Investigating Consumers' Willingness to Pay for Organic Green Chicken in Iran (Case Study: Rasht City)

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Abstract

Health and safety are important factors in today's life. Most of studies show that consuming the chicken that has anti biotic caused different diseases like digestive vessel cancer. Attention to controlled use of antibiotics can play a key role in society health which considered in the production of green chicken. Planning for increasing the production of mentioned chicken needs the investigation of consumers' WTP. So, using double bound contingent valuation method and logit model, present study estimates consumers' WTP for green chicken in Rasht city. Among the explanatory variables applied in logit model, income and education level had positive and significant effects on WTP for green chicken. Results revealed that average WTP for a kg of green chicken equals to 37279 Rials, and because this WTP does not compensate the production costs, government protection such as Green subsidy should be considered in order to expand green products consumption in Iran.

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INTRODUCTION

By improving science and new technologies like changing the growth speed of poultry, especially chicken by means of genetic engineering, changing the food consumption pattern and creating a suitable farm environmental situation, in last three decades, caused a big revolution in chicken production. Production increase solved the food shortage problem in many of developed countries and developing countries, but new problems like new deceases and reduction of food quality are created. Diseases increase like different kinds of cancers which is derived from consuming the agricultural products caused worldwide view change toward the use of more organic food.

In reality, unfavorable advantages and remained effects of consuming different kind of chemicals, hormones and antibiotics in nutrition production in different developed countries, caused agriculture develops in opposite side of modern method and technology, in which there is a prohibition in consuming chemical materials or artificial things in production process named organic production.

Antibiotics are groups of chemical compounds that produced biochemically by plants or micro organism like spores and have antibacterial characteristics and prevent bacterial growth and its less doze (5ppm) in a period can increase the poultry's growth (Jabarzadeh, 2011). Consuming antibiotics causes two main problems in human health that consists of remained antibiotic in bestial products and pathogen's resistance against antibiotic. Remained antibiotics in bestial products caused allergic response, fever, squirt, charley horse of gastric muscle, harmful effects on metabolism in digestion system and in long run consumption caused cancer. According to the previous studies, different kinds of cancer have a direct and close relation with consuming protein and antibiotics. In Iran about 200,000 cases of cancers recorded annually that about 36 percent of these cancers related digestion system and liver cancer (Akbari, 2000).

In Iran more than 1000 million tones, chicken meat produces annually (FAO, 2011). In recent years nearly about 120 production unit of green chicken activated among these units, 12 centers are producing green chicken in Guilan province (Ministry of Jihad-Agriculture, 2011). Omitting antibiotics in chicken production raise costs and normally this green product should be sold with higher price in markets. In this case investigating consumers' preference and willingness to pay (WTP) for green chicken helps producers to price their commodity better and analyze the possibility of production increase.

WTP can be defined as the money that paid to firm and is the different between surplus pay of consumers before and after the improvement in one characteristic of nutrition products. (Rodriguez and et al., 2007).

Contingent Valuation Method (CVM) had been used increasingly for valuing green products throughout the world. Mafi and Saleh (2009) estimated the consumers' WTP for organic vegetable and cucumber in Guilan and Tehran provinces of Iran. Results revealed that income and knowledge about cancers had positive and significant effect on WTP. Tagbata and Sirieix (2008) studied the effect of organic label on consumer's WTP in France. Results showed that half of the Consumers are sensitive to organic label in food buying. Rodriguez and et al., (2007) evaluated consumers' WTP for organic products in Argentina. Their findings showed that consumers would pay more money for buying organic products something between 6 to 200 percentages.

Considering the importance of the cognition of consumers' WTP for green chicken in production increase plans and marketing strategy, present study investigated the WTP for green chicken in Rasht city using CVM and survey analysis.

MATERIALS AND METHODS

In order to estimates the consumers' WTP for green chicken applying CVM, 200 random individuals in Rasht city selected and requested explanatory variables obtained through questionnaires filled by sample individuals. Suppose the utility function of Rasht city consumers as below:

U(Y,S)   (1)

In which, U is indirect utility function, Y is individual's income and S is the vector of individual's social-economic characteristics. Each consumer agrees to pay some of his or her income for buying green chicken that we call this amount A, only if consuming green chicken increases his or her utility more than the situation in which this consumption does not occurred. Below equation express mentioned situation:

$$U(1,Y-A;S)+\epsilon 1 \geq U(0,Y;S)+\epsilon 0 \qquad (2)$$

In above relation, ϵ_1 and ϵ_0 are random variables with average of zero that distributed accidently and independent of each other (Khodaverdizadeh and *et al.,* 2011). The increase in individual's utility because of green chicken consumption defined as below (Akbari and *et al.*, 2007):

$$\Delta U = U(1, Y - A; S) - U(0, Y; S) + (\epsilon_1 - \epsilon_0) \quad (3)$$

According to the per-test statistical distribution, double bound approach has been used in CVM questionnaires designing. CVM questions in double bound approach followed a binary answer (accept or deny the bid) by individual (Lee and Han, 2002). For estimating valuation function in CVM, Logit functional form used widely (Amirnejhad *et al.,* 2006). In valuation model, Logit functional form used to study the different explanatory variables effects on WTP of individuals for consuming green chicken.

In Logit model the probability of accepting the bids by individuals defined as below:

$$p_i = F_\eta(\Delta U) = \frac{1}{1 + \exp(-\Delta U)} = \frac{1}{1 + \exp[-(\alpha - \beta A + \gamma Y + \theta S)]} \quad (4)$$

In which, $F\eta(\Delta U)$ is aggregate distribution function with standard logistic difference and in which explanatory variables like income, bid, age, gender, family size and education level had been used for estimating valuation function. Also, β, γ and θ are regression coefficients which are expected to be $\beta \leq 0$, $\gamma > 0$ and $\theta > 0$, respectively. Logit model could be estimated in linear or logarithmic form. The interpretation of two parameter is important in logit model results include elasticity and marginal effect. The

elasticity of k explanatory variable (X_k) is as below (Hayati and *et al.*, 2011):

$$E = \frac{\partial(B'X_K)}{\partial X_K} \frac{X_K}{B'X_K} = \frac{e^{B'X}}{(1 + e^{B'X})^2} B_K \frac{X_K}{(B'X_K)} \quad (5)$$

Elasticity of an explanatory variable explained the percentage change in the probability of bid acceptance for green chicken buying by individual when X_k amount changed by one percentage. Also, the marginal effect showed the percentage change in the probability of bid acceptance for green chicken buying by individual when X_k amount changed by one unit.

$$ME = \frac{\partial Pi}{\partial x_k} = \frac{\exp(B'X)}{(1 + \exp(B'X))^2} \cdot B_k \quad (6)$$

In above relation, the extent of change in the probability of bid acceptance depends on the initial probability and initial value of independent variables and their coefficients. When the explanatory variable is a dummy variable, the following relation is used for computing the marginal effect (Khodaverdizadeh and *et al.*, 2011):

$$ME = p(y = 1|x_k = 1, X^*) - P(Y = 1|x_k = 0, X^*) \quad (7)$$

Marginal effect for a dummy variable equals to change in the probability of bid acceptance ($Y_i = 1$) as a result of changing dummy variable amount (X_k) from 1 to 0, while other variables amounts held constant at (X^*) levels.

For calculating the maximum WTP of sample individuals, considering the linear Logit functional form, below equations had been used (Haneman, 1984):

$$u(1, y - A; s) = u(0, y; s)$$
$$v(1, y - A; s) + \epsilon_1 = v(0, y; s) + \epsilon_0 \Rightarrow \Delta v = 0 \quad (8)$$

We can write indirect utility difference as below:

$$v(h, y - A; s) = \alpha_h + \beta y + \epsilon_h \qquad , \beta > 0, \ h = 0,1$$
$$v(1, y - A; s) = \alpha_1 + \beta(y - A) + \epsilon_1$$
$$v(0, y; s) = \alpha_0 + \beta y + \epsilon_0$$
$$\Delta v = v(0, y; s) + \epsilon_0 - v(1, y - A; s) - \epsilon_1 = (\alpha_0 - \alpha_1) + \beta A + \eta$$

(9)

Considering that the average amount of equals 0, above equation could be rewrite as below:

Table 1. Descriptive statistics of sample's characteristics.

Characteristic	Average	Maximum	Minimum	SD	Mode
Age	42.36	77	20	13.23	36
Education level*	4.28	7	2	1.24	5
The number of family	3.74	8	1	1.14	4
chicken consumption**	3.63	12	1	1.64	3

*Education level categorized to 7 levels.
**The chicken consumption during a week

$$\Delta v = v\,(0, y; s) - v\,(1, y - A; s) = (\alpha_0 - \alpha_1) + \beta A$$

(10)

From which, maximum amount of individual's WTP for a kg of green chicken equals $-\frac{\alpha_0 - \alpha_1}{\beta}$. Requested data set obtain from a survey that was done in early 2011 in the city of Rasht.

RESULTS AND DISCUSSION

Investigated sample include 200 citizen of Rasht city that was selected randomly. Out of total sample individuals, there were 29.5 percent (59) women and 70.5 percent (141) men. Important descriptive statistic of investigated sample reported in table 1.

Out of total sample size, 37.5 percent knew the advantages of green chicken consumption, while 62.5 percent didn't know anything about the advantages of green chicken. To evaluate the consumers' views about the advantages of green nutrition, four questions based on likert scale asked from each individual. Sample's answers to these questions reported in table 2.

Using scoring approach, individuals' answers to attitude questions applied for constructing individual attitude variable toward green chicken consumption advantages and this variable used in regression analysis of determining effective variables on acceptance of bids, proposed for a kg of green chicken. Three bids used in double bound approach of CVM which are include 37000, 44000 and 52000 Rials per a kg of green chicken. These bids proposed based on full cost and two scenarios of considering 20 and 40 percent margins. For estimating individuals' WTP for a kg of green chicken, explanatory variables of proposed price (BID), education level (EDU), family size (FN), dummy variable of consumption experience (CE), chicken consumption meals per week (CN) and attitude variable of green chicken consumption advantages (SAS) had been considered. In order to estimate Logit binary model, at first multicollinearity existence among explanatory variables had been investigated. (Table 3)

According to this fact that there isn't any pair of numbers greater than 0.5 in each row of above table, it could be concluded that there is no multicollinearity among the explanatory variables of this study.

Table 2. The frequency of sample's answer to four attitude questions.

Attitude question	A	B	C	D	E
The development of green nutrients production firms should have priority in the development programs of Iran.	30	71	96	2	1
Although the price of green product is higher than the same common product but green products should have a greater share in my family's consumption basket.	39	88	69	4	0
In my opinion the value and utility of green nutrients and common nutrients are equal.	2	14	61	96	27
Although green nutrients consumption helps us to improve our health but I do not want to pay more for buying these products.	8	51	80	45	16

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

Table 3. Principle component test results.

Explanatory variable	BID	EDU	FN	CE	CN	SAS
1	0.84	0	0	0	0	0
2	0.14	0.01	0.003	0.0001	0	0.71
3	0.01	0.0001	0.008	0	0.95	0.0006
4	0.0006	0.25	0.65	0.001	0.02	0.19
5	0.003	0.59	0.34	0.002	0.02	0.08
6	0.002	0.14	0.0008	0.99	0.01	0.01

Table 4. The results of Logit model estimation.

Variables	Coefficients	SD	t-statistics	Elasticity
BID	-0.31×10^{-2}	0.39×10^{-3}	-7.86*	-5.87
EDU	0.45	0.13	3.3*	0.95
FN	-0.19	0.12	1.55	-0.33
CE	0.49	0.31	1.56	0.084
CN	0.25	0.083	3*	0.44
SAS	0.47	0.074	6.41*	3.2
Constant	2.68	1.43	1.87**	-

* Significant at 1%
** Significant at 5%

For evaluating the effects of explanatory variables on binary dependent variable (accepting bid or denying) Logit model estimated using maximum likelihood estimator. The results of model estimation reported in table 4.

The signs of two explanatory variables include BID and FN was negative that showed the reverse effect of mentioned variables on the acceptance of proposed price for a kg of green chicken. The t-statistics of BID variable showed that its negative effect on dependent variable was significant at 1 percent. The elasticity of BID showed that a percent increase in BID amount decrease 5.87 percent the probability of accepting the proposed price by consumer. Explanatory variables include EDU, CE, CN and SAS had positive signs and had direct effects on proposed price acceptance by individuals. According to the t-statistics, direct and positive effects of EDU, CN and SAS were significant on 1 percent. The elasticity amounts of these variables showed by 10 percent increase in EDU, CN and SAS levels, the probability of proposed price acceptance for a kg of green chicken increase 9.5, 4.4 and 32 percent, respectively. Also, the marginal effect calculation for each variable reported in table 5.

The marginal effect of BID showed that 10 thousand Rials increase in proposed price amount reduces the probability of WTP and bid acceptance by 0.51 units. The negative marginal effect of FN revealed that one unit increase in its level reduces the probability of bid acceptance by 0.03 units. Positive marginal effect of EDU,

Table 5. Marginal effect of different explanatory variables.

Variable	Type of variable	Case Value	Marginal Effect
BID	Continuous	4207.5	-0.51×10^{-3}
EDU	Ranked	4.28	0.07
FN	Continuous	3.74	-0.03
CE	Dummy	0	0.08
CN	Continuous	3.63	0.04
SAS	Continuous	14.75	0.07

* Significant at 1%
** Significant at 5%

CE, CN and SAS showed that increase in their amounts would increase the probability of proposed price acceptance by individuals.

The LR (Likelihood Ratio) calculated statistic for Logit model equals 145.29 with 0 probability value which showed the significance of estimated Logit model. Logit Model Percentage of Right Prediction equals 71 percent which insist on high prediction power of model.

Applying Haneman (1984) method for calculating WTP showed that the amount of individual's average WTP for a kg of green chicken equals 37279 Rials. This willingness to pay amount is close to the full cost amount for a kg of green chicken and suggests that producers could not gain high margins by pricing more in markets because less consumers would buy this product in higher prices.

CONCLUSION

According to the increase of cancer diseases in Iran and the importance of society health, expanding the production and consumption of organic products is inevitable. Consumers' knowledge and information increase about the advantages of green products and the effects of antibiotics on health would change their tendency toward these products.

Advertising green products is in different ways, using public sector marketing system besides private marketing would change consumers' tastes and attitudes toward these products. Developing the standards for green products, intensifying the control process in food production firms and allocating subsidy to green products by government would increase these products share in consumers' consumption baskets.

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