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# Estimating Iranians Consumers' WTP for Hashemi Organic Rice

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### ABSTRACT

Health, food safety and the environment are the main reasons for tendency to consume organic products, the entire world especially the industrialized countries are seeking for agricultural system to supply human food sources that are economically renewable and socially desirable, however the organic agriculture is an integrated and safe systematic agricultural production system that does not conflict with environmental and economic benefits and is suitable for the production of healthy food with no contaminants. Present study investigates the Iranian consumers' willingness to pay (WTP) for organic product of Hashemi rice based on the use of Heckman two-stage open-end valuation approach. The study results showed that the variables of education, household income, individuals' attitudes towards organic products and consumption frequency of rice per week had a significant and positive statistical effect on the urban consumers' WTP for Hashemi organic rice. Also, the average WTP for a kilogram of organic rice is 13.6% higher than that of the ordinary rice

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**Keywords:** *tendency to pay, organic rice, urban households, Heckman method.*

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### INTRODUCTION

Population growth and the demand increase for foods and imbalance between supply and demand have driven traditional agriculture to industrial agriculture (Rezaie, 2014). Industrial agriculture's dependence on external inputs especially fertilizers and chemical pesticides, agricultural machinery and indiscriminate exploitation of soil and water has put excessive pressure on the environment and the interests of future generations. So that, in recent decades modern agro-systems were criticized because of concerns about the problems, and a global consensus arose to develop an agriculture that can cause the least damage to the environment while increasing productivity (Connolly and Klaiber, 2012).

The increased prevalence of diseases associated with the rise of public awareness of the dangers caused by food processing arose concerns about safer and healthier method in food production and the production of organic products, for this reason, many governments encourage farmers to go into organic farming through innovation, marketing and communication and collaboration with customers to achieve a healthier and more sustainable lifestyle (Valerian, 2011). In fact, organic farming enhances and develops the health of bio-ecosystems and bio-cycles and soil biological activity. In other words, the organic products are products that have natural growth stages and grow in soil in which no pesticides such as herbicides and fungicides have not been used since a few years ago and have only been strengthened by using natural materials such as vegetal compost and animal manures. The main features of the method are maintaining soil fertility for a long time, soil self-sufficient in terms of nitrogen,

providing needed food crops, the application of holistic methods of animal management, wild weed control by using various methods such as crop rotation and the use of natural enemies (Badalzadeh and Kuhi-Dehkordi, 2014). This rule is also true for products such as rice; rice belongs to millet family and according to the latest statistics released by the FAO from 2000 to 2010, area under paddy cultivation in the world varied from 153,783 to 161,762 thousand hectares. Rice is the second crop widely consumed after wheat in Iran. In the past two decades, fertilizers and chemical pesticides have been used to increase rice production, that the annual amount of fertilizers consumption in agriculture sector of Iran is about 4.5 million tons of which 87% is accounted for Urea-phosphate fertilizers.

The heavy use of the fertilizers because of the cadmium and nitrate content causes cancer. In Iran, cancer is considered the third cause of mortality, annually more than 30 thousand individuals are died from cancer in Iran. However, with the advancement of technology and lifestyles away from a clean environment, and increased industrial carcinogens pollutants, it is expected that the cancer cases will be doubled in the next two decades (Heydari- Shalmani, 2014). In Iran, supply and distribution of chemical fertilizers in 2002, cost for the governmental total amount of 2391 billion RLS (Ghorbani, 2008).

There is evidence indicating that the use of chemical pesticides and fertilizers is able to create serious risks for the environment and public health. General problems related to pesticides include groundwater pollution, public health problems, loss of crops and varieties that are not targeted and also persistent pesticides. The presence of pesticides in groundwater is extremely dangerous to humans and cause abnormal disorders of the nervous system, the endocrine and the immune system. Pesticides also cause cancer through several mechanisms including direct changes in DNA, mutations and toxic effects on the immune system (Amoli Diva, 2007). Lack of chemical fertilizers use and organic planting of rice caused increased soil fertility, destruction of weeds, prevention of soil erosion, destruction of pests and diseases, the use of biological resources such as beneficial insects can decrease environmental pollution (water and soil). Organic rice is a new product in the world and in our country of which there is no detailed data and knowledge about the cultivation and production because of the novelty of the product, extensive research must be done in the field of production and consumption of organic rice for a proper supportive policy to be adopted. Thus, the present study aims to assess the knowledge of the individuals to know the organic product of rice and determine the urban consumers' tendency to pay for Hashemi organic rice in Guilan province.

### **Research background**

In Iran few studies analyze consumers' attitudes and WTP for organic products. Rostam-Abadi (2014), examined the relationship between knowledge, attitude, trust and willingness to consume genetically modified crops among food industry staff in Khuzestan province using Likert scale and regression analysis. The results of the study showed that the trust is the most effective factor on consumers' WTP. Vaseghi Dudran (2014) address the factors affecting WTP of consumers to buy organic products, the high price of organic products compared with inorganic similar products and consumers satisfaction with the current products are factors affecting consumers' WTP for organic products.

Barber's and (2014) measure consumers' actual willingness to pay (WTP) for pro-environmental (PE) and non-PE products through a controlled experimental auction in Northeastern U.S. Findings showed the majority of consumers would not pay more for PE offerings, suggesting that they may not view PE products as "normal." Implications for shaping PE behavior of this neutral majority are addressed. Further, the need for researchers to collect actual behavioral data is emphasized, as this is of paramount importance in the environmental domain due to the well-known "action gap" between intentions and behavior. Hyun-Joo and Zee-Sun. (2015), investigates how consumers perceive organic food attributes, which in turn influence their utilitarian and hedonic attitudes and intentions to purchase organic food. Specifically, consumers' perceptions of nutritional content, ecological welfare, and price attributes of organic food have strong effects on utilitarian attitudes as well as hedonic attitudes toward buying organic food, while perceptions of the sensory appeal attribute have a strong effect on hedonic attitudes. Veldstera and (2014), separates the decision to be certified organic into the decision to use organic practices and the subsequent decision to certify those practices, using data from a survey of US fruit and vegetable producers. They document that many producers are using organic practices but choosing not to certify. Philosophical beliefs and perceived risk of losses due to disease, weeds, and insects have the largest impact on the decision to use organic practices. Producers who use organic practices and direct market are less likely to certify. Moreover, they find that the certification process discourages certification. Rousseau and Vranken, (2013), investigate how the provision of objective information about the environmental and health impact of organic labels by policy makers can influence the WTP of consumers for labeled organic apples in Flanders (Belgium). Using a stated choice experiment, they initially find that Flemish consumers are willing to pay a positive price premium of some 33 euro cent per kilogram for labeled organic apples. After the provision of information on the actual environmental and health effects of organic apple production, this price premium becomes even more pronounced and increases to 57 euro cent per kilogram. Using a conditional logit model with covariates and a mixed logit model, they find evidence of preference heterogeneity. Also, the effect of information provision is more pronounced for certain groups of consumers such as non-vegetarians, infrequent buyers of organic products and members of a nature protection organization. As such, this paper illustrates that there is a role for policy makers and CSR producers in providing more accurate and reliable information about socially responsible production processes. Moreover, it is important to take the observed preference heterogeneity into account and tailor policies to specific consumer

groups. Liu and et, al. (2013), evaluates Chinese consumers' decision-making processes in relation to safe food. It specifically focuses on consumers' use of and trust in information about safe food and their knowledge, attitudes and behavior towards safe food. The findings show that Chinese consumers have a high awareness of safe food but limited knowledge about the concept of safe food, low recognition of the relevant labels and limited ability to identify safe food. Despite limited knowledge about safe food, Chinese consumers generally hold positive attitudes towards it, particularly with regard to its safety, quality, nutrition and taste. They are willing to pay more for safe food products. The implications of this review for the food industry, food policy decision makers and future scientific research are discussed. Ozguven (2012), analyze the motivations factors of buying organic foods in consumers in Izmir (Turkey). Consumers were questionnaire included in a number of criteria that influence consumers when buying food. The decision-making process is complex and the motives factors may affect vegetables. Probst and et, al. (2012), investigated the marketing potential of organic vegetables in the food vending sector of Cotonou (Benin), Accra (Ghana) and Ouagadougou (Burkina Faso). Certified organic production and marketing was examined as a potential strategy to improve chemical food safety. A stratified random sampling strategy was applied to study the preferences of food vendors and consumers. The results showed that awareness of chemical contamination risks was generally low. Appearance of a product was central to vendor choice; consumers attributed similar utility to taste and organic certification. Consumer WTP was calculated to be a premium of 1.04 USD if the food served contained only certified organic vegetables. In restaurants, this would mean an average premium of 19% for a meal. If certified organic vegetable production is to make a positive impact on food safety in urban West Africa, they therefore conclude that demand from the food vending sector alone will not institutionalize domestic certification mechanisms.

Unfortunately, there are no accurate statistics on the amount of organic rice production in Iran and in particular in Guilan province, that is currently the second largest producer of rice in Iran. Furthermore, little studies have also been conducted in the field of consumers' WTP toward organic rice. Hence, the present study deals with valuation of Hashemi organic rice. In this regard, making use of the experiences of domestic and foreign research, contingent valuation model based on the open-ended approach was used.

### MATERIALS AND METHODS

Heckman two-stage approach assumes that a set of explanatory variables can have effect on consumers' decision to pay more for organic rice and another set of variables can have effect on the consumers' additional WTP levels. This approach consist of two Probit and linear regression models. Probit and linear regression models are shown as following equations that are resulted from separating Heckman two-stage approach (Heckman, 1976).

$$\begin{aligned}
 Z_i &= \beta'X_i + V_i && \text{Probit's models} \\
 Z_i &= 1 \text{ If } Y_i^* > 0 && \\
 Z_i &= 0 \text{ If } Y_i^* = 0 && \\
 Y_i &= \beta'X_i + \delta\lambda_i + e_i && \text{Linear regression}
 \end{aligned}
 \tag{1}$$

In the above model,  $Z_i$  means existence or non-existence of additional WTP for each kilogram of organic rice,  $Y_i^*$  is the latent variable of model, and  $Y_i$  is the amount of individuals additional WTP.  $\beta$  and  $\delta$  are the parameters of the models that should be estimated and  $X_i$  are explanatory variables which include gender, education, consumers' attitude, household income and consumption of rice per week.  $v_i$  and  $u_i$  are residuals of models which had been independent from explanatory variables and it is supposed that they have normal distribution with zero mean and fixed variance of  $\delta^2$ .

$\lambda_i$  is inverse of Mill's ratio that it is obtained from equation (2) (Heckman, 1976).

$$\lambda_i = \frac{\phi(\beta'X_i)}{1-\phi(\beta'X_i)}
 \tag{2}$$

$\phi(\beta'X_i)$  and  $1-\phi(\beta'X_i)$  means respectively density and normal distribution density functions in above equation. Probit's model is estimated by using maximum likelihood method in first stage of Heckman two-stage approach. Estimating second model (line regression) is done by adding a new independent variable named "inverse of Mill's ratio" and applying ordinary least squares estimator; this new explanatory variable is made by using estimated parameters of first model (Probit) for all  $Y_i^* > 0$  observations.

Greene (1993) showed that inverse of Mill's ratio in linear regression model removes heteroscedasticity and makes coefficients unbiased and consistent. Elasticity is used to evaluate the effect of changing in  $X_i$  on  $Z_i$  variable. The effect of changing in independent variable amount on the expected amount of dependent variable ( $Z_i$ ) is obtained from following equation (MacDonald and Moffitt, 1982):

$$\frac{\partial E(Z_i)}{\partial X_i} = B_j \tag{3}$$

In order to choose proper functional form in second stage of Heckman’s method, MacKinon non-nested test is used (Judge and , 1985):

$$\log y_t = b. + \sum_{i=1}^n b_i \log X_{it} + \theta v_t + e_t \tag{4}$$

$v_t$  coefficient is tested by Wald’s statistic after estimating above model. If the coefficient of this variable becomes significant, line model is chosen and if it does not become significant, logarithm model is chosen and used for future analysis. At last, the average amount of consumers’ willingness to pay more for each kilogram of organic rice is obtained in selective regression model of second stage of Heckman approach.

### RESULTS AND DISCUSSION

Studied case had involved 294 people of Rasht’s citizens in Iran which have been chosen and interview accidentally. 23.8 percent (70 individual) are women and 76.2 percent (226 individual) are men from the whole studies case. The most important features of sample descriptive statistics are as follows:

Table 1. The most important features of studies case descriptive statistics

Characteristic	Average	Maximum	Minimum	SD	Mode
Age of respondent	43.93	80	20	12.07	29
Education level*	4.11	7	1	1.32	5
Household size	3.31	6	1	0.95	3
Rice consumption**	7.74	14	2	1.92	7

\*Education level categorized to 7 levels.

\*\*The Rice consumption during a week

Data of interviewed individuals’ education level is collected in rank and is involved to seven ranks which are: 1- Illiteracy, 2- Under diploma, 3- Diploma, 4- A two-year university education, 5- B.A or B.S, 6- M.A or M.S, 7- PhD. 41.8 percent of citizens have already been aware of organic rice’ advantages, although 58.2 percent of studied citizens were not aware of this products’ advantages. Four attitudinal questions were raised on the basis of Likert's spectrum for evaluating consumers’ attitudes especially the advantages of organic provisions.

Table 2. Frequency of individuals’ responses to attitudinal questions

Attitude questions	A	B	C	D	E
The development of organic nutrients production firms should have priority in the development programs of Iran.	91	128	75	0	0
Although the price of organic product is higher than the same common product but organic products should have more share in my family's consumption basket.	88	134	71	1	0
In my opinion the value and utility of organic nutrients and common nutrients are equal.	39	147	92	14	2
Although organic nutrients consumption helps us to improve our health but I do not want to pay more for buying these products.	24	99	109	59	3

A: completely agree B: agree C: indifferent D: disagree E: completely disagree

After collecting data, Heckman two-stage approach was estimated based on two model of binary probit and linear regression. The variable of gender, education and consumers' attitude considered as factors effect on the decision to pay more for organic Hashemi rice and the variables of education, consumers' attitude, household income, consumption of rice per week and inverse of Mill's ratio were include in linear regression as factors which effect on the individuals' additional WTP for Hashemi organic rice.

Table 3. Results of Heckman Two-Stage Approach

Variable	The first stage (Probit)		The second (linear regression)	
	Coefficients	t-Statistics	Coefficients	t-Statistics
Gender	-0.54	-1.98**	-	-
Education	0.41	4.31*	0.88	3.39*
Consumers' attitude	0.42	7.21*	1.35	10.55*
Household income (RLS)	-	-	0.11×10 <sup>-6</sup>	4.32
Consumption of Rice per week	-	-	0.28	1.97**
Inverse of Mill's ratio	-	-	3.66	7.46*
Constant	-6.53	-7.82	-20.87	-10.42

\* Significant at 1%

\*\* Significant at 5%

LR statistic of Probit model was equal to 167 that considering the probability level of 0% for mentioned statistic indicates the total significance of Probit regression. Estrella, Maddala, Cragg-Uhler, McFadden, and Chow R-Squares are respectively 0.54, 0.43, 0.62, 0.47 and 0.51. Percentage of right prediction for Probit model is also equal to 71 percent. The LM2 statistic was equal to 0.46, that considering the probability level of 93% for mentioned statistic indicates the homogeneity of residuals variance in Probit model. The marginal effect and elasticity of explanatory variables in the Probit model are presented in the table below.

Table 4. The amount of stretching and ultimate effect of variables in Probit's model

Variable	Marginal Effect	Weighted Elasticity	Elasticity
Gender	-0.1	-0.109	-0.108
Education	0.09	0.36	0.45
consumers' attitude	0.09	1.4	1.65

In linear regression, R<sup>2</sup> and R<sup>2</sup> adjusted coefficients were 56 and 55 percent, respectively. Based on the results of the Heckman two-stage approach, the expected value of individuals additional WTP for a kilogram of Hashemi organic rice compared to Hashemi ordinary rice was equivalent to 6.13 percent.

### Conclusions and recommendations

Organic farming seeks to provide authentic food, also use of artificial fertilizers, synthetic chemicals, and genetically modified organisms must be avoided. This study analyzes Iranian consumers' WTP toward organic rice. The expected value of additional WTP for Hashemi organic rice in compare with Hashemi ordinary rice was equivalent to 6.13%. The key antecedents of consumers' attitudes are perceptions of the nutritional content, ecological welfare, sensory appeal, and price attributes of organic food, and that these attitudes in turn influence their behavioral intentions to purchase organic food. To meet the change in consumers' food consumption patterns and the demand for safe food, food safety guarantees become a significant issue. Consequently, the research on measuring consumers' value by range including values by individual steps is necessary.

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