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**Estimation of greenhouse unit's efficiency for planning sustainable
culture pattern
(The case study: Zabol city, Iran)**

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Abstract

Iran due to specific climatic conditions and water restriction is a country that requires substantial revision in the structure of culture and development; in this regard greenhouse cultivation can be presented as a suitable way. In this study the technical efficiency units of cucumber greenhouse in Zabol and the following sections were calculated using data envelopment analysis and application of linear programming models. Data needed to complete the study questionnaire 42 cucumbers greenhouse units were collected in the city of Zabol. Results showed that the average efficiency of Zabol city was equal to 71 percent. Technical efficiency was estimates equal to one for 38 percent of the greenhouses, too. Greenhouse technical efficiency in subsectors of Zabol (Shibab, central, Miankangi and Postab) was 88, 81, 64, 50 percent, respectively.

Keyword: *Technical Efficiency, DEA, Cucumber Greenhouse, Zabol*

Introduction

Data Envelopment Analysis (DEA) is a linear mathematical technic. In this method group efficiency from units of under study was evaluated via a multiple groups from variables of input and output. In DEA was determined special mark for each special group from variables of input and output. In this method, efficient border was determined as empirical. Then units that were set on efficient border are efficient units, and units that weren't set on this border were introduced as no efficient units.

Population growth and increase of per head consumption have high correlation with level of income and society person leave, so that these two subjects are very important to supply food requirements especially in developing countries such as Iran. So in Iran there is high important for use of suitable and effective from limited resources of water, soil and human labor power. On the other hand in Iran there are problems in agriculture because of limitation of sugar water and various weather conditions. So technology of greenhouse crops production in Iran with due attention to drought climate of it lead to increase of considerable in effective use of limited water and soil resources.

Much study has done on technical efficiency and greenhouse culture pattern, inside and outside of Iran country so far. In part of extraterritorial studies, Pena (2005) I a research with tittle of greenhouse crops production, economic notices, marketing and financial stock exchange has studied production economic analysis of some greenhouse crops in USA. Valdier et al, (2003)studied economic evaluation of tomato cultivation in cultures of 1 and 2 rows. The results of research showed that tomato yield in groups with distances of 10 cm between rows 10% more than groups with distances of 30 cm between rows. Also in Iran, Seyedan(2005) studied economic evaluation of greenhouse culture of tomato and cucumber in Hamedan province. In this research much attention to water deficit in this province has became. Also GharehBaghi and GharehBaghi (2005) studied advantages of greenhouse cucumber production than cucumber production in farm. They reported that cucumber yield in greenhouse was twelfth as much more than yield of it I farm. Also net profit per hectare for greenhouse culture was fortieth as much more than farm culture, and for employment creation per hectare greenhouse culture was tenth as much more than farm culture. Furthermore water use in greenhouse was half of water use in farm. So in this research cucumber greenhouses efficiency in Zabol city was evaluated using linear programming and Data Envelopment Analysis

(DEA)methods. Advantage of DEA method than other methods is efficiency calculation. So that can with this method evaluate unit's efficiency that have several inputs and outputs.

DEA is one linear programming method that use from information of input and output each productive unit for making one non parametric production border. In this condition whole of observed units were set on or under of envelopment border. So was evaluated efficiency of each productive unit than efficiency of whole of productive units in sample.

DEA can be output oriented or input oriented. In models of output oriented, aim is maximum of production with due attention to amount of constant inputs. But in method of input oriented, aim is minimum of use of inputs with due attention to a level of constant output.

For determining efficiency via method of DEA, input oriented model was formula as (1, 4):

$$\begin{aligned} \theta^* &= \max \theta \\ \text{s.t.} \quad & \sum_{j=1}^n \lambda_j x_{ij} \leq x_{i0} \quad i = 1, 2, \dots, m \\ & \sum_{j=1}^n \lambda_j y_{rj} \geq \theta y_{r0} \quad r = 1, 2, \dots, s \\ & \lambda_j \geq 0 \quad j = 1, 2, \dots, n \end{aligned}$$

Where:

θ is 0 productive unit efficiency than other productive units, λ is border of numbers amounts of non-negative; x_i and y_r are inputs and outputs of j farm, m is the number of inputs, s is the number of outputs and n is the number of farm. Amounts of θ indicate amount of technical efficiency of j farm, that is lower or equal to 1. Amount of 1 state that productive unit is efficient completely, and productive unit has set on efficient border. So current inputs level can't was decrease. Linear programming questions of above must was solved for each farm (2, 3).

Result and discussion

In this research were studied cucumber greenhouse traits and then were stated problems of them in 4 parts of Zabol city: Central, PoshtAb, ShibAb and Miankangi. Data this research obtained via completing 42 questionnaires, reports of agriculture department

and agriculture department and agriculture Bank of Zabol city. In Zabol city, ShibAb part has the most number of greenhouse, also this region has 28% surface of under culture and 35% the number of region producers. After ShibAb part, parts of PoshtAb and Miankangi set in next ranks. Also these two parts have 34% and 22% region producers.

Generally, in this region there are 339 producers that $\frac{1}{3}$ of them are tomato producers and $\frac{2}{3}$ of other is cucumber producers.

Storm is one of major problems of greenhouse owners in Zabol city. In this region in some seasons occur severe storms that lead to many damages to greenhouses. Moreover in this region usually sale market of greenhouse productions has problems such as productions sale as on farm, city market and brokers. On the other hand lack of union and guild is one of major problems for sale of these productions in region. The other problems of greenhouse owners are consisted of synchronous in harvest of crops among greenhouses of whole of region. That this subject lead to decrease of crop price; lack of enough supplement of fuel for greenhouses, lack of suitable transport means for fuel transfer to greenhouses place, below be level of technical science of greenhouses and etc. Whole of these problems lead to low yield of greenhouse productions in this region (6).

Table 1- Economic information of the Greenhouse in the Sistan

Unit: the Greenhouse

Region's name	surface of under culture(hectare)	yield average(for each unit)	productions
Central	3	6979	12.9
PoshtAb	4	13200	24.4
ShibAb	4	11851	21.9
Miankengi	2	7769	14.4

Reference: study data

Table 1 shows amount of production and surface of under culture of greenhouse productions in different regions. According to table, cucumber yield average for each

unit is almost 6-13 ton in different regions. Also the most surface of under culture for cucumber was observed in PoshtAb and ShibAb region. So that surface of under culture of cucumber in regions of Central and Miankangi are 2 and 3 hectares respectively. Also cucumber yield average in PoshtAb region is more than other regions. So that surface of under culture of cucumber in regions of PoshtAb and ShibAb is 4 hectares and in regions of Central and Miankangi are 2 and 3 hectares respectively. Also cucumber yield average in PoshtAb region is more than other regions. Table 2 shows amount average of inputs and outputs used in these 42 greenhouses.

Table 2- The average amount of input and output used in the region

	revenue	labor	pesticide	Animal fertilizer	Chemical fertilizer	Number seed
minimum	420	538	2	23	1	1000
maximum	11000	846	415	1194	764	6000
Average	4907	765	49	288	181	2301

Reference: study data

The second part of research calculates technical efficiency of cucumber greenhouses in Zabol city. So 10 unites of greenhouse was selected from each region and then was calculated its efficiency by foreword method. The results showed that cucumber greenhouse unit's efficiency in ShibAb part is 0.88 that it is more than other parts. Also in Central, Miankangi and PoshtAb parts cucumber greenhouses efficiency is 0.81%, 0.64 and 0.50 respectively.

At last, in order to results calculation for whole of region (Zabol city) were collected 42 questionnaires. The results showed that average of greenhouse efficiency of region is 71%. With due attention to these results, 44% greenhouses had technical efficiency lower than average amount, and 56% greenhouses had technical efficiency more than average amount.

Table 3-greenhouse unit's efficiency in Zabol

	shibAb	PoshtAb	miankengi	central	zabol
average	0.88	0.5	0.64	0.81	0.71

Reference: study data

Generally, this subject indicated that cucumber greenhouse position in region is suitable.

Moreover technical efficiency 38% greenhouses equal to 1 was calculated.

Conclusion and suggestions

Agriculture in Zabol city is very important, and many people earn one's livelihood from this method. Creation of special climatic condition in this region in recent years led to this subject that farmers for opposite to water deficit create new solutions. One of these solutions is selection of suitable plants for region that its water requirement is below and in short terms gain considerable profit for farmers however, with due attention to region condition, different plants production in out of season (such as cucumber, tomato, pepper, melon and etc.) in greenhouse is a suitable method. So evaluation of technical efficiency of greenhouse productions in Zabol city is necessary, so that with use of policy and suitable practical methods create conditions for technical efficiency improvement and decrease of technical non efficiency in greenhouse crops production, till via these methods supply partial of country (Iran) requirement in out of season by farmers. On the other hand for increasing greenhouse productions by inside farmers for supplying country inside requirements; governments must so Policy making that base of agriculture productions be higher technical efficiency.

Generally, this research suggests that greenhouses productions must were supported on the side of government, till via this method supply more requirements of country by farmers in out of season. Of course there is a problem in relation to this matter. It is consumers taste. We can solve this problem via use of new cultivars, because not only these cultivars have higher yield but they have higher quality.

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