Identification of factor affecting the Abadan citizen`s tendency of payment for organic products

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ABSTRACT

In the present study, in a case study, Abadan`s citizens' willingness to pay for organic products and factors affecting it examined whit using Hekman two-stage model. Statistics and information of this study were collected through questionnaire as twofold and interview with Abadan citizens using the random sampling method. Sample volume, using the Cochrane relation, was 384 persons. According to the results of estimation models, factors affecting the probability of payment and rate of payment are different. Variables of number of the household members ,income ,treatment cost, acquaintance to organic products ,and record of cancer affect the tendency of payment of the consumers and the variables of age ,education, income ,treatment cost ,and inverse of tendency`s ratio of payment affect the consumer payment. Make acquainted households in relationship between the incidence of diseases like cancer and type of food, the use of protectionist policies in order to reduce production costs and providing training and promoting health and food safety, are the proposed solutions to increase consumers pay for organic products in the present study

Keywords: organic products, willingness to pay, Hackman model, vegetables
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INTRODUCTION

In one hand, the population crisis ,and in the other hand ,the limitation of the primary resources of production cause the traditional agriculture to move toward the industrial one namely the agriculture green revolution in the 1950s.With these progresses, new problems such as the biological imbalance in the area of agriculture ecosystems, water, soil and food resources pollution, new plant pests and diseases ,and concerns related to the foodstuff security has also been resulted. Currently, risks and crises resulted from the chemical inputs entered the agriculture sector have caused soil chemical erosion and destruction and the nature imbalance .Increase of various diseases is another problem for the communities, which is resulted from the entrance of the pesticides from soil to the foodstuff. Use of these harmful inputs in the developing countries is above the international standards .Undesired effects and the residual effects of using various chemical fertilizers and pesticides in the food products in the developed industrial countries caused that the agriculture evolutes in a different way against the modern approach by preventing the use of any chemical in the agriculture, garden, and livestock products [1]. In the recent years , because of the precise characteristics of the organic agriculture systems and its positive points compared with the usual one ,this kind of agriculture is now considered all over the world, so ,in the recent decades , agriculture product health and the

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organic agriculture process have been considered as international protocols and regulations . Paying attention to the organic agriculture has a fast growth in the world. In the other hand, increase of the consumer awareness about health and the environmental advantages of the organic agriculture increase the consumer`s demand of organic products [2].Iran is a suitable location for producing organic products because it is located in arid and semi-arid climates. In Iran, pesticide and fertilizers are not used in more than 239 thousand hectares of the farms and gardens and pesticides, alone, are not applied for more than 808 thousands hectares [3] . Based on this, producing organic products has become one of the important policies of the ministry of Agriculture Jihad for reducing the user of pesticides and chemical fertilizers in addition to keep the consumers healthy. Following this policy, the ministry of agriculture Jihad started its activity with the private sector`s actors and the support of agriculture Jihad organization. Thus, producing organic products, as the most important step toward the sustainable development, is now the new strategy [4]. But, problems bring a high a risk for producing these products; one of them is the consumers' unfamiliarity with the organic products leading to troubles in marketing these products. In other words, the way in which these are produced may cause an increase of production costs followed by an increase in the cost forcing the consumer to pay more for using these products than for the customary ones . Michelson et al (1999) and Morris et al (2001) believed that the most important factor reducing the demand of organic products is their high price [5][6]. Williams and Hammit (2000) indicated the consumers` attitude toward these products as the most important factor for the consumers` tendency to pay for the organic products[7]. Hartman (1997) stated that using the organic products will have a direct relationship with the people`s life style[8]. In the worldwide many studies have been carried out about demand for organic products:

Using the contingent valuation method (CVM).
Bernal and Vina (2005) studied the Mexican consumers' preferences for the organic fruits and vegetables. Results showed that this tendency is at a low level[9]. Main reasons mentioned are low consumer awareness and knowledge about healthy foodstuff, environmental protection, defending the biotic variety, and households' low level of income.

Rodríguez (2006) & etal studied the consumer`s understanding of the qualitative properties of the food and their role in selecting the organic products in Argentina[10]. Unhealthiness of the production process of the customary foodstuffs (in terms of health) and healthiness of the organic ones are the most important factors of using these products in Argentina. Akgungor et al (2009) compared the tendency of payment for organic products in both rural and urban regions of Turkey[11]. Results showed that urban people have more tendencies to pay because they are more educated, have more income, and have more knowledge about the nutritional values. Using the Probit model and Hackman method, Ariaza et al (2007) evaluated the consumers` tendency of payment for organic products in Spain. Results showed that age, income, sex, and geographic properties are the variables affecting the rate individuals` tendency of payment for organic products[12]. Ones who have purchased the organic foodstuff were ready to pay more for their local organic apple. Even with many global studies, the study of Mafi and Saleh (2009) can be mentioned as one study that evaluated the factors affecting the tendency of payment for organic products in Iran[4]. Contingent valuation method was used to evaluate the payment for organic products (cucumber and vegetables) in Tehran and Gilan provinces .Results showed that the variables of income and history of cancer among people have a positive and significant effect on the tendency of payment for organic cucumber. In addition, the people`s mean tendencies of payment for organic cucumber and vegetables have been estimated to be 12200 and 17238 Rials, respectively. Since 2004, Khuzestan province is one of the country`s provinces which has considered the production of organic products at specific and selected sites. Consequently, according to this issue and targeting for these products consumption in the province`s cities, as a case study, Abadan citizens` tendency of payment was considered.

MATERIALS AND METHODS

Contingent valuation method was used to estimate the advantages of environmental goods, services, and etc. This method was aimed at gaining a precise estimation of advantages created under the effect of changes in the production levels or the price of goods and public and nonmarket services. Typically, this method is applicable for both important and main existential and selected values [13]. People become ready to pay for an organic product when their utility, at the time of using the organic product and the cost they pay for it, is more compared with the time they don`t use it. This issue is mathematically illustrated as follow :

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$$U(1, Income - Bid; S) + \varepsilon_1 \geq U(0, Income; S) + \varepsilon_0 \qquad (1)$$

In this equation, U is the indirect utility each individual gains. Income is the individuals` monthly income and Bid is the cost individuals deducted from their income paying it for organic products. S is another socio-economic characteristic of the individuals. ε_0 and ϵ_1 are random variables (error components) with a mean of zero ,which are equally and independently distributed. In the indirect desirability U (0) function, zero is for the time when the individuals do not pay anything for the organic product, so they do not use it and 1 is for reverse mode. To estimate the regression functions with variables of zero and 1, Logit and Probit models are used; their results are not significantly different [14].

But, using simple econometric models make both kinds of errors possible. First error is occurred due to the samples` non-randomness meaning that it is possible, for sample selection, individual with or without the tendency of payment for organic products is selected. But the second error is occurred for a reason that factors affecting the payment and the rate of payment are considered the same, while this can be different. Using the Tobit model, applying both groups of individuals having or having not the tendency of consumption, can take out the first error. Hackman model, however, is suggested for eliminating the second error. In this method, to determine the factors affecting the probability and the rate of tendency for payment, Tobit model is broken into probit and linear regression models [15]. In the probit model, the dependent variable is a two- valued variable of zero and 1, meaning that 1 and zero are entered for people having and not having the tendency for payment, respectively, so this model can be illustrated as follow [14]:

$$Z_k = B\acute{X}_k + V_k \quad k = 1,2,3, \dots, N$$

$$Z_k = 1 \qquad if \quad Y_k^* > 0$$

$$Z_k = 0 \qquad if \quad Y_k^* \leq 0 \qquad (2)$$

Linear regression model can be shown as follow:

$$Y_k = BX_k + \sigma\gamma_k + e_k \qquad \acute{k} = 1.2.3 \dots N \quad (3)$$

In the equations above, $\acute{B}$ and σ , are the model`s parameters, $X_k$ indicate the descriptive variables and $Y_k$ indicates the tendency for payment. In addition, $V_k$ and $e_k$ show the error components. $\gamma_k$ illustrates the inverse tendency`s ratio built by using probit model`s parameters for the condition of $Y_k^* > 0$ and calculated through:

$$\gamma_K = \frac{\varphi(B\acute{X}_k)}{1 - \varphi(B\acute{X}_k)} \qquad (4)$$

In the equation above, $\varphi(B\acute{X}_k)$ and $1 - \varphi(B\acute{X}_k)$ indicate the density function and standard normal variable distribution function, respectively. To explain a dependent variable`s behavior, a cumulative distribution function (CDF) can be applied. The estimation model resulted from the normal CDF is known as probit or notmit model. Probit model estimates the forecasted probability amounts of the dependent two-valued variable between 1and zero by using the normal probability distribution. Probit model has standard normal variable distribution function as follow:

$$F(t) = \int_{-\alpha}^{t} \left(2\pi^{-\frac{1}{2}} exp \left\{ -\frac{x^2}{2} \right\} \right) \qquad (5)$$

In the standard normal distribution, random variable`s variance is equal to 1 and because the distribution is symmetric, so $F(-t) = 1 - F(t)$. Thus:

$$P_i = \Pr(Y_i = 1) = 1 - F(-\acute{B}X) = F(\acute{B}X) \qquad (6)$$

Based on the standard normal cumulative distribution function, probit function can be written as below [14]:

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$$P(Y_t = 1) = \int_{-\alpha}^{\acute{B}} \varphi(t)dt = \theta(\acute{B}X) \qquad (7)$$

But in the binary models such as probit, the final effects of the variables are more considered than the coefficients'` interprets. This effect measures the change in the probability of condition 1`s occurrence for the dependent variable caused by a one unit change in the independent variable .This effect, in the probit models, is calculated through:

$$ME = \frac{\partial P_i}{\partial x_k} = \frac{\partial \theta(\acute{B}X)}{\partial x_k} \qquad (8)$$

In this model, elasticity of each variable shows the change in the dependent variable`s probability for the 1 percent changes in the independent variable [16].

$$E^P = \frac{\partial \theta(\acute{B}X)}{\partial x_k} \cdot \frac{x_k}{\partial \theta(\acute{B}X)} \qquad (9)$$

Likelihood ratio (LR) was used to evaluate the model`s significance. McFadden and Madala Strala`s coefficients of determination were used to evaluate the explanatory power of the model [17]. After evaluating the factors affecting the probability of the tendency of payment for organic products by the probit model, in the next stage, using the linear regression, factors affecting the rate of payment were assessed. In this stage, in addition to the independent variables, inverse of the tendency`s ratio was also entered in the model as an independent variable. The coefficient of this variable shows the error resulted from the sample selection, meaning that if this variable`s coefficient is statistically significant, removal of zero observations from the observation set causes the parameters to be oriented, but if this coefficient does not statistically have significant difference with zero, removal of zero observations does not cause the parameters to be oriented. Statistics and information of this study were collected through questionnaire as twofold and interview with Abadan citizens using the random sampling method. Sample volume ,using the Cochrane relation , was 384 persons .SPSS and Shazam software were respectively used for the variables` statistical analysis ,mathematical calculations ,and estimating the parameters of the Logit model.

RESULTS

In table 1, a summary of the studied sample`s characteristics are illustrated .Findings showed that mean age of the individuals is 35/4, so it is relatively a young sample. Mean size of the household is 5/3 ones which is close to the Iranian households, 5 ones. Table`s information showed that mean income of each studied household 678 ten thousand Rials which is higher than the Khuzestan mean income of 57734423 Rials. In addition, mean treatment cost per capita of the households is 35 ten thousand Rials, which is higher than the announced per capita of 14 ten thousand Rials for health and remedy.

Table 1: Summary of the studied sample`s characteristics				
Variable	Average	Max	Min	Standard Deviation
Age	35.4	78	18	13.1
number of household members	5.3	14	1	2.3
Income(ten thousand Rials)	678.4	1800	180	233.3
treatment cost (thousand Rials)	350	1500.4	100	189.3
vegetable consumption	6.3	9	3	3.3

Information of the table above indicate that the mean rate of vegetable consumption in the studied sample is about 76 kg /y ,which is lower than the rate of 90 kg/y   of vegetable consumption in our country based on the agriculture statistics, and the standard global rate of 180 kg/y.Some information related to the organic products is illustrated in table 2. This table`s information indicate that about 64 percent of the studied society do not even know what the organic products are; but ,by giving descriptions about these products , more than 70 percent of this society are ready to pay a higher price for such products. More interesting is that more than a half of the studied individuals have experienced an illness resulted from the foodstuff consumption. This statistics needs a more attention from the authorities for controlling the health issues in producing the foodstuff.

Hackman model was used to evaluate the effectiveness of each factor on the tendency of payment and the rate of consumption payment. Estimated parameters of the model are reported in table 3 using the maximum likelihood method, t statistic, and elasticity of the tendency of payment probability caused by a change in each independent

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variable. Achieved statistic for the likelihood test is 105/88, so explained changes by this model are significant at a 1 percent level. McFadden statistic for Tobit model is 0/55, indicating the model`s high explanatory power. The percentage of the model`s power of forecast is 80/06 indicating its high power of forecasting .statistic`s significance to the likelihood indicates the regression`s overall significance. LM2`s insignificance shows the nonexistence of the heteroscedasticity problem in the estimation model. In addition, results of the linear model estimation are reported in this table. Estimated statistics for this model are 65 percent indicating that the entered variables in this model explain about 65 percent of the tendency of payment variance. heteroscedasticity of the model was also evaluated by White test resulting a nonexistence of heteroscedasticity problem in the model.

Table2: Information related to the organic products

	yes		No	
	Percentage	quantity	Percentage	quantity
acquaintance with the organic products	35.9375	138	64.0625	246
acquaintance with the organic production process	29.6875	114	70.3125	270
cancer record	29.94792	115	70.05208	269
have experienced an illness resulted from the foodstuff	55.46875	213	44.53125	171
Tendency to by organic product with high price	73.17708	281	26.82292	103

Table3:Hekman model results for organic vegetable

Variable	Probit model				Linear regression	
	coefficient	T statistic	Marginal effect	elasticity	coefficient	T statistic
Intercept	0.633	1.9046*	-	-	2.18	13.22
Age					.19	2.49[*]
education					.28	1.9901
number of household members	-2/320	-1.78*	-.09	-.28		
incom	2.17	1.9584[*]	.22	.28	3.12	4.17*
treatment cost t	1.21	2.33[*]	.38	.31	7.19	3.19*
acquaintance with the organic products	3.13	2.32[*]	.24	.21		
cancer record	1.87	1.91**	.12	.17		
inverse of tendency`s ratio					-.023	-2.9
	R2=.65		Likelihood Ratio Test=105.88		Maddalas R^2=0.48	
	F=0.71				Percentage of Right Prediction=80.06	MCFADDEN R^2=0.55

As illustrated in the table above , among the entered variables in Hackman model , number of household members , income ,treatment cost , acquaintance with the organic products ,and cancer record affect the tendency of payment of the consumers and the variables of age ,education, income ,treatment cost ,and inverse of tendency`s ratio of payment affect the consumer payment. In Hackman model, the coefficient of 2/17 estimated for income indicates that the mean of individuals tendency of payment would increase to 2/17 units as one unit of the individuals` income is increased. The final effect for this variable is 0/22 indicating that with a unit increase of income; the probability of organic products consumption would have an increase of 0/28 percent. A 0/28 elasticity indicates that 1 percent increase in income increases the probability of the organic products consumption for 0/28 percent. The negative coefficient resulted for the variable of household size indicates that increase in the number of household members in the studied sample reduces the probability of the acceptance of consuming the organic products. The final effect of 0/09 with a negative sign shows that a 1 unit increase in the household size reduces the probability of consuming the organic products for 0/09 of unit. A positive sign was resulted for the coefficient of treatment cost in Hackman model. This positive sign indicates that households paying higher monthly costs for their treatment have a more tendency to consume the organic products. A final effect of 0/38 with a positive sign is resulted for this variable indicating that the probability of accepting the consumption of organic products with 1 unit increase in the treatment cost would increase to 0/38 of unit. According to the table`s results, the coefficient of the variable of acquaintance with the organic products has a positive sign, too. In other words, the probability of consuming the organic products would be increased by the increase of awareness on the organic products among the studied households. In addition, it can be said according to the results that cancer-exposed persons in households can increase the probability of households' tendency to consume the organic products. A 0/17 elasticity for this variable shows that 1 percent increase in the number of cancer –exposed persons among the studied sample increases the probability of the organic products consumption for 0/17 percent. A one percent significance of the variable of inverse of tendency`s ratio indicates that factors affecting the tendency of payment are not equal to ones determining the rate of tendency

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of payment, emphasizing on the necessity of using two-step Hackman method. In the linear model, the positive and significant coefficient of the variable of age shows that as individuals get older; their tendency of payment for organic products is increased. In addition, in this model, a positive coefficient of 0/28 is resulted for the variable of education indicating that with increasing of the educational level, the tendency of payment for organic products is increased. A positive coefficient is resulted for the variables of income and treatment cost in the linear model showing that households with higher incomes or having a higher monthly treatment costs have a more tendency of payment for the organic products. Based on the linear model`s results, Abadan citizens` mean tendency of payment for each kilogram of organic vegetables is 12700 Rials.

DISCUSSION

According to the results of estimation models, factors affecting the probability of payment and rate of payment are different. Variables of number of the household members ,income ,treatment cost, acquaintance to organic products ,and record of cancer affect the tendency of payment of the consumers and the variables of age ,education, income ,treatment cost ,and inverse of tendency`s ratio of payment affect the consumer payment. There is a positive and significant relationship between the educational level and the tendency of payment for vegetables. This is confirmed by Eom (1994), and Akgungor et al[18]. Consequently, it seems that the more the educational level, the more the probability of tendency of payment , and this is because of the more awareness and knowledge of the educated individuals about the safety and taste of the organic foodstuff. There is positive and significant relationship between the variable of age and the tendency of payment for vegetables. This is confirmed by Arriaza et al (2007),Ghorbani et al (2011) ,and Behjati et al (2011) [19][20]. meaning that older ones have a more tendency of payment for organic products than the younger ones . The reason can be that these individuals, because of various illnesses, are more careful of their consumptive products. Income is a variable having a positive and significant effect on both the probability and rate of payment for organic vegetables. In other words, individuals with higher income, in addition of having a more likely consume of organic products, pay more for purchase such products. This is confirmed by Batte (2006) and Behjati (2011) [21][19]. It is natural because as the income is increased , the possibility of purchasing the organic products which are typically expensive is increased, too. Therefore, using complementary policies in order to provide the needed per capita income for healthy foodstuff can be a step to increase the consumption of organic products. In addition, because the organic products are more expensive due to the production expenses, using supportive policies in order to reduce the production expenses are suggested so that households with lower incomes would be able to consume these products. There is a negative and significant relationship between the number of household members and the probability of tendency of payment. This is confirmed by Dashti and Sohrabi (2008)[21]. As the number of a household members increases, because of the reduction of per capita income, the probability of payment for organic product is reduced. Based on this, authorities` more attention to the quality and health of the consumptive foodstuff especially in the crowded households is suggested. Perhaps giving subsidies with the name of health subsidy to the household members could resolve this problem of the populated households. There is a positive and significant relationship between the cost of treatment and tendency of payment. This is confirmed by Akgungor et al (2007). Thus, the more the treatment cost, the more the tendency of payment for organic products. Main reason of this can be justified in a way that when the treatment cost is increased in the households, their sensitivity to this cost and strategies to for preventing the enhancement of this cost`s share of the income cost is increased, too; then, taking healthier products (organic ones) into account would be increased. So it is suggested that authorities pay more attention to make the consumers familiar with the culture of prevention of getting exposed instead of treatment specially consuming healthy foodstuff as a main strategy. There is a positive and significant relationship between the acquaintance with organic products and the tendency of payment for organic products. This is confirmed by Akgungor et al (2007) and Mafiee and Saleh (2010)[11][4]. Consequently, the more the acquaintance with organic products, the more the tendency of payment for organic products is resulted. So, educations and advertisements related to foodstuff safety and health through media, schools, seminars, and educational workshops are suggested in order to promote and develop the organic agriculture. There is positive and significant relationship between the record of cancer and the tendency of payment for organic products .This is confirmed by Mafiee and Saleh (2010)[4]. This result indicates that the existence of cancer –exposed individuals in households increases their sensitivity to the quality of consumptive foodstuff. Making the households familiar with the relation of the outbreak of various illnesses such as cancer and the kind of consumptive food can be a strategy for making them sensitive to the kind of the consumptive foodstuff.

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REFERENCES

[1] Malakoti M.J, *Journal of Agricultural trading*, **1999**,2, 14.

[2] Lotter DW, *Organic agriculture J Sustain Agric* ,**2003**,214.

[3]Agricultural Jihad, Statistic and planning department of agriculture in Iran ,**2006**,13.

[4]Mafiee H,Saleh A, 6th Iranian agricultural economic conference, Mashhad, Iran,**2001**,19.

[5]Michelson J, Hamm U,Wyen E , Roth E , economics and policy,**1999**, 7, 290.

[6]Morris C, Hopkins A, Winter M , Final report to the Countryside ,**2001**,560.

[7] Williams P, Hammitt J, *Risk Analysis*,**2000**, 20, 746.

[8] Hartman H, The Hartman Group, **1997**,78.

[9] Bernal L, Veyna K, Poster presented at the 15th annual world food and agribusiness symposium Chicago,**2005**,28.

[10] Rodríguez E,Victoria L,Bertriz L , *Food Utilization*,**2006**, 14,16.

[11] Akgungor S, EAAE seminar International Marketing and International Trade of Quality Food Products Bologna Italy, **2009**,45.

[12] Arriaza M, Kallas Z, *Conference of Agro-Food Social Scientists*,**2007**, 56.

[13] Venkatachalam L, *Environmental Impact Assessment Review*,**2003**, 24,124.

[14]Green WH, Econometric Analysis, 2nd Edition, **1993**,PP 205.

[15] Salami H , Einilahi,A , *Journal of agricultural science* ,**2002**,32,445.

[16] Judge G, Hill C, Griffiths W, Lee T , Lutkepol H, Introduction to the theory and practice of econometrics, New York, Wiley and Sons ,**1982**,PP 231.

[17] Maddala GS, Limited Dependent and Qualitative Variables in Econometrics, Network. Cambridge University Press, Cambridge,**1983**,PP 56.

[18] Eom Y, *American Journal of Agricultural Economics*,**1994**, 76,771.

[19] Gorbani M, Nemati A , Gorbani R , *Journal of economic and development* ,**2011**,25,28.

[20] Behjati T,Mortazavi A , Abdollahi B ,*Journal of economical research*,**2011**, 10 ,40.

[21]' Batte B,Marvin T, Neal H,Hooker H, Timothy C,Haab H, Jeremy B,Ingredient processed organic food products food policy,**2006**, 5 ,26.

[22] Dashti G, Sohrabi F, *Journal of Iran natural resources*,**2008**, 61, 932.