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Economic analysis of marketing margin for greenhouse cucumbers and tomatoes in Kohgiluyeh-va-Boyerahmad province, Iran

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ABSTRACT

The cultivation of greenhouse products has a special importance in Kohgiluyeh-va-Boyerahmad Province in the South West of Iran. This study aims to examine factors affecting the marketing margin of greenhouse cucumbers and tomatoes in the province in order to develop an approach for solving problems and to expand the market of these agricultural products. The required data have been collected through filling a questionnaire by 40 greenhouse owner, 40 retailers and 25 wholesalers of the products in 2012. The results revealed that the total marketing margin, wholesalers and retailers are 4670, 1800 and 2870 Rials for greenhouse cucumber and 4500, 1980 and 2520 Rials for greenhouse tomato, respectively. From the price paid by consumer, the portion of producer, wholesaler and retailer were 71.4, 17.2 and 11.4, respectively for cucumber, and 74.4, 14.9 and 10.6 for tomato, respectively. The results of estimated marketing margin function using mark-up model indicated that retail price, transportation cost and the dummy variables of spring, summer and winter seasons have a direct and significant relationship with the marketing margin and a significant and inverse relationship with other marketing costs. Evaluations reveal that the unawareness of market conditions, lack of facilities and shortage of underlying facilities are the most important problems for producers of greenhouse cucumbers and tomatoes. By forming unions of greenhouse owners, restructuring the available marketing system of these products can reduce the marketing margin of these products while it creates the completion with inductors that are mainly the factor of increasing marketing margins.

Keywords: Cucumber, Greenhouse, Iran, Mark-up model, Marketing margin, Tomato

INTRODUCTION

In recent years, greenhouse cultivation has strongly been developed and considered as a factor in employment to produce off-season agricultural products, optimal use of water and soil resources and especially utilize small parts and facilities in villages and the margin of populated cities that lack water and sufficient time. Insufficiency in the marketing system of agricultural products is one of the major factors that cause to lack the agricultural development aims and increase the farmer's production and income in the developing countries [1]. Today, in most developed countries, marketing of agricultural products is considered as one of the major parts of economy. Given the current

world situation, production is out of traditional form and production for sailing is one of the major objectives of producers. Market is the location of embodying all activities of a producer to receive the profit obtained from production. Therefore, the marketing operation not only begins from harvest time, but also it appears from the time of making decision to produce. In this regard, due to the particular features of these products that contain perishability, seasonality and demand for all seasons, the marketing of agricultural products has a specific importance [2]. In less developed countries such as Iran, one of issues that always arise in the marketing of agricultural products is the difference between producer price i.e. the price received by producer and the price paid by the consumer. However it should not be assumed that this price difference is only devoted to the developing countries while there exists such a discrepancy in the developed countries. But here, the price difference is more related to services such as packing, grading and converting product while little services are performed in the least developed countries during product's marketing. One factor known in the price difference of product is the mediating factor that only causes product to go hand in hand. These people are called dealers. By controlling market and creating a sort of restriction, the mediator factor has some decisive role in prices and thereby gets huge profits [3].

Studying and researching the marketing of agricultural products has a long history in the literature of agricultural economics and marketing. For marketing of agricultural products, operations and processes have become more important with developing urbanization and keeping the consumption centers out of the production areas in the way that the United Nations considers the marketing of agricultural products as a factor affecting development and wants more attention of governments to this important subject in the field of agricultural economics [4]. Hence, in recent years, marketing researches and its related problems have been more expanded. Operations and processes of the marketing of agricultural products include storage, transportation, conversion, grading, packing and standardization of the product. Performing such activities on agricultural products leads to increasing its added value and creating price gap between the prices paid by consumers and the price received by producers. This price gap is called marketing margin. Economists use the marketing margin in order to express the transport costs of agricultural goods during the market chain - from farm to retail [4]. Given the population growth and increasing demand for greenhouse products such as cucumber and tomato, the great price gap at the level of producer and consumer and their dissatisfaction, analyzing economic marketing model and market conditions seem to be necessary for greenhouse products.

Research in the marketing of agricultural products was particularly considered by researchers and scholars in the early 60's AH. Shafii and Pourjoopary [5] investigated the marketing of greenhouse products in Kerman, Iran. Results revealed that the marketing operation net profit of greenhouse cucumber and tomato producer were estimated as 375 and 230 Rials, respectively and the marketing operation net profit of greenhouse cucumber and tomato retail were estimated as 204 and 284 Rials, respectively. From the price paid by consumer, the portion of producer, wholesaler and retailer were 71.4, 17.2 and 11.4, respectively for greenhouse cucumber and 74.4, 14.9 and 10.6 for greenhouse tomato, respectively. In the path of producer, retailer and consumer, marketing efficiency was the greatest value for tomato and the minimal value for cucumber. Moghadesi *et al.* [6] in their study, examined the tomato marketing issues in Khuzestan, Iran. Results showed that the average price of producer, wholesale and retail are 870, 2120 and 5210 Rials, respectively in which from the entail price, the portion of producer, wholesaler and retailer are 16.69%, 24% and 59.30%, respectively. In the retail level, the price efficiency was estimated as 90.8% and the efficiency of the total marketing was estimated as 77.65%. Chaudary [7] studied greenhouse products in Canada. Results indicated that marketing margin was estimated as 54.46 \$ for ornamental plants, 26.42 \$ for pepper, 26.3\$ for tomato and 15.77 \$ for cucumber. Marketing cost is averagely 110 \$ for tomato and 168 \$ for cucumber. Pina [8], in his study, examined economic production and the marketing of greenhouses vegetables. Based on this study, the capital needs and variable costs of greenhouses are about 60 and 42 \$ per square meters, respectively, in America. The generated employment, the production rate and the total income were about 9/9 individuals per hectare, 27 lb per square foot and 51.1 \$ per square meter and 8.98 \$ profit has been obtained from per square meter. The sale price of the product, costs of marketing and sales and transportation cost have been estimated as 1.7 \$, 0.562 \$ and 0.099 \$ per kg. Using the mark-up marketing margin model was separately studied by Shajari [9] about marketing Shahani date in Fars province and Abbasian *et al.* [10] about marketing of Mazafati date in Sistan-va-Balochestan Province in Iran. Results of estimating marketing margin function of these studies showed that the price in farm and date harvest cost are factors affecting the margin function of total marketing. In a study on the market of greenhouse products, Ghorbani [11] investigated factors affecting the minimum offer price for organic cucumber in Khorasan Razavi Province, Iran. He concluded that the minimum offer price for organic greenhouse cucumber must be 10 percent more than conventional products. Hassanpour and Zare [12], in a study, examined marketing margin

and the portion of marketing factors on the entire price of rice in Kohgiluyeh-va-Boyerahmad (KB) Province in addition to the estimation of rice waste rate in various stages of marketing.

Due to the significant number of the producers of greenhouse products in KB Province and its impact on the policymaker's view of agricultural part in the province, the main objective of this study is to select a suitable model for explaining and determining the factors affecting the marketing margin changes of these products in the province. By selecting a suitable model and then determining factors affecting the marketing margin of greenhouse products, planners can reduce their marketing margin through implementing appropriate policies on the factors affecting marketing margin and reduction of the role of these factors and cause more income of producers and also on the other reduce the entire price of the product retail and increase the consumer welfare. In summary, the major objectives of this study include (a) calculating margins of retail and wholesale and the total marketing margin of greenhouse cucumber and tomato and determining the portion of marketing factors from the entire price of the products and (b) estimating the marketing margin functions to investigate the factors affecting the marketing margin of greenhouse cucumbers and tomatoes.

MATERIALS AND METHODS

The measuring methods of marketing margin

In a competitive market, the total marketing margin has been defined as the difference between the purchase price of a product by consumers and their sales price by producer. Therefore, the main criterion of determining the total marketing margin will be the difference between the price received by producers and the price paid by consumers [13].

Absolute marketing margin

In Digby's view [14], marketing margin has been defined as the price difference between rings of marketing chain. Accordingly, three types of wholesale and retail margin and total marketing margin is distinct. Relations related to each of these three types of margins are as the following:

$$M_r = P_r - P_w \quad (1)$$

$$M_w = P_w - P_f \quad (2)$$

$$M_m = P_r - P_f \quad (3)$$

In the above formulas M_m , M_w , M_r , P_w , P_r and P_f are total market margin, wholesale margin, retail margin, wholesale prices, retail prices and in farm product prices, respectively.

The portion of marketing margin

To calculate the marketing margin portion of product price, percentage of marketing margin is used [5, 12]. From the price of the product, the portion of producer, wholesaler and retailer is calculated using the following formulas.

$$\text{Producers portion} = (P_f / P_r) \times 100 \quad (4)$$

$$\text{Wholesaler portion} = [(P_w - P_f) / P_r] \times 100 \quad (5)$$

$$\text{Retailer portion} = [(P_r - P_w) / P_r] \times 100 \quad (6)$$

Models of marketing margin

a) Mark-up pricing model

The model was first presented by Waugh [15]. The consumer demand is the factor determining prices of retail and in farm so that in farm, the food prices is simply: Retail prices subtracted from the cost of marketing factors and accordingly the marketing margin model is defined as follows [16]. In this pattern, marketing margin has been considered as a function of the retail price and marketing costs:

$$M_m = f(P_r, Z) \quad (7)$$

where M_m , P_r and Z have been considered as marketing margin, the product price in retail level and marketing costs, respectively.

b) Relative model

The model was presented by Gardner [17]. In this model, the market margin is a function of the total income, retail price and marketing costs.

$$M_m = f(P_R, T_R, Z) \quad (8)$$

where P_R , T_R and Z are retail price, the value of sold good and marketing costs, respectively.

c) Marketing Cost Model

The model was proposed by Wholgenant and Mullen [18]. In the model, it is assumed that conditions are competitive and economic business provides marketing services to the extent that the entire cost of service is the entire income. The cost of marketing services is exclusively determined by the amount of farm product and business costs. Specifically, in the model, marketing margin is expressed as the following:

$$M_m = f(Q, Z) \quad (9)$$

where Q and Z are the rate of supplied product and the vector of marketing cost, respectively.

In the present study, the marketing functions were also estimated by the way of ordinary least squares (OLS) and using Eviews software.

RESULTS AND DISCUSSION

The harvest of greenhouse products including cucumber and tomato is done traditionally and by hand in KB Province. Greenhouse products are harvested gradually and in several harvests. The number of harvesting these products is different in terms of weather conditions in various seasons. The place of packing is in greenhouse. Due to the uniformity and equality of product, grading is not performed in greenhouse products and product is supplied to market after packing. These products are quickly carried to market in four seasons after harvesting and there is no special storage at any stage of marketing. The transport of greenhouse products is done by private car and van to vegetable field and by truck for long distances. The main buyers of the product include provincial buyers, wholesalers and shop owners. The price of greenhouse products is different in various seasons. The price has the maximum value at the end of autumn and winter and is gradually reduced by approaching to summer. The largest share of total marketing costs of greenhouse products is related to costs of transporting, harvesting and packing. In three markets of in farm, wholesale and retail, the medium of average price was estimated as 7380, 9180 and 12050 Rials, respectively for cucumber and 8300, 10280 and 12800 Rials, respectively for tomato. These prices indicate that prices of cucumber and tomatoes have increased in the false proportion from wholesaler to retailer. The calculation of marketing margin revealed that total marketing margin and the margin of wholesaler and retailer are 4670, 1800 and 2870 Rials, respectively for cucumber and 4500, 1980 and 2520 Rials respectively for tomatoes that indicate the existence of much margin in the market of these products. From the entire price of sale, the portion of producers, wholesalers and retailers is 61%, 15% and 24%, respectively for cucumber, and 65%, 15.4% and 19.6%, respectively for tomato. Therefore, according to these results, it can be understood that from the entire price of cucumber and tomato, the portion of producer is more than that of wholesaler and retailer.

Estimating the marketing margin functions of cucumber

In the present study, three mark-up, relative margin and marketing cost models were used to estimate marketing margin function. Using different models, results of estimating marketing margin function of cucumber are presented in Table 1. In estimated regressions, F-value indicates that these regressions are statistically significant. In estimating models of the study, heteroscedasticity hypothesis was rejected among residual terms using generalized least squares (GLS). Among other classical assumptions, estimation is in the method (OLS) of non-connection residuals in various periods. The rejection of this hypothesis creates a problem called autocorrelation. Durbin-Watson test (DW) was used to diagnose this problem. When the main model was estimated, we found the existence of positive autocorrelation by comparing the obtained DW with the decision modes. This problem was solved applying the first-order autoregressive process technique and adding variable AR (1) as a new independent variable

to the above-mentioned regression. Having multicollinearity is among other hypotheses of classical linear regression [19].

Table 1. Results of estimating marketing margin function of cucumber using different models

Variables		Mark-up model		Marketing cost model		Relative model	
Variable explanatory	Variable	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Constant	C	-3490	-2.65	1238	0.86	-3491	-2.6
Retail price	P	0.62	4.71	-	-	0.62	4.65
Transportation cost	Z ₁	1.07	2.1	2.45	2.44	1.07	1.05
Marketing cost	Z ₂	-2.79	-2.33	-2.27	-1.47	-2.79	-2.21
Spring	D ₁	2344	3.1	4265	3.79	2343	3.03
Summer	D ₂	1943	2.58	4260	3.54	1941	2.36
Winter	D ₃	2018	3.13	3569	3.13	2016	3.02
Sold goods value	T _R	-	-	-	-	22.3e-6	0.01
Supplied product	Q	-	-	-2.97	-0.99	-	-
		F=6.9**	R ² =0.60	F=3.31*	R ² =0.43	F [*] =5.8**	R ² =0.60

*, **, respectively indicate the significance level at levels 5% and 1%

Source: research findings

Among the recognition ways of multicollinearity, high R^2 with the few number of t ratios can be indicated that there was not a multicollinearity problem in the present estimated model too. Based on criteria obtained from the results of estimating these models, mark-up model has been diagnosed as a suitable model for studying factors affecting the marketing margin of cucumber. Thus, stating results of both relative margin and marketing cost models are avoided and only the results of mark-up model are interpreted. This important subject has also been confirmed in studies by Baigzade and Chizari [20] on the marketing of potato, Rajai and Nasiri [21] on the marketing of apple, Moghaddasi *et al.* [6] on the marketing of tomato and Hassan Shahi *et al.* [22] on the marketing of trout in Iran. Since in their studies in mark-up model, the significant ratios of t has been more and the coefficient of determination (R^2) has also been larger than those in other models, so these researchers recognized the mark-up model as an appropriate model to study factors affecting marketing margins.

Using mark-up model, results obtained from estimating marketing margin function show that marketing margin has a direct and significant relationship with retail price, so that one unit increase in the retail price causes 0.62 units increase in marketing margin. The abovementioned results are theoretically acceptable too.

Given that marketing margin is obtained from subtracting the retail price and in farm price, therefore the retail price has a positive relationship with the marketing margin. In the way that increasing retail price causes to increase in total margin. On the other hand, transportation cost has a direct and significant relationship with marketing margin in the way that one unit increase in transportation cost causes 1.07 units increase in marketing margin. Results also show that marketing margin has a diverse and significant relationship with other marketing costs in the way that increasing one unit in marketing costs causes 2.79 units decreasing in marketing margin. Estimating parameters related to the dummy variables demonstrates that winter and spring seasons have more marketing margin than summer season while summer has the lowest marketing margin. This issue is due to the increasing price in winter and indicates that the reduction in marketing margin requires time. The estimation coefficient of spring, summer and winter has become significant. In this model, estimating the coefficient of determination (R^2) indicates that about 60% of changes in cucumber market margin have been described by variables inserted in the model. The results show that major factors affecting cucumber marketing margin are transportation cost and the dummy variables of spring season. The positivity of dummy variables is the indicator of increasing marketing margin in these seasons which can be due to the increasing costs. Considering the seasonality effects can be a great help in predicting the trend of marketing margin and making the appropriate policies in case it is predicted that marketing margin has a significant increase in spring season, policies related to its reduction can be planned beforehand. As it was mentioned, transportation cost has been identified as one of the most important factors affecting marketing margin. So, reducing transportation cost is the most efficient way to reduce marketing margin and thus increase the efficiency of the marketing process of these products.

Estimating marketing margin of functions of tomato

Three models of mark-up pricing, relative margin and marketing cost were used to estimate marketing margin function of tomato. Based on results obtained from the results of estimating of these models, mark-up model has been recognized as a suitable model to study factors affecting marketing margin of tomato. The comparison of F-

value with critical value shows that the above-mentioned regressions have been generally statistically significant. Using GLS test, in estimating models, the problem of non-heteroscedasticity between residuals was rejected. Among other classical assumptions of linear regression by OLS method, the non-connection of residuals is in various periods. The violation of this assumption causes a problem called autocorrelation. When the main model is estimated, by comparing DW statistics obtained with states of DW decision making, we found the existence of positive autocorrelation that any evidence of autocorrelation is not observed in the DW statistics through applying the first-order out-regression process AR (1). And also no evidence of existing multicollinearity in the mentioned regression from classical assumptions of linear regression was observed. Using different models of marketing margin, results of estimating marketing margin function of tomato is presented in Table 2.

The results obtained from estimating mark-up model indicates that marketing margin has a direct and significant relationship with retail price in the way that one unit increase in the retail price causes 0.26 units increase in marketing margin of tomato products. The above-mentioned results are also theoretically acceptable. Given that marketing margin is obtained from disturbing retail price and in farm price, the retail price has a positive relationship with marketing margin in the way that increasing retail price causes to increase in the total margin. These results are similar to the results of researches by Shajari [9] on date product marketing, Rejai and Nasiri [21] on apple marketing, Moghaddasi *et al.* [6] on tomato marketing and Hassanshahi *et al.* [22] on trout marketing in Iran. According to the research hypothesis, transportation cost has a direct and significant relationship with marketing margin in a way that one unit increase in transportation cost causes 3.08 units increase in marketing margin. Also, the results reveal that marketing margin has a diverse and significant relationship with other marketing costs in a way that one unit increase in marketing costs causes 2.77 units reduction in marketing margin.

Table 2. Results of estimating marketing margin function of tomato using different models

Variables		Mark-up model		Marketing cost model		Relative model	
Variable explanatory	Variable	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Constant	C	-134	-0.12	1165	0.8	-232	-0.2
Retail price	P	0.26	4.12	-	-	0.27	4.07
Transportation cost	Z ₁	3.08	2.31	2.48	2.46	1.12	0.87
Marketing cost	Z ₂	2.77	2.13	-2.17	-1.3	-2.94	-2.22
Spring	D ₁	2831	3.06	4222	3.7	2853	-1.12
Summer	D ₂	2449	2.88	4109	3.4	2550	3.02
Winter	D ₃	2130	2.4	3491	3.03	2172	2.88
Sold goods value	T _R	-	-	-	-	-0.00001	2.38
Supplied product	Q	-	-	-1.28	-0.56	-	-
		F=5.5**	R ² =0.65	F=3.2*	R ² =0.42	F=4.7**	R ² =0.55

*, **, respectively indicate the significance level at levels 5% and 1%

Source: research findings

Estimating parameters related to the dummy variables shows that spring and summer seasons have more margin than winter season and winter has the lowest marketing margin. Estimated coefficient of spring, summer and winter seasons has become significant. In the model, estimating the coefficient of determination indicates that about 65% of changes in marketing margin of tomato have been described by variables entered in the model. As a whole, the results of estimating the marketing margin model of tomato is similar to those of the model estimated in cucumber marketing margin in the study area. It can be said that the most important factors affecting marketing margins of tomatoes is shipping cost and dummy variable of spring season.

CONCLUSION

Given the soil restriction, being mountainous and impassable, very steep and being rocky in some areas in the South West of Iran, KB Province is among provinces that have not suitable conditions for cultivating various agricultural products. This causes that the cultivation of greenhouse products has a special significance in this province. In this province, greenhouse products including cucumber and tomato are harvested traditionally and by hand and the packing place is in the greenhouse and the grading operation is not done. Considering the median of the average price for cucumber product in three farm, wholesale and retail markets, it is determined that the cucumber and tomato prices have increased in the false proportion from wholesale to retailer. Calculating marketing margin indicates that the producer portion of the entire price of the cucumber and tomato is more than that of wholesaler and retailer. By Mark-up method, results of marketing margin function estimation show that transportation cost and the dummy variable of spring season are the most important factors affecting the marketing margin of cucumber and

tomato. Positivity of dummy variables is the indicator of increasing marketing margin in these seasons that can be due to the increasing costs. Considering the seasonal effects in predicting the trend of marketing margin can give a great help in adopting appropriate policies. If it is predicted that marketing margin has a significant increase in the spring, policies related to its reduction can already be planned. Additionally, the reduction of transportation costs is the most efficient way to reduce the marketing margin of cucumber and tomato and thus increase in the efficiency would lead to marketing process of these products. According to the obtained results, it is proposed that by the state support and participation of crop summer and vegetable greenhouse owners in the province, the marketing system structure in these products be changed through forming unions of greenhouse owners or local cooperative in the major areas of greenhouse product in the way that all stages of market operations from production to distribution be done by the union. It is clear that in this way, prices and marketing margin of these products become more balanced by creating competition with dealers that are irrationally the main factor of increasing marketing margin. Also, through paying low-interest loan on the part of the government to greenhouse owners, their encouragement to increase the efficiency of marketing products is provided. Through equipping these unions/cooperatives with convenient transportation devices and packing equipment, a lot of marketing costs such as transportation cost of products from production place to market and high marketing margin that is in false proportion can also be reduced and producer's proportions from the entire price can be increased. On the other hand, since the retail price is the most important factor in increasing the marketing margin, it is suggested that the retail prices be controlled under government control so that retailers cannot be the main cause of increasing marketing margin.

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