

Research Article



Factors Influencing Households' Willingness to Pay for Pesticides-Free Fresh Apple in District Peshawar, Khyber Pakhtunkhwa (KP) Pakistan

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Abstract | This study measured household's willingness to pay for pesticides-free fresh fruits, produced locally, such as Apple. For data collection, a sample of 200 households was randomly selected from urban and rural region of Peshawar district of Khyber Pakhtunkhwa Province. Sampled households were interviewed face to face. An open-ended CVM question was designed to elicit households' willingness to pay (WTP) and a linear regression analysis conducted to identify important determinants of households' WTP. Results show that 93% of respondents are willing to pay a price premium of PKR. 14. Empirical findings reveal that socio-demographic characteristics like age, education and income have positive significant effects on households' willingness to pay. Findings of the study also reveal a significant influence of employment status of the household's head on WTP, whereas household's size has a negative significant effect on willingness to pay for pesticides-free fruit. Findings of the study indicate that in addition to demographic characteristics, households' perception regarding health concern and environment concern tend to have a positive influence on willingness to pay for pesticides free fruit. Households in the study area are willing to pay 14 percent more price premium suggests households' demand for pesticides free apple in the study area.

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Introduction

Conventional agriculture has gained the power of providing food to majority of the world population but at the cost of damaging the environment and human health. While pesticides free farming on the other side is environmental and human health friendly farming that avoids the use of such hazardous chemicals which are harmful for human, plants and animal planet. Pesticides-free farming system is increasingly becoming popular in producers as well as in consumers (Pouratashi, 2012). The term pesticides-free denotes agricultural production without the use of chemical inputs like pesticides. It has

been observed that fruits produced without the use of chemicals pesticides are generally higher in prices than the conventional fruits production in most part of the world (Krishna and Qaim, 2008). However pesticides free farming and pesticides free food is a relatively new phenomenon and very few people especially in developing countries like Pakistan are aware about the beneficial impacts on health and environment.

Pakistan is blessed with diverse agro-ecological conditions which support the production of different variety of cereal crops, fruits and vegetables. Fruit such as Apple, which is of different varieties and flavors,

has greater potential for large scale production and export. Unfortunately tonnes of chemicals are applied to this fruit which reduce their quality below the WHO standards. These chemicals include more than 108 types of insecticides, 30 types of fungicides, 39 types of herbicides, 5 types of acaricides and 6 different types of rodenticides (Zia et al., 2009; Anwar et al., 2011). In 1960, the consumption of pesticides was 7000 tons per annum which increased to 78232 tons per annum in 2003. On one side Pakistan imports a large quantity of pesticides which cost in billions and on the other side overuse of pesticides on agricultural commodities like vegetables and fruits causes many health diseases and environmental pollution.

A large number of studies on pesticides-free fruits and vegetables have been conducted in many developed countries, but the number of such studies is fewer in developing countries such as Pakistan. Due to suitable agro-climatic conditions and low cost labor, huge potential exists for production of pesticides free fruits. However, information on consumers' demand and their willingness to pay are required for pesticides free fruits to compare with additional cost associated with their production. This study aims to elicit households' WTP and factors influencing on households' WTP for pesticides-free apple fruit in Khyber Pakhtunkhwa using Contingent Valuation Method (CVM).

There are main three reasons that why CVM is used in such studies. Firstly, as pesticides-free fruits are the non-marketed fruits in Pakistan and not readily available in markets, so contingent valuation method provide us to establish a hypothetical market. Secondly, pesticides free fruits present different attributes such as good for health and environmental friendly behavior, so for such type of questions mostly primary data are required. So, CVM is a practical method that helps out in collecting such data. Third, contingent valuation method directly asks for willingness to pay a price premium, so the net value of willingness to pay for such food products can be obtained.

The paper is organized as follows: section 2 discusses the methodology adopted for the study and the designing of CVM survey; section 3 presents' results and discuss them; and finally, section 4 makes conclusions and forwards recommendation based on findings of the study.

Materials and Methods

Study area

Khyber Pakhtunkhwa (KP) occupies a north-west position in Pakistan with a total area of about 74,521 square km. Gilgit-Baltistan is situated on its north-east, Punjab on the southeast and Azad Kashmir on the east. A long and narrow piece of land belongs to the Federally Administered Tribal Areas (FATA) borders situated to its south and Baluchistan directly below it. Federally Administered Tribal Areas situated to its west and to its northwest is Afghanistan. The total population of Khyber Pakhtunkhwa in 1998 was 17.7 million. According to the 2011 Census Bureau of Pakistan house listing operation, the population of Khyber Pakhtunkhwa was estimated to be more than 26.8 million. There are a total of 26 districts in Khyber Pakhtunkhwa. Naturally Khyber Pakhtunkhwa has been endowed with abundant cultural and tourism friendly environment. It has the capability to become a charming area for the tourist in the world. Due to its beautiful and attractive scenery, geographical location, climate and God gifted natural resources. Khyber Pakhtunkhwa is exceptionally abundant in terms of multitudes of tourist attraction. The core of this charm is clear from the striking natural picturesque consisting of beautiful rivers, attractive and splendid waterfalls, spiral lakes mostly in the hilly areas and ever green valley's in most parts of the province (TCKP, 2015).

CVM Survey designing

To elicit consumer's willingness to pay for pesticides free fruits in Pakistan, Contingent Valuation Method (CVM) was used in this study. CVM uses different question formats such as open ended, bidding game, payment card questions, single bounded dichotomous choice questions and double bounded dichotomous choice questions. Open ended format was adopted in designing CV scenario. In open ended questions format respondents are asked to report their WTP for the hypothetical pesticides free fruits. The wording of the WTP question is;

The use of pesticides can badly affect the agro-ecological system as well as human health. Human health related problems may vary with the composition of chemicals. The most common problems are skin, flue and headache, while severe health hazards include paralysis, cancer, etc. Studies show that globally around 30 lakh people are poisoned annually from consump-

tion of pesticides contaminated food and 2 lakh of them die from different health problems caused by pesticides residues. Most of the pesticides used on agricultural crops are banned by the WHO.

Suppose your favorite fruits, such as Apple, regularly cost you Rs.100/Kg. assuming no difference in taste and nutritional content, how much would you pay for pesticides free version of the same fruits.

Ans. _____ PKR

Before asking the WTP question, respondents were fully briefed to differentiate between pesticides-free fruits and fruits produced by conventional method.

Question regarding demographic and socio-economic characteristics, such as age, gender, education, households' size and income of the respondents were also included in the survey.

Empirical model

For open ended questions data, a linear WTP model was used to estimate WTP and identified its determinants.

$$WTP_j = \beta_0 + \sum_{i=1}^n \beta_i X_{ij} + \varepsilon$$

Where;

WTP_j : is the WTP of the j th household for PFF. X_j : Set of socioeconomic characteristics of the j th household.

Factors effecting consumers' willingness to pay for pesticides free fruits can be written as

$$WTP = \beta_0 + \beta_1 (Age) + \beta_2 (Gender) + \beta_3 (Education) + \beta_4 (Household's size) + \beta_5 (Income) + \beta_6 (Health) + \beta_7 (Environment) + \beta_8 (awareness) + \beta_9 (urban) + \beta_{10} (employment) + \mu$$

Where;

WTP is willingness to pay for pesticides free fresh fruits; β_1 age of the households' head in years; β_2 is dummy variable shows gender, where 0 showed female and 1 showed male respondents; β_3 is the education of households in years; β_4 is the number of members in a house; β_5 is the income of the households in rupees; β_6 and β_7 are dummy variables where 1 showed concerned and 0 showed non concerned re-

spondents; β_8 is the dummy variable where 1 showed those consumers who were aware of the pesticides used on fresh fruits and 0 showed unaware respondents; and β_9 showed households location where 1 showed urban and 0 showed rural households; β_{10} showed employment status of the households' head where 1 showed those respondents who were employed in government or private organization and 0 showed unemployed households head and μ is the error term.

Ordinary least square (OLS) method was used to estimate this model using Stata version 12.

Sample section and survey administration

This study was carried out in district Peshawar of Khyber Pakhtunkhwa (Pakistan). The selected district was divided into its Urban and Rural union councils and then one urban and one rural UC was selected randomly. From each union council 100 households were randomly interviewed. Thus, in total 200 households were selected as sample for data collection by using fixed proportion sampling technique.

The survey was conducted in summer 2017 and respondents were interviewed face to face. According to Carson (2000), face to face interview is mostly more reliable.

Results and Discussion

Socio-demographic characteristics

The socio-demographic characteristics of the respondents are depicted in Table 1. The information was gathered from 200 household. In the overall sample, 97 percent of the respondents are male and 3 percent are female. This was consistent with our expectation because male household member are the primary decision makers in purchasing fruits for household in Pakistan. Age of the respondents in the study area ranged from 25 to 90 years with an average around 42 years. The average household size was around 7 members. Respondent's average years of formal education were 8 years with minimum 0 and maximum 18 years of schooling. The average income in study area is approximately 53,465 Pakistani rupees (Rs.) per month.

Descriptive statistics shows that 61 percent of the total respondents are aware of the inverse impact of pesticides. The results also depicts 85 percent and 94 percent of respondents respectively are concerned

about health and environment.

Table 1: *Households' socio-demographic characteristics.*

Variables	All	Min	Max	Std. Dev
Age	42.015	25	90	11.501
Gender	0.975	0	1	0.156
Education	8.19	0	18	6.655
Household size	6.685	2	15	2.808
Income	53,465	11,000	200,000	35193.63
Health concern	0.85	0	1	0.357
Environment concern	0.94	0	1	0.238
Employment	0.54	0	1	0.499
Urban/ rural	0.465	0	1	0.500
Awareness	0.61	0	1	0.488

Households' WTP for pesticides-free fruits

The distributions of households' WTP for pesticides-free fruits are reported in Figure 1. The respondents were asked to state how extra price are they willing to pay for pesticide-free fruits than conventionally produced fruits. Results show that about 93.5 percent of respondents are willing to pay a higher price premium for pesticide-free fruits in the study area. The results are in line with previous studies (Hayati et al., 2017; Nandi et al., 2017) who reported that 96% and 90% respondents were willing to pay higher price premium for pesticide free fruits in Iran and India, respectively. Decomposing the responses, 35 percent of the households are willing to pay (16-20) percent higher prices for pesticides-free fruits than the conventional, 24 percent willing to pay (20) percent higher price, and only a minor portion of the respondents (6.5) percent are not willing to pay higher price. A plausible reason for higher WTP for significant portion of the population is due to households' awareness. As most of the respondents (61%) in the study area were aware of the fact that farmers are intensively using pesticides on fresh fruits, so they were willing to pay higher prices if such pesticides free fruits are available in the market. Another reason for more price premium was the education level of the respondents. As most of the households' head were literate, they may have some knowledge about negative effects of chemical pesticides. Therefore, they were willing to pay higher prices for pesticide free fruits if available.

Post estimation diagnostic test

The model was tested against Multicollinearity by using (variance inflating factor criteria) and for Het-

eroskedasticity (Breusch-Pagan test). Table 2 shows multicollinearity and heteroskedasticity test results for the estimated model Rule of thumb for VIF is that if the value is ≥ 10 , then the problem of Multicollinearity is severe. According to our findings, the mean value of variance inflating factor is 1.14 less than the critical value, suggests that there is no Multicollinearity problem in the model. Breusch-Pagan test is used for detecting Heteroskedasticity problem. The (χ^2) value is 0.66 and p- value is 0.41. This p-value suggests that the probability of rejecting the presence of Heteroskedasticity is 41%.

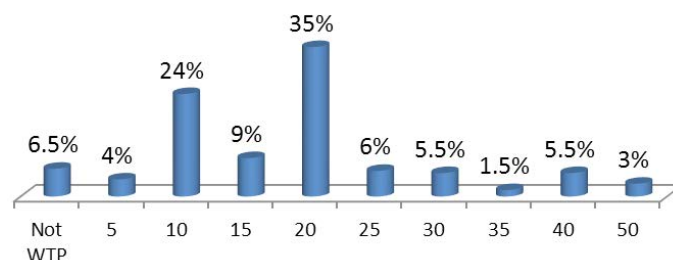


Figure 1: *Households' WTP responses.*

Estimated WTP model

Results of household's willingness to pay for pesticides-free fruits using linear regression model is shown in Table 3. Variables such as age, education, awareness, income, households' size, households' employment status and consumer perceptions regarding health and friendly environment are significantly influencing households' WTP for pesticide-free fruits. Age has a positive and significant influence on willingness to pay i.e. the result shows that with an increase in age, willingness to pay also increases. This result is slightly different from few findings of other researchers who reported a high WTP in young and middle age consumers' (30-40) years. But there are some logical reasons behind our findings. As young people are not so much health conscious but with getting older and older, the disease of aging caught their minds and they keep more care about their health. Another reason, with an increase in age, education and experience increases, as a result an increase in WTP for pesticides-free fruits. These results are supported by (Muhammad et al., 2015).

Table 2: *Diagnostic test results.*

Problems	Diagnostic Test	Mean value	p-value
Multicollinearity	VIF	1.12	—
Heteroskedasticity	Breusch-Pagan / Cook-Weisberg	0.66	0.14

Education and monthly income are the other factors positively and significantly influencing households' WTP. Households with more formal education have more concern and better understanding of the risk associated with consuming food contaminated with pesticides. So, they better understand that fruits produced without the use of chemicals pesticides could be beneficial for health. Results show that a one year increase in formal education, households' WTP increases by rupees 0.25 for pesticide-free fruits as compared to those having no education (Table 3). In regards to income, respondents with higher income are willing to pay more prices premium. A one rupee increase in income will increase household's WTP by 0.0001.

Households' size is reported as negatively significant influence on households' willingness to pay. As with limited resources, feeding more people is increasingly difficult. These results were in contrast with (Muhammad et al., 2015). Who reported a positive relationship of willingness to pay and household's size. Our finding shows a decrease of 0.38 rupees by an addition of one member in a household.

Other important variables are respondents' concern regarding health and environment. Results show that respondents are highly concerned about residual effect of pesticides on human health and environment. Our results support these findings by positive WTP. Table 3 shows respondents' concerned regarding health and environment. Results suggest that consumers' with more concerned for health and environment, are willing to pay Rs.4.95 and Rs.0.14, respectively higher prices for pesticide-free fruits compared to those not concerned. These results are in line with Khan et al. (2018), who conducted a research study on household's willingness to pay for pesticides free fruits in Khyber Pakhtunkhwa (KP) province of Pakistan by adopting a payment card elicitation format. Results of the study revealed that socio-demographic characteristics such as household's head age, income, education and perceptions regarding health and environmental concern were the important factors influencing households' decision to pay higher price premium for pesticides free fruits.

However, this study also introduced new variables such as employment status and residence of the households. Findings of our study reveal households working in government or private organization are willing to pay Rs.2.14 more price premium compared

to unemployed households.

Finally, we found variable awareness positively and significantly influencing households' WTP for pesticide-free fruits in survey area. The result shows that more aware consumers are willing to pay more price premium compared to unaware consumers.

Mean WTP by using open ended elicitation format are reported in Table 4. The willingness to pay evaluated using average values for the explanatory variables are Rs. 14.37 for open ended elicitation format. Results indicated that households' are willing to pay 14% more price for pesticides-free fruits in the study area. Mean willingness to pay reported by Ngo et al. (2013) for tomato and Choy sum was 39% and 30% respectively. However, WTP reported in some other studies were higher than this amount such as Rodriguez et al. (2008) reported a higher premium of 87%, and Coulibaly et al. (2011) showed premium from 50% to 66%.

Table 3: *Estimated parameters using liner regression model.*

Variables	Coefficient	Std. Error	t-Statistics	P-value
Constant	-5.96816	4.325058	-1.38	0.169
Age	0.2166494	0.0469107	4.62	0.000
Gender	-2.753448	3.052646	-0.90	0.368
Education	0.2532646	0.0765958	3.31	0.001
Household's size	-0.3873636	0.1731683	-2.24	0.026
Income	0.000119	0.0000156	7.65	0.000
Health concern	4.958403	1.46751	3.38	0.001
Environment concern	0.1448708	2.008858	0.07	0.943
Employment	2.453839	1.001741	2.45	0.015
Urban/rural	0.4922149	1.047299	0.47	0.639
Awareness	3.559834	.9881861	3.60	0.000

Note: *, **, *** indicate statistical significance at 10%, 5%, and 1%, respectively; **No of observation:** 200; **F (8):** 34.94; **Prob > F:** 0.000; **R_{squared} adjusted:** 0.55

Table 4: *Mean Willingness to Pay.*

Variable	Mean	Std. Dev	Min	Max
WTP	14.375	7.621	0.629	39.395

Conclusions and Recommendations

The general objective of this survey was to study the socio-demographic and socio-economic characteristics of the households' and to investigate factors in-

fluencing their willingness to pay for pesticides-free fruits. A variety of factors including respondent's age, gender, respondent's income, household's head education, consumers' awareness, certain attitudinal questions like health concern and environment concern and households' head employment status appear to influence household's willingness to pay a price premium. Household's size is negatively significant which usually reported that households with more members do not care much about quality but more quantity because feeding more people with limited resources are difficult. More aged people have always been concerning about their health. As the people get aged more and more the diseases of aging caught their minds, so they like to pay more for safer food. While when it became to pay more price, variable gender and households residence shows insignificant affect due to the limited availability of female respondents' selection of rural location nearby by urban location in the sample data. Results showed that health concern and environment concern have significant influence on consumer willingness to pay. Hence it can be concluded that respondents in the study area are more concern about their health and surrounding environment. Findings of the study also reveal a positive and significant influence of variable employment on household purchasing decision. Overall consumer across the study areas who are more willing to pay for pesticides-free fruits can be described as having higher incomes, those with more aged, respondents with more awareness, more concern about the negative impact of pesticides on health and environment and those who were employed.

Naturally producer would like to earn profit as much as possible for their production, so if they sought higher profit, production and marketing efforts will have to be focused on consumers who are willing to pay higher prices than the conventional price. Keeping in view, it is need of the day to speed up efforts on the part of stakeholders including government, agencies such as plant protection and health department to expedite, produce and improve latest agricultural methods to curtail the residues in agricultural fruits and vegetables. The government should allocate budget for agricultural scientist and researchers to investigate healthier, safer and sustainable agricultural production. If we adopt new agricultural practices and meet the standards of World Trade Organiza-

tion (WTO), this will not only provide enough and healthier food to the society but also will boost the economy of the country due to increase in fruits and vegetables exports.

Author's Contribution

Jahangir Khan: Main PhD research scholar who conducted this study.

Abbas Ullah Jan: Supervisor of the principal author.

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