PAPER

CONSUMER FAIR PRICES FOR LESS PESTICIDE IN POTATO

C. SEREFOGLU[1]* and S. SEREFOGLU[2]
[1]Ankara Development Agency, Aşağı Öveçler Mah. 1322. Cad. No. 11, 06460 Çankaya, Ankara, Turkey
[2]The Ministry of Defence of Turkey, 06100, Bakanlıklar, Ankara, Turkey
*Corresponding author: cserefoglu@gmail.com

ABSTRACT

This study estimates Turkish citizens' willingness to pay (WTP) for reduced pesticides on potatoes. These estimates rely on data collected from 393 persons covering all regions in Turkey through an online survey during the period from June 22 - July 21, 2014. The average WTP was found to be about TL 1.68 for all observations including zero bids and TL 2.91 excluding zero bids. The results of the probit model show that cosmetic defects, free-pesticide potatoes with insect damages, age, and gender were identified by the model to have significant impacts on the probability of WTP.

- Keywords: dichotomous contingent valuation, food safety, organic potatoes, probit model, reduced pesticides -

INTRODUCTION

Pesticides are defined by the European Commission (EC) (2009) as substances or mixtures of substances including chemical compounds intended for killing, destroying, or mitigating any pest. The use of pesticides has tragically and rapidly increased since 1960's due to the green revolution (CARVALHO, 2006). As explained by HOPPIN *et al.* (2007), pesticides could cause some respiratory diseases to farmers. Similarly, ALAVANJA *et al.* (2004) stated that indirect exposures which occur by way of drinking water, food or air happen more frequently than direct exposures occurring to individuals who apply pesticides in agriculture.

The consumption level of pesticides in Turkey increased to 54,000 tonnes in 2002 but during the last decade the level notably decreased to 40,000 tonnes (MFAL, 2012). The amount of pesticides used in Turkey seems quite low when compared with countries such as Germany and France in Europe according to the FAO statistics.

Stated and revealed preferences are the methods that are often used to measure the WTP of consumers. As stated by EBERLE and HAYDEN (1991), each individual`s valuation of a non-market good is reflected through a direct questionnaire approach. Thus, our research is mainly based on the Contingent Valuation Method (CVM) and food safety issues through the responses which come from an online survey which covers the whole of Turkey. The food safety issue plays a crucial role for both policy makers and consumers, with fast dissemination of information through social network. As underlined by ROWELL (2004), food safety and sustainable food supply are on the agenda of developed countries to develop diets that are fundamentally affordable and health-enhancing.

The overall objective of this study is to assess Turkish consumers' attitudes towards purchasing reduced pesticides that are guaranteed not to be risky to human health. The specific objectives are: determine consumers' attitudes and concerns toward pesticide use in potatoes and ascertain consumers' willingness to pay higher bid amounts for reduced pesticides in potatoes by ensuring no pesticide residues, and estimate consumers' mean WTP for reduced pesticides potatoes.

There are several reasons why the potato product is chosen. Firstly, potato is one of the most consumed vegetables in Turkey and its consumption increases yearly even if its price increases, this is according to the data extracted from the database of the Turkish Statistic Institute (TURKSTAT). Second, it is a traditional food that has a wide usage with different vegetables. Last but not least is the over-use of pesticides used on potatoes and pesticide residues in it (BIRINCI and UZUNDUMLU, 2009; AYAZ and YURTTAGUL, 2008).

Following the Introduction, methodology will be covered in detail in section 1. Within the framework of the methodology, there is discussion of: sample size, and data analysis covering both questionnaire design and descriptive statistics including the socio-economic characteristics of the respondents and consumer preferences with respect to health risks and why the CVM is used. The second section will comprehensively focus on the econometric results and their interpretations. Regarding the econometric results, descriptive statistics and regression analysis will be included, and also, the assumptions made to perform the study is included. The paper ends with a brief Conclusion.

MATERIALS AND METHODS

The online survey as mentioned in the previous sections randomly covered all of Turkey through the social network. Surveys' results in Table 1 clearly demonstrate that the rate of participation in survey in the North East region (NE) is proportionally higher than other regions while some regions such as Aegean region (AEG) and the South East region (SE) has a lower participation rate considering their population. A high rate of responses in some regions might be explained with a fast spreading of surveys linked with the help of respondents.

The analysis was based on applying the CVM that is defined as "any approach to valuation of a commodity which relies upon individual responses to contingent circumstances posited in an artificially structured market" (SELLER *et al.*, 1985). This method was first proposed by CIRIACY-WANTRUP in 1947 in order to estimate the benefits of the prevention of soil erosion (KONTOLEON *et al.*, 2005; CAMERON, 1992). The CVM, which is basically based on a survey-based methodology for eliciting consumers' valuations of non-market goods and services, has been widely applied by researchers and policy makers in health economics and food safety for several decades and received considerable attention in the literature. It was stated by JEAN *et al.* (1995) that benefit estimates that are comparable to estimates from market-based approach can be produced by the CVM. There are a number of studies which have been used in surveys with discrete answers that have been analysed with logit and probit techniques (BUZBY *et al.*, 1995; AKGUNGOR *et al.*, 2001; GARMING and WAIBEL, 2006; KALOGERAS *et al.*, 2009).

Determining sample size

The sample size is defined by considering the current Turkish population and calculated according to the formula provided by FINK (2003):

$$n = \frac{N}{(1 + N * p^2)}$$

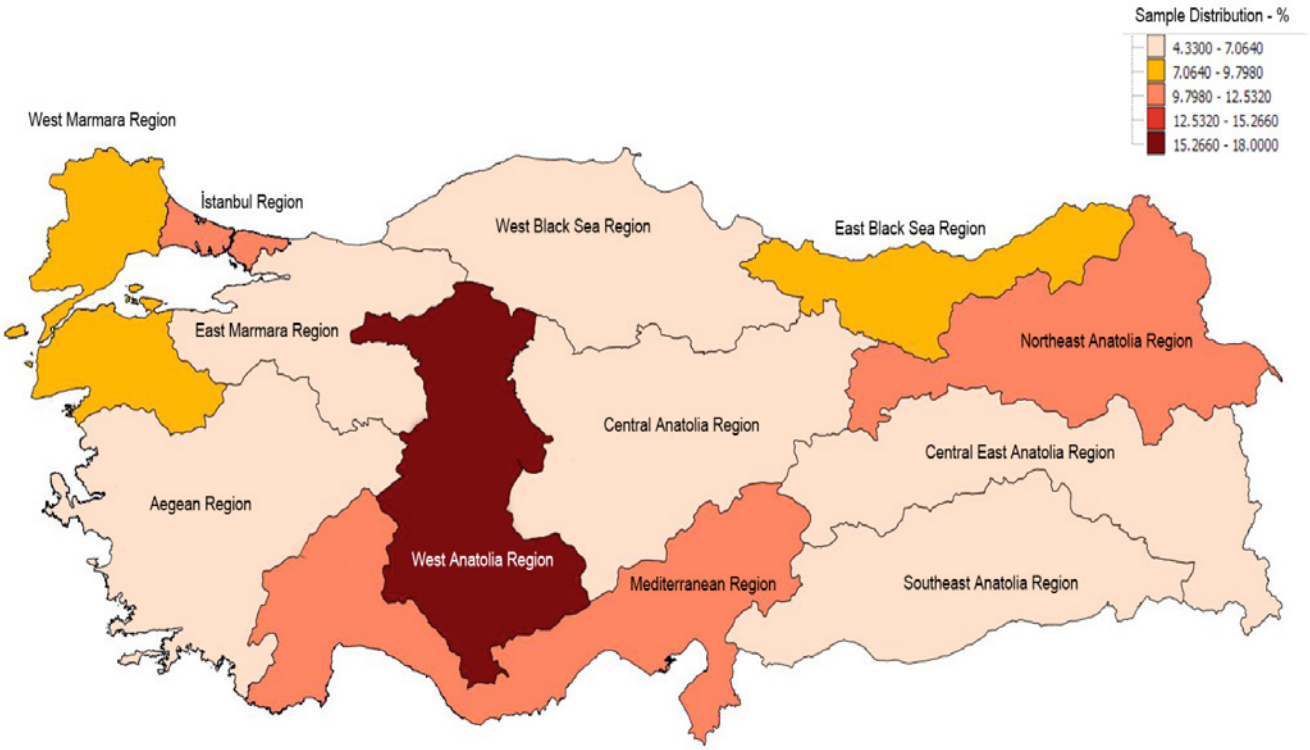

Table 1 - Percentages of Survey and Turkish Population at the level of NUTS 1 Regions (Source: Primary data extracted from survey).

Where n is the sample size determined, N is the population size, p is level of precision. The sample size is 400 at 95% confidence level and a 5% margin of error. But 393 samples were used after the first elimination due to the incompleteness.

Survey and data generation

Before moving further through online survey, the first draft was shared with 10 Turkish consumers by using face to face interview method in order that the perspective of a consumer side is truly reflected in the format of questions. After receiving some positive and negative feedback, the questionnaire form was finally rearranged in a short and clearer way as the first draft shared with consumers was found slightly longer and unclear instructions. Particularly, open-ended questions were not preferred by these consumers. Instead, options were included in some of the questions. Also, the answer choices were re-organized according to the consumer`s expectations.

Following pre-test with Turkish consumers, the link to the online survey was shared with Turkish consumers via the social networks such as in general e-mails, Facebook, LinkedIn and forums, and in particular regional development agency network covering all Turkey for one month as from June 22 until July 21, 2014. The survey mainly comprised of three parts. The first part covered the questions to elicit perceptions that are related to pesticide residues. The consumers were asked about their perceptions of pesticide residues in potatoes as well as the cosmetic defects. The question on cosmetic defects intended to measure whether or not the consumers would be willing to purchase fresh produce with insect damage, such as worm holes or irregular shape of the potatoes. The second part included WTP questions. The survey asked consumers the maximum WTP for reduced pesticide residues in potatoes. Socioeconomic questions were inserted in the third part. For simplicity, the survey was designed to simulate consumers' potato purchasing behaviour of their respective households under alternative prices on reduced pesticides in potatoes. The scenario was built on the consumers that were provided with a label that guarantees that the potatoes were tested and certified that they do not contain pesticide residues harmful to human health by assuming no change in quality. By doing so, we were able to see if the consumer`s WTP is enough to justify these increased costs of production with a reduction in pesticide use.

Regression Models of the CVM

Probit and logit which are known as non-linear functions of unknown coefficients in literature are widely applied in binary choice models. Though both models may give similar results, there are slight differences because of

the tail of observations. AMEMIYA (1981) expressed that the samples with heavier tails are more appropriate for logit models. A similar stance was made by CAKMAKYAPAN and GOKTAS (2013). They observed that logit model is generally preferred for large sample sizes (500 and 1000) and probit model is usually for smaller sample sizes. So, probit model will ultimately be employed for estimations because of the sample size. Alternatively, tobit model will be applied to measure WTP amounts that are obtained through single bounded dichotomous questions since the endogenous variable includes zero values.

Probit model

The Probit model is defined by WOOLDRIDGE (2006) as:

$$Zn=Xn\beta+un.$$

Where β is a vector of parameters including the intercept term; xn is a vector of covariates; u is the error term which either has the standard logistic distribution or the standard normal distribution. In either case, u is symmetrically distributed about zero. Zn is the unobservable amount that respondents are willing to pay for the reduced pesticides in potatoes.

WTPi is the observed dichotomous variable stating whether the individual pays or not. It can be defined as follow:

$$WTPn=0 \text{ if } WTPn^*\leq 0$$
$$WTPn=1 \text{ if } WTPn^*>0$$

As it is indicated by WOOLDRIDGE (2006), the main goal in binary responses is to explain the effects of x on the response that follows the probability P(y=1|x).

$$P(WTP=1|x)=P(WTPn^*>0|x)=P[e>-(\beta 0+x\beta|x]=$$
$$=1-G[-(\beta 0+x\beta 0]=G(\beta 0+x\beta).$$

The direction of the effect of xj on E(WTP*|x)= β0+xβ and on E(WTP|x)=P(y=1|x)=G(β0+x β) is similar to each other.

It is not possible to apply OLS due to the nonlinear nature of E(y|x). Maximum likelihood methods thus must be used in order to estimate limited dependent variable models. The maximum likelihood can be written as follows (WOOLDRIDGE, 2006);

$$f(WTP|xi;\beta)=[G(xi\beta)]y[1-G(xi\beta)]1-y, \text{ WTP-0,1,}$$

It can easily be seen that when y=1 results in G(x, β) and when y=0, we get 1- G(xiβ). The function of log likelihood for observation is a function of the parameters and the data (xi, yi)

$$li(\beta)=WTPilog[G(xi\beta)]+(1-WTPi)log[1-G(xi\beta)].$$

Tobit model

The general formulation of the Tobit model can be expressed in the following way (GREENE, 2000; WOOLDRIDGE, 2006);

$$WTPn^* =Xi\beta+ui.$$
$$WTP=0 \text{ if } yn^* \leq 0.$$
$$WTP=WTP^* \text{ if } WTPn^*<0$$

E[WTPn*|xnβ] is xn`β. Wherefore, the nth individual, Xn is a vector of explanatory variables, ui is a random disturbance term, and β is a parameter vector common for each individual. By assuming the random error is independent and normally distributed among respondents, the expected WTP for an observation drawn at random from the population is

$$E[WTP|xn]= \varphi(Xn`\beta/\sigma)+ xn`\beta+\sigma\lambda n)$$

Where φ (Xn`β/σ)/Φ(Xn`β/σ);

Where φ represents the normal distribution function and σ represents the standard deviation. Moreover, the expected value of WTP for observations above zero, which will be called E(WTP*), is simply Xβ plus the expected value of the truncated normal error terms. The expected WTP can be expressed as

$$E(WTP)= \varphi(X\beta/\sigma)E(WTP^*)$$

WOOLDRIDGE (2006) points out that the function of the tobit model which is based on maximum likelihood estimation can be shown as:

$$\text{Ln L } (\beta, \sigma)= \sum_{i=1}^{N} WTPn \sum_{i=1}^{N} WTPn(WTPn=0)$$
$$\ln[1-G(xn\ \beta/\sigma)]+(WTPn>0)\ln\{(1/\sigma)g$$
$$[(WTPn-xn\ \beta)/\sigma]\}$$

Where G(.) is the standard normal cumulative distribution function; g(.) is the standard normal density function; and σ refers the standard deviation of the error term. By maximising the log-likelihood function, the Tobit estimator $\dot{\beta}\dot{\beta}$ is obtained.

RESULTS AND CONCLUSIONS

As indicated in Table 2, 63.10 % (248) of the 393 respondents that were considered in the study are males, and 36.90 % (145) are females, which represents all of Turkey. It is also shown that 54.20 % (213) of the surveyed respondents are 31-45 years old, followed by individuals of 18-30 and 46-64 years old, representing 38.17 % (150) and 7.38 % (29) of the sample respectively. The educational attainment of the respondents is in favour of higher level of education, 53.94 % (212) acquired a university degree followed by 42.24 % (166) of post graduate degree. When comparing the above figures with

the data of TURKSTAT as in Table 3, our sample has higher income and education levels, and a higher percentage of males.

Regarding working status, a great majority of respondents (70.74 %) are employed in the public sector, while only 18.32 % and 4.33 % of the respondents work in the private sector and are unemployed respectively. Taking into consideration income level of respondents, it was found that the middle income group was overwhelmingly predominant. Respondents from low, medium and high income level consisted of roughly 12 %, 66 % and 32 % respectively. The average size of the household of respondents is 3 individuals per household and their age distribution reflected 31-45 years old.

Table 2 - Characteristics of the sample.

Sample Size:393	**Freq.**	**%**
Gender	393	100
Male	248	63,10
Female	145	36.90
Age	393	100
18-30	150	38.17
31-45	213	54.20
46-64	29	7.38
>64	1	0.25
Employment Status	393	100
Public sector	278	70.74
Private sector	72	18.32
Retired	5	1.27
Unemployed	17	4.33
Housewife	5	1.27
Student	13	3.31
NGO	3	0.76
Education	393	100
Pri&High School	15	3.82
Graduate	212	53.94
Post Graduate	166	42.24
Household Size	393	100
1 person	47	11.96
2 people	63	16.03
3 people	123	31.30
4 people	107	27.23
>4 people	53	13.49
Monthly Income (1 TL=£0,28)	393	100
849 TL or less	16	4.07
850 TL – 1449 TL	29	7.38
1500 TL – 2149 TL	43	10.94
2150 TL – 2799 TL	69	17.56
2800 TL – 3449 TL	44	11.20
3500 TL – 4149 TL	64	16.28
4150 TL or more	128	32.57
Place of residence during the first 15 years of life	393	
100		
City or suburb	251	63.87
Small town	96	24.43
Village	46	11.70

Table 3 - Comparison of Sample Sociodemographics Versus Turkey's Population.

Sociodemographies	**Sample**	**Turkey's Population***
Female (%)	36.9	49.8
Household Size	3.1	3.7
Graduates (%)	96.2	12.0
Median Income (TL)	3150	1838
Median age	40	31

*Elaborated from data extracted from TURKSTAT.

Table 4 fundamentally indicates the basic preferences stated by Turkish consumers for pesticides and food safety issues. Survey results showed that approximately 75 % of respondents have no idea about the pesticides and their harmful effects whereas only 20 % indicated limited knowledge about pesticides. Respondents aged 46-64 showed a higher degree of knowledge about pesticides.

A great majority of those having pesticide knowledge specified mass media as a source of knowledge on pesticides. When a cross check question about the pesticides in potatoes was later asked, more than 50 % of respondents again indicated no idea about it; while 32 % of those have an opinion of "there are pesticide, hormone and other chemicals that are harmful for health". Regular shapes of potatoes are predominantly remarked by respondents (around 56 % of respondents). A similar viewpoint comes from another question to observe how cosmetic defects are important for individuals. More than 86 % of respondents pointed out that they are not willing to pay for potatoes with insect damages even though they are pesticide-free produce. This finding might be interpreted that for those who are willing to pay more for pesticide-free products, suppliers should ensure that they can be provided with satisfactory quality standards. OTT and MALIGAYA (1989) quoted in WEAVER *et al.* (1992) found that 88 % of the respondents would be unwilling to accept those defects. Apart from cosmetic defects, Independent science-based advice is one of the most important critical issues in food safety in the European Union. European Food Safety Authority (EFSA) as an independent body is responsible for carrying out risk assessment from risk management (EFSA, 2014). Conflict of interest inevitably appears when the same institutions both control and monitor the same findings. This is a crucial issue for Turkey as well. Therefore, a question was asked to observe the respondents' opinions on "Who should carry out food safety control?". The least frequent responses for this question are municipalities and public agents with roughly 4% and 12% respectively. The majority, 37%, of respondents preferred having an independent laboratory certification for more fair and transparent food safety control.

Based on the data in Tables 1, 2, and 4, respondents aged 31 to 45 and having Master and PhD. degrees were found to be more willing-to-accept insect damage in reduced pesticides in potatoes than those aged 46 and older, and those having non-college and college degrees respectively. Males, lower income households and college graduates were found to be less willing to accept cosmetic defects in reduced pesticides in potatoes than were females, high income households and non-college graduates respectively. Finally, the survey results show that respondents considering pesticides in potatoes that are harmful for health and having no idea about it were found to be more willing-to-pay than were those considering no harmful pesticides in potatoes and having no idea about pesticides respectively. This matter was comprehensively argued by RAVENSWAAY (1990). She mainly discussed that people with college degrees might be less concerned than those with non-college degrees since reaching knowledge for them is less costly than others. They are, as a result of this deduction, least willing-to-pay for the safe food.

Additionally, it is possible to make regional comparisons at the level of NUTS 1 regions. Respondents from South East Region (SE), Middle Eastern Anatolia (ME) and West Marmara Region (WMAR) were found to be less willing to pay for extra payment per kg for pesticide-free potatoes than were other regions, while respondents from IST (Istanbul) and East Marmara Region (EMAR) which are largely industrialised parts of Turkey were found to be more willing to pay for it than were other regions. Despite this result, it does not make sense at all to have any correlation between income and willingness to pay for the price increase per kg for potatoes has no major effect on individuals' incomes. This is supported by BUNTE *et al.* (2010). They showed that any reduction in organic prices for some products such as potato has no considerable effect on demand.

Respondents from SE and EMAR were found

Table 4 - Pesticide concerns and purchasing preferences of Turkish consumers.

Source of Concern	**Freq.**	**%**
Remember a serious incident	1	1.05
Heard concern expressed over one or more of mass media	48	50.53
Heard concern expressed by NGO`s	4	4.21
Heard concern expressed by Public agents	7	7.37
Other	35	36.84
Opinion about the pesticides in potatoes	**Freq.**	**%**
There is no pesticide, hormone and other chemicals	17	4.33
There are pesticide, hormone and other chemicals, but residues are not risky for health	33	8.40
There are pesticide, hormone and other chemicals that are harmful for health	127	32.32
No idea	216	54.96
Purchasing preferences	**Freq.**	**%**
No preservative including pesticide and hormones	21	5.34
Taste	78	19.85
Price	71	18.07
Regular shape	220	55.98
Brand	3	0.76
Purchasing place of potatoes	**Freq.**	**%**
Open-air market	151	38.42
Greengrocer	46	11.70
Supermarket/Hypermarket/Shopping centre	174	44.27
Villagers	15	3.82
Others	7	1.78
Importance of cosmetic defects	**Freq.**	**%**
Not important	0	0.00
Less important	53	13.49
More important	268	68.19
Highly important	72	18.32
Food safety control	**Freq.**	**%**
Municipalities	16	4.07
Public agents	50	12.72
Universities	66	16.79
Independent agents	139	37.37
Producer Unions	13	3.31
Consumer Unions	109	27.74

Table 5 - Collinearity diagnostic.

Variable	VIF	1/VIF
Working Condition	1.38	0.72475
Income	1.38	0.725141
Education	1.15	0.871934
Age	1.12	0.893866
Insect Damage	1.06	0.943308
Living in a village	1.06	0.945987
Reason for Health	1.04	0.96083
Harmful pesticides	1.04	0.960983
Cosmetic Defects	1.02	0.981626
Mean VIF	**1.14**	

to be more willing-to-accept insect damage on pesticide-free produce than were other regions and respondents from West Black Sea (WBS), and AEG are less willing to accept insect damage on reduced pesticides in potatoes than were other regions.

Variance Inflation Factor (VIF) should not ideally exceed rule of 4, rule of 10 in literature. If it exceeds the rule of thumb, it is regarded as casting doubts on the estimations of regression analysis. As attentively viewed from the results given in table 5, the VIF values among independent variables change between 1.02 and 1.38 and mean VIF value is 1.14, which has sufficiently concrete evidence that there is no serious multi-collinearity in the model.

Table 6 exhibits the estimation results provided from the ordered probit model. As is illustrated, cosmetic defects for consumer preferences, free-pesticide potatoes with insect damages, indicating reasons of health for WTP questions, age, and gender were identified by the model to have significant impacts on the probability to WTP while spending the first 15 years in a village was found to negatively impact the probability to WTP. However, income and education were not found to have a significant impact, positively or negatively, on the probability to WTP.

Being female increases the probability of WTP by 21% as revealed in most of the studies (HENSON, 1996; GILL *et al.*, 2000; LOUREIRO *et al.*, 2002; KONTOLEON *et al.*, 2005; SUNDSTROM and ANDERSSON, 2009).

This can easily be explained as women are more sensitive to food safety problems than men. Also, those indicating health reasons for WTP question were found to increase the probability to WTP by 43%. On the contrary, KALOGERAS *et al.* (2009) found that health aspect does not significantly influence the probability of WTP. Similar effects were observed on cosmetic defects and age. Considering cosmetic defects as an important feature for their purchasing preferences raises the probability to WTP by 12%. In much the same way, the age of our model had a positive impact (by 10%) on WTP as in most of the studies (MISRA *et al.*, 1991; KONTOLEON *et al.*, 2005; DETTMANN and DIMITRI, 2010). Contrariwise, the age of the consumers were found to have a negative effect

Table 6 - The Probit Model.

Dependent Variable: WTP Variable	Coefficient	Standard error	Marginal effect	Standard error
Constant	-2.70513***	0.739544	-	-
Knowledge	-0.25266	0.180227	-0.09928	0.07116
Cosmetic Defects	0.319988**	0.128319	0.124498**	0.0499
Insect Damage	0.41714*	0.223001	0.154209**	0.07671
Harmful pesticide	0.242785	0.159825	0.093258	0.06043
Reason for Health	1.151586***	0.149467	0.434584***	0.05094
Age	0.267368**	0.122852	0.104025**	0.04781
Working Condition	0.078549	0.063429	0.030561	0.02469
Gender	0.556782***	0.152852	0.210075***	0.05503
Education Level	0.046347	0.36927	0.018112	0.14491
Income	0.038651	0.131314	0.015038	0.05109
Living in a village	-0.39952*	0.219629	-0.15794*	0.0866

***Indicates significance at 1% level,
**at 5% level,
*at 10% level.

Probit regression	Number of obs = 393
	LR chi2(11) = 93.65
	Prob > chi2 = 0.0000
Log likelihood = -220.82775	Pseudo R2 = 0.1749

166 left-censored observations at pay <=0;
227 uncensored observations;
0 right-censored observations.

on the WTP for organic potatoes by LOUREIRO and HINE (2002) and reduced pesticides in tomatoes by AKGUNGOR *et al.* (2007). Additionally, spending the first fifteen years in a village reduces the probability to WTP by 16%, ceteris paribus. The interpretation could be made that those people who spent their first fifteen years in a village might have a lower level of education, thus, less knowledge of pesticide impacts and less sensitiveness to the topic.

Table 7 summarizes the results of the Tobit model concerning their marginal effects. Individuals who considered cosmetic defects as important features for potato preferences, who are female, and who were indicating health reasons for WTP questions have higher WTP. To put it in context, considering cosmetic defects as important features for potato preferences raises the WTP amount by TL 0.3[1], and similarly, being female raises the WTP amount by TL 0,4 respectively, ceteris paribus. Respondents who spent their first fifteen years in a village have significantly lower WTP.

The mean WTP amount was estimated for the reduced pesticides in potatoes in Turkey on the basis of CVM study. The survey covering all of Turkey showed that respondents, representing different geographical areas, on an average are willing to pay extra TL2.90 if the zero respondents corresponding to approximately 42% are not included in the models. If it was included, the mean would be extra TL1.67. These absolute numbers can be given in percentages as 48% and 83% price premium for reduced pesticides in potatoes per kg, respectively. The average market price for potato was found as TL 3.50 based on the virtual Turkish super-market prices for those dates. The estimations could be likely interpreted that demand for organic food among Turkish consumers is growing. In a similar study, GIL *et al.* (2000) presented that Spanish consumers living in Navarra and Madrid would be willing to pay 17 % and 5.6 % more for organic potatoes, respectively. This big gap between Turkish and Spanish consumers can be explained mainly by the organic markets in Turkey that are not sufficiently saturated yet.

A similar result was found by AKGUNGOR *et al.* (2007) that Turkish consumers would be willing to pay 36% price premium for organic products or certified products. Also, WEAVER *et al.* (1992) found that 26% of respondents in Pennsylvania were willing to pay more than 15% for organic tomatoes. As seen from the values and percentages, there are no extreme prices that are accepted by consumers. This situation was argued by RAWENSWAAY (1990) that consumers would be willing to pay modest amounts to reduce perceived health risks in food.

Two important caveats can be placed on any discussion drawn from the survey results. First, actual WTP cannot be observed as it is solely based on stated preferences. Second is the homogenous distribution of individuals with respect to income and education. In spite of the fact that education and income are found to be significant factors for many WTP studies, no relationship was found in our model.

The first one seems more important while income has a minor impact on an individual's budget as indicated by BUNTE *et al* (2010). However, there is no consensus in literature in-

Table 7 - The Tobit Model.

Dependent Variable:MWTP **Variable**	**Coefficient**	**Standard error**	**Marginal effect**	**Standard error**
Constant	-5.15815***	1.344697	-	-
Knowledge	-0.27364	0.328352	-0.1237628	0.14583
Cosmetic Defects	0.681142***	0.228425	0.3135761***	0.10497
Insect Damage	0.607647	0.373106	0.2955922	0.19146
Harmful pesticide	0.361183	0.284776	0.1690033	0.13527
Reason for Health	2.334047***	0.288372	0.9972112***	0.11239
Age	0.529826**	0.220929	0.243915**	0.10148
Working Condition	0.166313	0.112667	0.076565	0.05181
Gender	0.903691***	0.263868	0.4291193***	0.12871
Education Level	0.379784	0.655299	0.1673579	0.2761
Income	0.028448	0.233872	0.0130964	0.10767
Living in a village	-0.87384**	0.41634	-0.3699325**	0.16148

***Indicates significance at 1% level,
**at 5% level,
*at 10% level.

Tobit regression	Number of obs = 393
	LR chi2(11) = 98.80
	Prob > chi2 = 0.0000
Log likelihood = -627.37228	Pseudo R2 = 0.0730

dicating a certain effect of education on WTP amount. Though DETTMAN and DIMITRI (2010) found a positive relation between education and WTP for organic products, MISRA *et al.* (1991); BUZBY *et al.* (1995); THOMPSON and KIDWELL (1998); BORCELETTI and NARDELLA (2000) and SUNDSTROM and ANDERSSON (2009) found a negative relation. It was also affirmed by Van RAVENSWAAY (1995) that the people with higher education level may be less concerned about pesticides because they might be better able to reach reliable information. These results might help to affirm why there is no significant impact of education on WTP in our model considering an outstandingly high rate of educated respondents.

Lastly, survey results show that the respondents overwhelmingly indicate that they have no idea about the level of pesticide residues used in the food. Roughly 32% of respondents considered that there are serious pesticide residues in potatoes, which are harmful to human health. An interesting finding from the survey results comes from the question "who should be responsible for controlling and monitoring of residues in food". Approximately 37.4% of respondents were in favour of independent laboratories while only 12.7 % went for public agents as an answer to this question. This clearly demonstrates that there is a high demand from consumers' side to independent agents for neutral decisions rather than public institutions.

As a result, this study stresses the consumer attitudes for pesticides in potatoes by employing CVM and single-bounded probit and tobit models. One of the drawbacks of the survey is based on the stated preferences rather than revealed preferences. The respondents might answer the questions with overestimation if compared with real situations. It would thus be better as a future research agenda to conduct another study in order to observe if similar results were truly provided by respondents.

REFERENCES

Akgungor S., Miran B. and Abay C. 2001. Consumer Willingness to Pay for Food Safety Labels in Urban Turkey. Journal of International FoodandAgribusiness Marketing, 12(1):91.

Akgungor S., Miran B. and Abay C. 2007. Consumer Willingness to Pay for Organic Products in Urban Turkey". 105th EAAE Seminar, International Marketing and International Trade of Quality Food Products, Bologna, Italy.

Alavanja M.C., Hoppin K.A. and Kamel F. 2004. Health Effects of Chronic Pesticide Exposure: Cancer and Neurotoxicity. Annual Review Public Health, 25:155.

Amemiya T. 1981. Qualitative Response Models: A Survey. Journal of Economic Literature, 19:1483-.

Arrow K., Solow R., Portney P.R., Leamer E.E., Radner R. and Schuman H. 1993. "Report of the NOAA Panel on Contingent Valuation," Federal Register, January 15 (58):4601.

Ayaz A. and Yurttagul M. 2008. "Toxic substances in nutrition-1". University of Hacettepe, Department of nutrition and dietetics, Ankara.

Birinci A. and Uzundumlu A. 2009. An assessment of producer's approach to agricultural pesticide usage in potato production: A case study in Erzurum, Turkey, Scientific Research and Essay Vol.4 (11):1225.

Boccaletti S. and Nardella M. 2000. Consumer willingness to pay for pesticide-free fresh fruits and vegetables in Italy. International Food and Agribusiness Management Review, 3:297.

Bunte F.H.J., van Galen M.A., Kuiper W.E. and Tacken G. 2010. Limits to Growth in Organic Sales. De Economist 158 (4): 387.

Buzby J., Ready R. and Skees J.R. 1995. Contingent Valuation in Food Policy Analysis: A Case Study of a Pesticide-Residue Risk Reduction. Journal of Agriculture and Applied Economics, 27 (2):613.

Cakmakyapan S. and Goktas A. 2013. A comparison of Binary Logit and Probit Models with a Simulation Study. The Journal of Social and Economic Statistics. Vol. 2 (1), Summer 2013.

Cameron T.A. 1992. Combining Contingent Valuation and Travel Cost Data for the Valuation of Nonmarket Goods. Land Economics, 68:302.

Carvalho F.P. 2006. Agriculture, pesticides, food security and food safety. Environmental Science and Policy, 9:685.

Dettmann R.L. and Dimitri C. 2010. Who's Buying Organic Vegetables? Demographic Characteristics of the US Consumers. Journal of Food Products Marketing, 16;1:79

Eberle W.D. and Hayden F.G. 1991. Critique of Contingent Valuation and Travel Cost Methods for Valuing Natural Resources and Ecosystems. Journal of Economic Issues, Vol. XXV (3)649.

EC. 2009. "EU Action on Pesticides, Our food has become greener" Factsheet. European Commission, Brussels.

EFSA 2014. "About EFSA" European Food Safety Authority.

Evans J.R. and Mathur A. 2005. The value of online surveys, Internet Research, Vol. 15 (2):195.

Fink A. 2003. "The Survey Handbook", 2nd Edition. Sage Publications Inc. London.

Garming H. and Waibel H. 2006. Willingness to Pay to Avoid Health Risks from Pesticides, A case Study from Nicaragua, Woking Paper 2006,4.

Gil, J.M., Gracia A. and Sánchez M. 2000. Market Segmentation and Willingness to Pay for Organic Products in Spain. International Food and Agribusiness Management Review 3:207.

Greene, W.H. 2012. "Econometric Analysis", 4th Ed. Prentice Hall, New Jersey.

Henson S. 1996. Consumer Willingness to Pay for Reductions in the Risk of Food Poisoning in the UK. Journal of Agricultural Economics, 47 (3):403.

Hoppin J.A., Umbach D.M., Kullman G.J., Henneberger P.K., London S.J., Alavanja M.C.R. and Sandler D.P. 2007. Pesticides and Other Agricultural Factors Associated with Self-reported Farmer's lung among Farm residents in the Agricultural Health Study. Occupational Environment and Medicine, 64:334.

Jean C.C. Richard R. and Skees J. 1995. Contingent Valuation in Analysis: A Case Study. Residue Risk Reductions, J. Agr. and Applied Econ. 27 (2):613.

Kalogeras N., Valchovska S., Baourakis, GandKalaitzis P. 2009. Dutch Consumers' Willingness to Pay for Organic Olive Oil. Journal of International FoodandAgribusiness Marketing, 21:286.

Konteleon A., Yabe, M. and Darby L. 2005. Alternative Payment Vehicles in Contingent Valuation: The Case of Genetically Modified Foods. Munich Personal RePEc Archive. Lindhjem H. and Navrud S. 2011. Are Internet surveys an alternative to face-to-face interviews in contingent valuation. Ecological Economics, 70(9):1628.

Loureiro M.L. and Hine S. 2002. Discovering Niche Markets: A Comparison of Consumer Willingness to Pay for Local (Colorado Grown), Organic, and GMO-Free Products. Journal of Agricultural and Applied Economics, 34(3):477.

[1] Turkish Lira equals roughly € 0.34.

Loureiro M.L., Mccluskey J., and Mittelhammer R.C. 2002. Will Consumers Pay A premium for Eco-labelled Apples. Journal of Consumer Affairs, 36(2):203.

MFAL. 2012. Statistics for Pesticides, the Ministry of Food, Agriculture and Livestock, Ankara. www.tarim.gov.tr.

Misra S.K., Huang C.L. and Ott S. 1991. Consumer Willingness to Pay for Pesticide-Free Fresh Produce. Western Journal of Agricultural Economics, 16(2): 218.

Ott S.L. and Maligaya A. 1989. "An Analysis of Consumer Attitudes Toward Pesticide Use and the Potential Market for Pesticide Residue-Free Fresh Produce" Southern Agricultural Economics Association Meetings, Nashville, TN.

Rowell A. 2004. Don't worry It's safe to eat. Earthscan publications Ltd. UK.

Seller C., Stoll J.R., and Chavas J.P. 1985. Validation of Empirical Measures of Welfare Change: A Comparison of Nonmarket Techniques, Land Economics, 61 (2):156.

Smith R.D. 1997. Contingent Valuation: Indiscretion in the Adoption of Discrete Choice Question Formats. Centre for Health Program Evaluation, Working Paper 74.

Sundstrom K. and Andersson H. 2009. Swedish Consumers' Willingness-to-Pay for Food Safety. Working paper 2009:1.

Thompson G.D. and Kidwell J. 1998. Explaining the Organic Choice of Organic Produce: Cosmetic Defects, Prices, and Consumer Preferences. American Journal of Agricultural Economics, 80:277.

Van Ravenswaay E. and Wohl J. 1995. "Using Contingent Valuation Methods to Value The Health Risks from Pesticide Residues When Risks are Ambiguous" In: J. Caswell (Ed.) Valuing food safety and nutrition. Chap.14:287.

Van Ravenswaay E.V. 1990. "Consumer Perception of Health Risks in Food" Michican State University.

Weaver R. Evans D. and Luloff A.E. 1992. Pesticide Use in Tomato Production: Consumer Concerns and Willingness-to-Pay. Agribusiness, Vol. 8:131.

Wooldridge J. 2006. "Introductory Econometrics" 4th Edition. South Western.

Paper Received October 10, 2014 Accepted May 5, 2015

APPENDICES

Appendix 1. Survey Instrument

Appendix 1.1. Hypothetical Scenario

Health risks resulting from pesticide use have made food safety a priority issue on the public policy agenda in developed countries. A research made in U.S showed that pesticide residues were rated a serious risk by 68 of respondents attending in a survey. Pesticides can cause many types of health problems in humans. "Pesticides have been linked to a wide range of human health hazards, ranging from short-term impacts such as headaches and nausea to chronic impacts like cancer, reproductive harm, and endocrine disruption (Toxic Action Center1)".
EC Directive 2009/128/EC determined the sustainable use of pesticides to reduce health risks resulted from pesticides. Therefore, EU countries minimise or ban the use of pesticides for health reasons. Turkey as a candidate country for EU membership has to harmonize her own legislations and directives.
The amount of pesticide use in Turkey has gradually increased since 2009 and it was over 40,000 ton in 2011 according to the data taken by the Ministry of Food, Agriculture and Livestock of Turkey. Particularly, potato is one of the most consumed vegetables which seriously include pesticide residues in Turkey. The scenario it is proposed for this survey is a price increase for reduced pesticides in potatoes per kg.
The research project is aimed at evaluating your opinion of reduced pesticides in potatoes. Reduced pesticides are in general valued for one or more of the following attributes: better taste, food safety, health, freshness, environment preservation and local production. Good Agricultural Practices are "practices that address environmental, economic and social sustainability for on-farm processes, and result in safe and quality food and non-food agricultural products" (FAO, 2003).
More precisely the main aim of this study is to find out what would persuade you to buy reduced pesticides in potatoes. On this basis the questionnaire tries to find out your opinion of the quality and availability of the reduced pesticides in potatoes in Turkey and the price that you would be willing to pay for these reduced pesticides in products.
Finally, for the purposes of the study you are required to give truthful answers and we recommend that you think carefully about the scenario previously mentioned, your disposable income and health concerns during the questionnaire survey. Furthermore, you should notice that this survey is completely anonymous and confidential. However, if you desire a copy of the final study, you should provide an email address so it can be sent to you.

Appendix 1.2. Questionnaire

Questions about qualifying candidates
1) Please indicate your current place of residence.
2) Please indicate whether you participate in the decisions regarding the payments in your household.
a) Yes
b) No

Questions about perceptions for food
3) Please indicate whether or not you have an idea regarding level of pesticides and hormones in potatoes, if you indicate choice a, please go question 5.
a) No idea
b) Little information
c) Sufficient information
c) All information in detail
4) Please indicate your recalling of pesticide information as related to level of concern for human health.
a) Remember a serious incident
b) Heard concern expressed over one or more of mass media
c) Heard concern expressed by NGO`s
d) Heard concern expressed by Public agents
e) Other
5) Please indicate the most important feature of potato for your purchasing preferences.
a) No preservative including pesticide and hormones
b) Taste
c) Price
d) Regular shape
e) Brand
6) Please indicate how cosmetic defects are important for your purchasing preferences in pesticide free products. Cosmetic defects refer growth cracks and knobby or irregular growth.
a) Not important
b) Less important
d) More important
c) Highly important
7) Please indicate if you accept potatoes with insect damage, such as worm holes in pesticide free products.
a) Yes
b) No
8) Please indicate your opinion about the pesticides, hormones, and other chemicals for potatoes.
a) There is no pesticide, hormone and other chemicals
b) There are pesticide, hormone and other chemicals, but residues are not risky for health
c) There are pesticide, hormone and other chemicals that are harmful for health
d) No idea
9) Please indicate what you generally do in order to alleviate your concern over pesticide dangerous in the potatoes.
a) Nothing
b) Washing it with plenty of water
c) Consuming by peeling off it
d) Cooking
e) Other (Please specify)
10) Please indicate whether or not fresh fruit and vegetables are as healthy as it was in the past with respect to health safety.
a) Never healthy
b) Still healthy
c) Better healthy
d) No idea

Questions about willingness-to-pay

At this stage, you should consider that the payment vehicle for the reduced pesticide in potato will lead to increases in potato prices if you favour the reduced pesticides in potato. Moreover, we strongly recommend you to consider your disposable income, health concerns, and possible positive and negative consequences of the reduced pesticide in potato when making your decision.

11) Would you be willing to pay extra 2 TL/per kg for reduced pesticides in potato? If answer is yes, please go to question 12, otherwise go to question 18.
a) Yes
b) No
12) Would you be willing to pay extra 2.5 TL/per kg for reduced pesticides in potato?
a) Yes
b) No
If answer is no, please go to question 17.
13) Would you be willing to pay extra 3 TL/per kg for reduced pesticides in potato?
a) Yes
b) No
If answer is no, please go to question 17.
14) Would you be willing to pay extra 3.5 TL/per kg for reduced pesticides in potato?
a) Yes
b) No
If answer is no, please go to question 17.
15) Would you be willing to pay extra 4 TL/per kg for reduced pesticides in potato?
a) Yes
b) No
If answer is no, please go to question 17.
16) Would you be willing to pay above 4 TL/per kg for reduced pesticides in potato? Also please indicate how much you would be willing to pay.
a) Yes (Please specify): TL
b) No
How much:.....

[1] http://www.toxicsaction.org/problems-and-solutions/pesticides

17) Would you please indicate the reason for the expressed amount?
a) More healthy
b) A reasonable price for my budget
c) More tasty
d) Protecting environment
e) Protecting local producers
f) Other (Please specify)

Questions about social and economic factors
18) Regarding your age, which of the following would you select?
a) 17 or less
b) 18-30
c) 31-45
d) 46-64
e) 65 or more
19) Regarding your working condition, which of the following would you select?
a) Public sector
b) Private sector
c) Retired
d) Unemployed
e) Housewife
f) Student
g) Farmer
h) NGO
20) Regarding your gender, which of the following would you select?
a) Male
b) Female
21) Regarding your marital status, which of the following would you select?
a) Married
b) Single
22) Regarding your family composition, which of the following would you select?
a) Have children
b) Do not have children
23) Regarding the size of your household, which of the following would you select?
a) One person
b) Two persons
c) Three persons
d) Four persons
e) More than four persons
24) Regarding your education level, which of the following would you select?
a) Primary school graduate
b) Secondary school graduate
c) High school graduate
d) Bachelor's degree graduate
e) Master's degree graduate
f) Ph.D. 's degree graduate
g) Other:.....
25) Regarding your monthly income, which of the following would you select?
a) 849 TL or less
b) 850 TL – 1449 TL
c) 1500 TL – 2149 TL
d) 2150 TL – 2799 TL
e) 2800 TL – 3449 TL
f) 3500 TL – 4149 TL
g) 4150 TL or more
26) Please indicate the place of residence during the first 15 years of life?
a) City or suburb
b) Small town
c) Farm
27) Please indicate the place you are currently living?
a) Less than 3 years
b) 3-5 years
c) 6-10 years
d) 11-20 years
e) More than 20 years
28) Please indicate from where do you generally purchase potatoes?
a) Open-air market
b) Greengrocer
c) Supermarket/Hypermarket/Shopping center
d) Villagers
e) Others
29) Please indicate your preference about which agent should ideally and fairly be responsible for food safety control?
a) Municipalities
b) Public agents
c) Universities
d) Independent agents
e) Producer Unions
f) Consumer Unions

Thank you for your time!

Appendix 2. Summary and descriptions of variables

Variable	Obs	Mean	Std. Dev.	Min	Max
pay393	1.676845	1.621334	0	6	
bid 393	0.5776081	0.4945699	0	1	
Knowl	393	0.2417303	0.4286774	0	1
Cosm_Def	393	3.048346	0.5626138	2	4
Insect_Dam	393	0.1399491	0.3473765	0	1
Harmfulpes	393	0.3231552	0.4682776	0	1
Age393	2.697201	0.6123035	2	5	
Work_Cond	393	1.608142	1.289334	1	8
Gender	393	0.3689567	0.4831373	0	1
Marital	393	0.4707379	0.4997793	0	1
Hav_Child	393	0.4274809	0.4953436	0	1
Household	393	3.142494	1.197383	1	5
livingincity	393	0.6386768	0.4809963	0	1
livingindist	393	.2442748	0.4302041	0	1
livinvilage	393	0.1170483	0.3218877	0	1
Educ	393	0.956743	0.2036944	0	1
Income	393	2.223919	0.6273835	1	3
livinvilage	393	0.1170483	0.3218877	0	1

Appendix 3. Multicollinearity analysis

	Knowl	Cosm_Def	Insect_Dam	Harmfulpes	ReasonHealth	Age	Work_Cond	Gender	Educdumy	Income	livinvilage
Knowl	1.0000										
Cosm_Def	-0.0380	1.0000									
Insect_Dam	0.2519***	-0.0739	1.0000								
Harmfulpes	0.3469***	-0.0401	0.1604***	1.0000							
ReasonHealth	-0.0888	-0.0306	-0.0828	0.0709	1.0000						
Age	0.1435***	-0.0092	-0.0281	0.0129	-0.0121	1.0000					
Work_Cond	0.0057	0.0016	0.1114**	-0.0179	(-)0.1438***	-0.0667	1.0000				
Gender	-0.0129	(-)0.1127*	0.0716	0.0129	0.0402	(-)0.1647*	0.0853**	1.0000			
Educdumy	0.0032	-0.0262	-0.0224	-0.0135	0.0508	-0.0439	(-)0.327***	0.0707	1.0000		
Income	-0.0216	-0.0018	(-)0.109*	0.0309	0.0623	0.2566***	(-)0.4558***	(-)0.2059*	0.2357***	1.0000	
livinvilage	0.1457***	0.0955*	0.0356	0.0531	-0.0762	0.1803***	-0.0306	-0.0816	-0.0393	0.0467	1.0000

Appendix 4. Regression analysis

Source	SS	df	MS	Number of obs =	393
				F(9, 383)	10.79
Model	14.56733	9	1.61859267	Prob > F	0
Residual	57.46829	383	.150047753	R-squared	0.2022
				Adj R-squared	0.1835
Total	72.03562	392	.183764345	Root MSE	0.38736

Knowl	Coef.	Std. Err.	t	P>t	[95 % Conf.	Interval]
Cosm_Def	-0.01601	.0350985	-0.46	0.649	-0.0850178	0.053002
Insect_Dam	0.233844	.0579889	4.03	0.000	0.1198276	0.34786
Harmfulpes	0.290287	.0426197	6.81	0.000	0.2064893	0.374085
ReasonHealth	-0.07965	.0416259	-1.91	0.056	-0.1614897	0.002198
Age	0.100169	.0337963	2.96	0.003	0.0337199	0.166619
Work_Cond	-0.01019	.0178243	-0.57	0.568	-0.0452324	0.024859
Educdumy	0.06667	.102861	0.65	0.517	-0.1355734	0.268913
Income	-0.04631	.0366208	-1.26	0.207	-0.1183125	0.025693
livinvilage	0.126524	.062492	2.02	0.044	0.0036537	0.249395
_cons	-0.01413	.1961847	-0.07	0.943	-0.3998678	0.3716

Appendix 5. Covariance matrix of coefficients of regress model

e(V)	Cosm_Def	Insect_Dam	Harmfulpes	ReasonHealth	Age	Work_Cond	Educdumy	Income	livinvillage	_cons
Cosm_Def	0.0012319									
Insect_Dam	0.0001513	0.00336271								
Harmfulpes	4.661E-05	-0.00041276	0.00181644							
ReasonHealth	3.774E-05	0.0001939	-0.0001506	0.00173271						
Age	3.531E-05	0.00002271	6.14E-06	0.00001231	0.0011422					
Work_Cond	4.64E-07	-0.0000685	8.00E-06	0.00008935	-2.13E-05	0.00031771				
Educdumy	8.484E-05	-0.00015164	0.00011349	-9.37E-06	0.0003194	0.0004571	0.0105804			
Income	-1.32E-06	0.00014854	-5.893E-05	9.25E-06	-0.000321	0.00025825	-0.000478	0.00134108		
livinvilage	-0.0002205	-0.00013419	-0.0001421	0.00020032	-0.000363	0.00004616	0.000235	7.79E-06	0.0039053	
_cons	-0.0039642	-0.00104393	-0.0005647	-0.00142089	-0.002716	-0.00152239	-0.010951	-0.0020787	0.0008133	0.0384884

Appendix 6. Correlation matrix of coefficients of regress model

e(V)	Cosm_Def	Insect_Dam	Harmfulpes	Reason_health	Age	Work_Cond	Educdumy	Income	livinvillage	_cons
Cosm_Def	1									
Insect_Dam	0.0743	1								
Harmfulpes	0.0312	-0.167	1							
ReasonHealth	0.0258	0.0803	-0.0849	1						
Age	0.0298	0.0116	0.0043	0.0087	1					
Work_Cond	0.0007	-0.0663	0.0105	0.1204	-0.0354	1				
Educdumy	0.0235	-0.0254	0.0259	-0.0022	0.0919	0.2493	1			
Income	-0.001	0.0699	-0.0378	0.0061	-0.2594	0.3956	-0.127	1		
livinvilage	-0.1005	-0.037	-0.0534	0.077	-0.1719	0.0414	0.0366	0.0034	1	
_cons	-0.5757	-0.0918	-0.0675	-0.174	-0.4096	-0.4354	-0.5427	-0.2893	0.0663	1

Appendix 7. Logit model

WTP	Coef.	Std. Err.
Knowl	-0.4106674	0.3074221
Cosm_Def	0.5257642**	0.2167355
Insect_Dam	0.6643928***	0.3706913
Harmfulpes	0.4106739	0.269297
ReasonHealth	1.886197***	0.2523839
Age	0.4439607**	0.2078363
Work_Cond	0.1279345	0.1060791
Gender	0.9363477***	0.2617843
Educdumy	0.0939652	0.6196589
Income	0.0539704	0.2209946
livinvilage	(-)0.681425*	0.3660309
_cons	-4.444088	1.238931
Number of obs=393		
LR chi2 (11)=93.33		
Prob>chi2=0.0000		
Pseudo R2=0.1743		

***Indicates significance at 1% level, **at 5% level, *at 10% level.

Appendix 8. Statistic values of WTP before and after trimming outlier

Percentiles		Smallest	pay		Percentiles		Smallest	Trimmed data (5%)	
1%	0	0			1%	0	0	pay	
5%	0	0			5%	0	0		
10%	0	0	Obs	393	10%	0	0	Obs	374
25%	0	0	Sum of Wgt.	393	25%	0	0	Sum of W	374
50%	2		Mean	1.676845	50%	2		Mean	1.497326
		Largest	Std. Dev.	1.621334			Largest	Std. Dev.	1.444224
75%	2.5	6			75%	2.5	4		
90%	4	6	Variance	2.628723	90%	4	4	Variance	2.085784
95%	4	6	Skewness	0.424015	95%	4	4	Skewness	0.2272442
99%	4	6	Kurtosis	2.16069	99%	4	4	Kurtosis	1.633528