculture is considered from the modern agricultural techniques that help increase production and fill the food gap, it provides crops in non off-season traditional, reduce losses resulting from the change in climatic conditions, Production early seedlings for exposed planting, produce good quality crops, reduce allocated area to cultivation the same crop compared with the exposed agriculture (ICARDA, 2005). In addition to rationalization of irrigation water consumption and increase the productivity of water, it was found that the productivity of water (kg / m^3) of p cucumber and tomato in protected cultivation in the Sultanate of Oman amounted to (9.8, 4.6) compared with (4.6, 2.1) in open agriculture (ICARDA, 2011).

Scientific studies have shown that protected agriculture leads to double agricultural output per unit area, it was found that the productivity per acre of cucumber in greenhouses in Sudan amounted to (45 tons) compared with (4.5 tons) in convertible agriculture (Taha, 2010). With the use of best agricultural technologies very large increases occur in production, (Pozderec *et al*., 2010) noted that the productivity of cucumber and pepper in greenhouses reached (300, 150 t / ha) compared with (60, 40 t / ha) in exposed agriculture respectively. Agricultural production costs in greenhouses generally larger than that in open agriculture, (Pozderec *et al*., 2010) found that costs production of cucumber and pepper in protected agriculture amounted to (113939, 109109 euro / ha) compared

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with (34948, 27320 euro / ha) in exposed agriculture respectively. While Profits realized from protected agriculture increase exponentially for convertibles agriculture, (Cantliffe *et al*., 2008) noted that the profit realized from cucumber cultivation in greenhouses has reached (72775 $/acre) compared (5620 $/ acre) for exposed agriculture.

Cucumber is one of vegetable crops with a high nutritional value, its fruit desirable from Iraqi consumer, it is consumed fresh or used to make marinades what making demand for cucumber continuously throughout the year. So we note cucumber cultivation spread in greenhouses , this style of agriculture are often twice a year in spring and autumn either in tunnels or plastic or glass houses. Due to the fact that the style of protected cultivation of vegetable crops, including cucumber began receiving acceptance from farmers and increasingly support from the agricultural institutions in Iraq, so such style of agricultural production need to an economic evaluation to know the costs of cucumber Production in protected agriculture, economics of cucumber Production in protected agriculture, and factors affecting the revenues of protected agriculture for cucumber.

There are many studies on the economics of protected agriculture. In Turkey (Engindeniz, 2002) found that the fixed costs accounted (64.5%) while variable costs (35.5%) including: standardization and certification (10%), labor (9%), seeds (5%). (Engendeniz & Engendeniz, 2006) also found that the fixed costs accounted for (18.68%) of the total costs while variable costs (81.32%)which include fertilizers (25.78%), seeds (21.10%), labor (21.09%), pesticides (11.72%). (Engindeniz & Ayse, 2009) found that the fixed costs amounted to (60.9%) and variable costs is (39.1%) included: labor (9.9%), fertilizer (8.6%), control (8.5%), seeds (6.2%), energy (4.2%), marketing (1.7%).

In Pakistan (Khan, *et al*., 2011) found that fixed costs accounted (51%) of the total costs and variable costs accounted (49%) ,this included: seeds (17%), fertilizer (8%), irrigation (7 %), energy and fuel (4%), mechanization (3%), marketing (3%), labor (2%), pesticides (2%), plant nutrients (1%), the installation of the structure (1%), Packaging (1%). In Alberta (Late, 2013) noted that fixed costs accounted (11.5%) and variable costs (88.5%), which included labor cost (34.6%), marketing (17.3%), seeds (11%), fertilizers (8 %), the creation of soil (7.5%), pesticides (5.2%), irrigation (2.6%), energy (2.3%).

In Saudi Arabia (Abdulkader, 2004) said that fixed costs accounted for (14.2%) and variable costs (85.8%) which included marketing (24.6%), labor (17%), fertilization (11.9%), seeds (10.7%), maintenance (10.3%), pesticides (6%), water (3.1%), energy (2.2%). The International Center for Agricultural Research in the Dry Areas (ICARDA, 2011) noted that the variable costs of cucumber production in agriculture protected in the Sultanate of Oman consists of the preparation of the ground (3%), manure (8%), seeds (11%), maintenance (11%), chemical fertilizer (12%), irrigation (14%), control (19%), Genie and marketing (22%). In India, (Sanjeev *et al*., 2015) noted that the fixed costs of cucumber production in protected agriculture accounted (38%) of the total costs and variable costs (62%), which include labor cost (31.5%), seeds (14.3%), fertilizers (4.7%), packaging (2.3%).

Study Objectives

The general objective of the study was to study economics of cucumber production under protected agriculture conditions in Babylon province – Iraq. The specific objectives of the study were to;

1: Study costs of cucumber Production in protected agriculture.
2 : Study the economics of cucumber production in protected agriculture using the following criteria (Colli *et al*., 1998) :

1. Net income by finding the difference between total revenue and total variable costs.
2. Net profit by finding the difference between total revenue and total costs.
3. Profitability coefficient (used to measure the profitability of the farm)its standard illustrates the extent to which cost coverage and whether there is an economic surplus, its calculated by dividing the total revenue on total costs
4. Return on costs (One of the farm profitability standards) calculated by dividing the net profit on the total costs, and increase the value of this standard indicates the efficiency in achieving a good profit.
5. Percentile productivity Profitability, calculated by dividing the economic profit on total costs multiplication in a hundred
6. Operating ratio, one of farm economic efficiency standards, calculated by dividing the total costs on total revenue. If the result lower than one, it indicated to the economic efficiency and the ability to repay the cash and non-monetary obligations for productive process.
7. Return on revenue: one of the administrative efficiency standards, when value increase It indicates the administrative capacity to lower costs or increase production , which represents the farm's ability to bear the burdens of increased costs in production requirements for some reason Or carry the risk of lower prices, and is calculated by dividing the net profit on the total revenue.

3. Study factors that affecting on protected agriculture revenues for cucumber.

MATERIALS AND METHODS

The study was conducted in Babylon province, which located in central Iraq and includes four districts namely Hashimiya, Hilla, Mahawil and Musayab. Three regions of Al Hashimiya district was purposively conducted namely, Al Talieah, AL Qasim and western Hamzah, where there are 80 protected farms for cucumber production. 50% of the farms in each region were randomly selected. In all, 20 farms formed the sample size and 20 of cucumber growers were personally interviewed during the months of November-December, 2014. Data was obtained in use of well structured questionnaires designed in line with the objective of the study; these data covered some socio-economic characteristics of cucumber growers, costs of production and returns. Data were analyzed using descriptive statistics (frequency, percentages and

average), farm budgeting model (Net farm income) and multiple regression model.

RESULTS AND DISCUSSION

1: Characteristics of respondents

It shows in Table 1 that majority of the farmers (40%) were from Al- Talieah, followed by those from Al-Qasim (35%), while only (25%) of them were from western Hamzah. Table 1 reveals that 10% of the respondents had secondary school education, 25% of the respondents had institute education, and 65% had university education. The number of greenhouse in the farm reflected in Table 1, indicates that 20% of the respondents had (1 – 2) greenhouse, 55% had (3 – 4) while 25% had (5 – 6) greenhouse, the mean greenhouse in farm was (3.6). As indicated also, most of cucumber producers (45%) had between (1-3) years of farming experience, (40%) had between (4- 5) years, (15%) had (6 – 7) years of experience, the mean years of cucumber production experience was 4.1 years

Table 1. Characteristics of respondents (n = 20)

Characteristic	Ca	N	%	Characteristic	Ca	N	%
Region	AL- Talieah	**8**	**40**	Education level	Secondary	**2**	10
	Al-Qasim	**7**	**35**		Institute	**5**	25
	Western Hamzah	**5**	**25**		University	**13**	65
	Total	**20**	**100**		Total	**20**	100
Number of greenhouses	1 – 2	**4**	**20**	Years of	1 - 3	**9**	45
in the farm	3 - 4	**11**	**55**	experience in	4 - 6	**8**	40
	5 - 6	**5**	**25**	protected	7 - 9	**3**	15
	Total	**20**	**100**	agriculture	Total	**20**	100
	Average number of houses per farm =3.6				Average Years of	Experience = 4.1	

Table 2. Average costs according to the categories of greenhouses number per farm (thousand dinars)

Greenhouse number / Costs type		Category 1		Category 2		Category 3		Total	
		Amount	%	Amount	%	Amount	%	Amount	%
variable costs	Soil preparation	410	4.6	650	5.5	800	5.2	620	5.2
	Seeds	760	8.7	1150	9.7	1600	10.5	1170	9.8
	Pesticides	650	7.4	900	7.6	1250	8.2	933	7.8
	Fertilizers	450	5.1	650	5.4	900	5.9	667	5.6
	Irrigation cost	250	2.9	300	2.5	400	2.6	317	2.6
	wages of labor	3500	39.9	4500	37.8	5250	34.3	4417	36.8
	electricity and fuel	250	2.9	350	2.9	450	2.9	350	2.9
	Marketing	2000	22.8	2450	20.6	3200	20.9	2550	21.3
Total variable costs		8270	94.3	10950	92.0	13850	90.5	11024	92.0
Fixed costs	House cover (plastic)	350	4.0	750	6.3	1100	7.2	733	6.1
	Irrigation system	150	1.7	200	1.7	350	2.3	233	1.9
Total Fixed costs		500	5.7	950	8.0	1450	9.5	966	8.0
Total costs		8770	100	11990	100	15300	100	11990	100

2: Costs production

Results in (Table 2) showed that variable costs represented a (92%) while the percentage of fixed costs (8%) from costs of cucumber Production in protected agriculture. The variable costs include wage labor (36.8%), marketing (21.3%), seeds (9.8%), fertilizers (7.8), pesticides% (5.6%), soil preparation (5.2%), energy (2.9%) and irrigation cost (2.6%). While fixed costs include house cover (plastic) (6.1%) and iirrigation system (1.9%). Results also showed that the third category in terms of greenhouses number in farm came in first rank of total production costs which amounted to (15300 thousand dinars), followed by the second category (11900 thousand dinars), then the first category (8770 thousand dinars.

3: The economics of production

Results in Table (3) show the averages of revenues, costs production and profit (thousand dinars) for the categories of greenhouses number per farms and the total farms, the third category achieved the highest average revenue (35700 thousand dinars), and the highest average profit (20400 thousand dinars).

Table 3. Averages of revenues, costs and profits, according to the categories of greenhouses number per farm (thousand dinars)

Categories Type	Average first category	Average second category	Average third category	Average all farms
Revenues	13500	23800	35700	24333
Costs	8770	11900	15300	11990
Profits	4730	11900	20400	12343

4: Economic efficiency standards

Economic standards and indicators used to judge the production efficiency in cucumbers protected farms are: net income, net profit, profitability coefficient, return on costs, Percentile productivity Profitability, operating ratio and return on revenue. It appears from results in Table 4 that farms in third category (5-6 house) are the best in all the standards, was achieved the highest net income (21850), the highest net profit (20400), the highest profitability coefficient (2.33), the highest return on costs (1.43), the highest percentile productivity profitability (133.3), the highest return on revenue (0.57) and

the lowest in ooperating ratio (0.43). Followed by the second category (3- 4 house), while the first category (at least in terms of the number of houses (1-2 house) are the lowest in terms of economic standards.

Table 4. Economic evaluation standards for the surveyed farms

Standard	First category	Second category	Third category	Total
Net income	5230	12850	21850	**13309**
net profit	4730	11900	20400	12343
Return on invested dinar (profitability coefficient)	1.54	2.0	2.33	2.03
return on costs	0.60	1.08	1.43	1.11
Percentile productivity Profitability	53.93	100	133.3	102.9
Operating ratio	0.65	0.50	0.43	0.49
Return on revenue	0.35	0.50	0.57	0.51

5 - Factors affected on protected agriculture revenues for cucumber

Multiple regression analysis was used to determine the factors affecting on protected agriculture revenues for cucumber, the analysis included revenue (Y) as a dependent variable, and the number of greenhouses (X1), education level (X2), years experience in protected agriculture (X3), seeds costs (X4), fertilizers costs (X5), marketing costs (X6), labor wages (X7), pesticide costs (X8) as independent variables ...

$$Y= a + b_1 x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_6 + b_7x_7 + b_8x_8$$

The result was as follows

$$Y = 10.734 + 0.214x_1 + 0.116x_2 + 0.163x_3 + 0.058x_4 - 0.039x_5 - 0.120x_6 - 0.248x_7 - 0.027x_8$$ *(8.315) *(4.175) *(3.415) (2.864) (0.319) (- 0.420) (- 1.174) *(4.852) (- 0.518)

$R = 0.951$ $R^2 = 0.904$ $F = 26.319$

It is clear from the results that (95%) of the variance in protected agriculture revenues for cucumber in Babylon province, is due to independent variables above and left of it (5%) due to the random variables not included in the study. Eestimations coefficients of three variables (number of greenhouses, education level, years of experience) with a positive signal, which means that any increase in these variables lead to an increase in protected agriculture revenue for cucumber, while the estimations coefficients for the remaining variables was a negative, which means that any increase in the values of these variables followed by a decrease in protected agriculture revenue for cucumber. The result also showed that the estimations coefficients for the number of greenhouses, years experience, education level and labor wages was a significance at (0.05) level, and regression analysis model is significant at the same level, which means it can be used to determine the factors affecting on protected agriculture revenues for cucumber.

Conclusion

1. Limited number of greenhouses in the protected farms in Babylon province, where the average number of greenhouses (3.6).
2. The wage labor cost are the highest among the production costs, which accounted for (36.8%), followed by cost of marketing (21.3%), seeds (9.8%), fertilizers (7.8%), pesticides (5.6%).
3. The average profit of cucumber Farms protected (24333 thousand dinars), which is a good profit, compared with average costs of production (11 990 thousand dinars).
4. The protected farms within (5-6 greenhouses) are the best in terms of economic standards such as profitability coefficient, return on costs and net profit.

Recommendations

1. Encourage investment in protected agriculture projects by offering possible facilities.
2. Organizing training courses and seminars on protected agriculture, how to conduct studies analyzing production economics and the optimal methods to raise farm productivity.

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