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Econometric analysis of consumer preferences and willingness-to-pay for organic tomatoes in Palestine: Choice experiment method

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This study aimed to examine consumers' willingness to pay a premium price for several environmental attributes of organic tomato to increase both producer production and consumer health in Palestine. The paper adopts the choice experiment method using the econometric analysis of the random utility model. The research questions of this study focus on awareness of the importance of ensuring / securing the environment, how many households in the West Bank purchase organic tomatoes, reasons for which households may be willing or not willing to pay more for organic tomatoes, and the main socio-economic variables that affect the households willingness to pay for organic tomatoes when making organic tomatoes choices. The empirical results show that organic tomatoes are preferred to conventional ones because of health claims by respondents so that we conclude that respondents are willing to pay more for organic tomatoes compared to conventional ones. Additionally, consumers prefer organic products because of health and environmental benefits. Some policy measures might further promote the consumption of organic products. These include creating awareness of the relevance of consuming organic products through effective marketing and educational campaigns. However, there are about 500 organic farms in Palestine with a total area of 1'0000 square meters mainly under fruit, almond, olives and dates. According to the Palestinian Agricultural Relief Committee, organic pasturelands are not found because of the Israeli control (German Development Agency GTZ) and according to the ministry of agriculture in Palestine, there are 24 organic olive farms with a total area of 18885 square meters.

Key words: Econometric Models, Choice Experiment Method, Mixed Logit Model, Palestine, Willingness to Pay.

INTRODUCTION

Organic agriculture can be a profitable, sustainable business for agricultural producers interested in going

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through the certification process necessary to enter this market (Annunziata and Vecchio, 2016). The Willingness to Pay (WTP) is highest for organic certification label certified by NGOs attribute and lowest for Viet GAP vegetables without a label (Thai and Pensupar, 2015). Moreover, many consumers are willing to pay a premium price for organic tomatoes (Engjell et al., 2017). Organic foods have been expanded during the last few years, and industry experts are forecasting steady growth of 9 percent or higher (Organic Trade Association (OTA), 2015).

However, adoption and development of certified organic farming is not an easy option for farmers, and they face technical, economic, social, cultural and legal barriers. In Jordan and Tunisia, with the technical and financial support of the German Development Agency (GIZ), a series of projects were implemented to gradually eliminate the use of chemical fertilizers and pesticides in agricultural production. The International Federation of Organic Agriculture Movements (IFOAM) (2014), in Jordan, explored that there are diverse organic farms with a total area of 25,669,000 square meters; the shares of these farms in the total agricultural land are equal to 0.25%, and there are 98 producers of organic agriculture. The Israeli agricultural sector is characterized by an intensive production system; this is to overcome the scarcity of natural resources, particularly water. The high-level development of the agricultural sector results in the cooperation between scientists, extension advisers, farmers, and agriculture-related industries. These four elements merged to promote advanced technologies in all agricultural branches. As per IFOAM (2014), Israel has diverse organic farms with a total area of 70,950,000 square meters; the shares of these farms in the total agricultural land are equal to 1.36% and with 500 producers of organic agriculture. On the other hand, Awad (2012) uses the econometric analysis of willingness-to-pay to investigate the efficiency and equity of domestic water services in the West Bank. The critical result reveals that efficient allocation mechanisms based on WTP with key socioeconomic variables suggested by economic theory and CV previous studies are nonexistent in Palestine.

Regarding Palestine, agriculture is one of the most critical sectors of the economy as it employs about 31.9% of the population (Palestinian Central Bureau of Statistics (PCBS), 2013). There are about 500 organic farms in the country with a total area of 10,000 square meters mainly planted in fruit and vegetables, almond, olives, and dates. According to the Palestinian Agricultural Relief Committee, organic farms are not widespread due to the dominance of the occupation of the agricultural lands in the Palestinian territories (GIZ, 2014).

According to the ministry of agriculture in Palestine, there are 24 organic olive farms with a total area of 8,964.8 square meters.

The hypothesis might be that organic food increases the capacity of living organisms towards resilience. However, effect studies on specific markers for health are necessary to be taken into consideration for future research (Huber et al., 2011). The impact of organic fruits and vegetables on human health is considered to be the main contributor to the increased demand for this kind of product. Also, consumers are increasingly interested in the health benefits of foods and have begun to look beyond the primary nutritional benefits to the potential disease prevention and health-enhancing compounds contained in many foods. This interest combined with a better understanding of how diet affects diseases, rising health-care costs and lifelong expectancy are driving a growing and robust market for organic foods and natural health products.

Some researchers have emphasized (Agriculture and Agri-Food Canada, 2009) the health benefits of tomatoes, which is the topic of this paper. Tomatoes are chosen for some reasons: First, other than olives, tomatoes are dominant in the organic food sector, and tomatoes are widely consumed among the Palestinian people. Second, organic tomatoes play an essential role in improving public health for both present and future generations. Third, increasing the level of environmentally-friendly food consumption in households is an essential element that can be utilized in the safeguarding of the environment and may reduce Greenhouse Gas (GHG) emissions. Fourth, in the West Bank, the willingness to pay for organic tomatoes is widely discussed and is becoming more relevant to the business in the West Bank. However, the central question of this paper is what is consumers' willingness to pay a premium price for several environmental attributes of organic tomato to increase both producer production and consumer health in Palestine?

Overall and specific objectives

The primary goal of the research was to investigate the potential of organic tomatoes to increase both producer production and consumer health in Palestine. In this paper we (1) estimate the effect of product attributes on households' choice; (2) estimate the households' WTP for organic tomatoes, and (3) investigate the impact of income and other socioeconomic variables on the choice of organic versus conventional tomatoes. Toward this end, the primary method of analysis in this study will be the choice experiment method.

LITERATURE REVIEW

West et al. (2002) used stated choice experiments to estimate WTP for different types of functional foods (for example anti-cancer tomato sauce), produced by conventional, organic, and GM technology. A Mixed Logit

(ML) model was used for analysis. The main results revealed that respondents were willing to pay a price premium for functional foods. Consumers were less receptive to a functional property if the functional food was a meat product. The results also indicated that many Canadian consumers would avoid GM foods regardless of the presence of functional health properties, and they are likely to accept conventional and organic functional foods if the prices are reasonable.

Probst et al. (2012) used a choice experiment to identify 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 were examined as a potential strategy to improve chemical food safety. Awareness of chemical contamination risks was generally low. The 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 (per plate) if the food served contained only certified organic vegetables.

Another example of the application of this method is the paper by Quagrainie et al. (1998). A stated preference experiment was administered in major cities in western Canada in 1996 via a mail survey; there were 530 respondents. The research question dealt with how product origin, packaging, and selected demographics affect consumers' choice of red meats. Several attributes were selected for each different fresh meat product, including price, product origin, and packaging. A Nested Logit model was used to analyze the stated preference data. The results indicated that the consumers generally preferred Alberta fresh beef rather than a more general Canadian origin, but the consumers were indifferent between fresh pork from Alberta and elsewhere in Canada. Consumers' age, household income, and family size were found to affect meat choice.

Lusk and Parker (2009) applied a choice-based conjoint experiment to examine consumer preferences for the amount and type of fat in ground beef. This paper linked consumers beef choices to their health concerns and fat content. The goal of this study was to examine preferences for a heart-healthy beef product. WTP estimates showed that consumers placed significant value on beef enhanced with Omega-3 fatty acids, ranging from $1.30 to $2.21 per pound of ground beef depending on total fat content. The authors suggested that it might be profitable for the beef industry to market and sell products that are healthier for the consumer (heart-healthy beef).

Woods and Bastin (2009) used the choice experiment method to study consumers' acceptance and willingness to pay for blueberry products with nonconventional attributes: organic, Kentucky-grown and sugar-free. An in-store intercept survey was conducted in Kentucky with a sample of 557 respondents in 2007. The results found strong evidence that demographic variables had a significant impact on consumers' preferences. For example, consumers of different ages, household income and years of education have different preferences depending on their characteristics, consumers' preferences and willingness to pay to differ for various attributes. For example, younger and mid-aged consumers with low to moderate income valued the attribute Kentucky-grown much higher than the organic feature for a pure blueberry jam product. Hovde et al. (2007) use a choice experiment to identify market preferences for high selenium beef in the United States. The survey design included three attributes: price premium, health claims, and origin. Health claims levels included the Food Drug Administration (FDA) level A and FDA level C claims. A Multinomial Logit Model was estimated. Unexpected results showed that respondents did not prefer the high-selenium beef products with the FDA level A and C health claims. The authors explained that because the words cancer and selenium were included in the claims; both words might have elicited negative perceptions about the product. Also, consumers were unfamiliar with the function of the new functional ingredient, selenium, which might reduce the risk of certain cancers. One interesting finding was that those with less health-oriented lifestyles, including those who did not exercise and who use tobacco, preferred high-selenium beef with health claims.

METHODOLOGY AND ECONOMETRIC MODELS

A choice experiment explores how consumers value and make trade-offs among the selected attributes. The selected attributes need to accurately reflect the competitive environment of the available alternatives and be strictly relevant to consumers' decision making (Blamey et al., 2001).

The primary purpose of this section is to outline a theoretical background of research methodology, where the theoretical definitions of willingness to pay concepts are discussed. Also, the choice experiment approach widely used as an empirical methodology in the economics literature (Probst et al., 2012; West et al., 2002; Quagrainie et al., 1998; Larue et al., 2004; Lusk and Parker 2009; Hu et al., 2009; Hovde et al., 2007, Hensher et al., 2005; Adamowicz et al., 1998; and Veeman and Adamowicz, 2004) is presented. For a consumer's choice problem, the classic random utility approach of consumer theory is appropriate (Manski, 1977). The choice experiment method is consistent with the Random Utility Theory (RUT). It is a data generation approach which depends on the design of choice tasks to show factors influencing choices and to understand how respondents make choice decisions (Louviere et al., 2000). A choice experiment is used to observe the effects upon one variable, a response variable, given the manipulation of the levels of one or more other variables in the choice sets (Hensher et al., 2005). The choice set is a subset of all alternatives in a universal set that are available at the time of the choice and have a non-zero probability of being chosen (Adamowicz et al., 1998).

To conduct the choice experiment, the first step is to define the study problem by asking the question: what does the study hope to achieve? After understanding the problem, the researcher must identify a list of alternatives, attributes and attribute levels which are

appropriate for the choice experiment. This step is called stimulation refinements, which means brainstorming and then narrowing the range of alternatives to consider in the experiment (Hensher et al., 2005). The critical issues in designing a choice experiment method include selecting the attributes and level of attributes, the experimental design and the treatment of the no-choice option.

A number of discrete choice models are available and differ in the assumptions made about the distribution of the error term (Train, 2009). For example, the conditional logit models error term is assumed to have a type-I extreme value distribution. The typical conditional logit model is visible as well:

1) The estimated coefficients of the attributes are fixed to be the mean values of all respondents' responses. This ignores the variation of the estimated coefficients and cannot handle preference heterogeneity among consumers. Consumer heterogeneity is an essential issue in food markets, especially when dealing with differentiated products, such as organic fruits, where target consumer preferences might be entirely different from other consumers.
2) The second major limitation of the CL model is the independence of irrelevant alternatives (IIA), also known as binary independence as an axiom of decision theory and various social sciences. The IIA property assumes that the ratio of the probability for any two alternatives is utterly independent of the existence and attributes of any other alternatives (Ben-Akiva and Lerman, 1985). It assumes that the errors are independently distributed across alternatives even for repeated choices, which is unrealistic. The CL model cannot avoid the restrictive substitution pattern of the IIA property (Louviere et al., 2000).

The Mixed Logit model is very flexible and can approximate any random utility model (McFadden and Train, 2000). The Mixed Logit model was developed by Boyd and Mellman (1980) and Bhat (1998) and Train (1998), to identify a broad range of consumers 'preference heterogeneity. The Mixed Logit probabilities are the integrals of standard logit probabilities over a density of parameters (Train, 2009). The ML model assumes that rather than being fixed, the parameters of attributes follow certain specific distributions across the respondents in the sample. Specifically, the choice probability of the Mixed Logit model of individual i choosing alternative j can be expressed as:

$$\breve{P}_{ij} = \int P_{ij} \quad f\ (\beta \mid \theta)\ )d \tag{1}$$

Where, θ = the distribution parameters of coefficient β (such as the mean and covariance of β), Pij = the standard logit probability function.

The likelihood function of the ML model cannot be efficiently estimated with Maximum Likelihood estimation (Veeman and Adamowicz, 2004). However, the probability function Pij in equation (7) can be estimated by a simulation method over the density function f (β | θ).

According to Train (2009), the procedure for the simulation method includes three steps. For any given value of $\boldsymbol{\theta}$: (1) draw a value of β from the density function f (β | $\boldsymbol{\theta}$), and name it βr with the superscript r = 1 to represent the first draw; (2) calculate the f (β | $\boldsymbol{\theta}$) found in equation 6 with the logit formula for the first draw; (3) repeat steps 1 and 2 many times (usually more than 100 times), and average the results. The average simulated probability can be expressed as:

$$\breve{\boldsymbol{P}}_{\boldsymbol{ij}} = \frac{\mathbf{1}}{\boldsymbol{r}} \sum_{\boldsymbol{r=1}}^{\boldsymbol{r}} \boldsymbol{P_{ij}}\ (\boldsymbol{\beta^r}) \tag{2}$$

Where, R = the number of draws, $\breve{\mathbf{P}}\mathbf{ij}$= unbiased estimator and its variance decreases as R increases, the summation of $\breve{\mathbf{P}}\mathbf{ij}$ is equal to 1 over alternatives.

The simulated log-likelihood function is given by inserting the simulated probabilities into the log-likelihood function as in the following equation:

$$\mathbf{SLL} = \sum_{i=1}^{I} \sum_{j=1}^{J} \boldsymbol{d_{ij}} \ln \breve{\boldsymbol{P}}_{\boldsymbol{ij}} \tag{3}$$

Where, dij is an indicator such that dij =1 if individual i chose alternative j, and zero otherwise and the maximum simulated likelihood estimation (MSLE) is derived by maximizing SLL over the value of the parameters of the distribution of θ (Train, 2009).

Participants

Stratified random sampling aims to produce a sample that reflects the population regarding each member of the population has an equal chance of being included in the sample and has relative proportions of people in different categories, such as gender, ethnicity, age groups, demographic groups, and region of residence.

Using a 5% margin of error, the appropriate households sample size for the Ramallah and Bethlehem governorates was 384 persons. The governorate of Ramallah and Al-Bira chose a stratified random sample, and Bethlehem governorates to identify and divide the households into two main zones with three main sub-groups. Specifically, the two governorates were broken down into three divisions and a representative sample of each stratum was selected: Division (A) household heads who live in cities (urban respondents); Division (B) household heads of rural areas (rural respondents); and Division (C) household heads who live in the refugee camps of the selected governorates.

After dividing the study population into the appropriate regions, a stratified random sample was undertaken throughout each region. The tables below clarify how we selected the sample in term of two-step samples with a stratified random technique. Villages were divided regarding population size, and we selected the largest ten villages in Ramallah and Al-Bira, and Bethlehem governorates.

Ethical approval

All procedures performed in studies involving human participants were by the ethical standards of the institutional and national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Survey and data collection

The choice experiment was administrated through an in-person survey. The survey contained seven sections. The first section asked some questions about the respondent to ensure that the household bought tomatoes from the Ramallah or Bethlehem governorates. The second section provides information to the respondents about the health benefits of organic tomatoes. The third section asked about health and environmental problems facing households in the West Bank. The fourth section gathered information about consumers eating habits and buying behaviour. The fifth section asked about household attitudes toward conventional agriculture and organic tomatoes. The sixth asked respondents to complete a series of choice tasks, which was the primary source of choice data for the estimation models in the study. The final section of the survey contained some socio-

economic and demographic questions.

Before conducting the in-person survey a pilot study, a pilot survey was carried out by different respondents from different locations in the West Bank: Al-Quds University, tomato markets in Bethlehem, tomato markets in Ramallah. Twenty respondents completed a pilot survey. This pilot study provided helpful feedback in finalizing the survey instrument and the main attributes to use in the actual choice experiments. Pilot interviews provided a good background on organic agriculture in the West Bank and how such products can give the farmers opportunities to achieve a higher profit. Accordingly, the formal survey was applied to respondents recruited from the West Bank (Ramallah and Al-Bireh governorate, and Bethlehem governorate). A random sample was taken from the two governorates, and in-person interviews were used. A survey of 345 households was taken for the whole sample.

The study site

The study is applied for two of the West Bank governorates; Ramallah and Al-Bireh governorate and Bethlehem governorate. These were chosen over other Palestinian governorates because these are the regions in Palestine most likely to be interested in organic food due to income, education, and other demographic and socioeconomic factors. This was clear from the pilot survey. Studying both Ramallah and Bethlehem increases the variance of social and economic background factors, such as nutritional habits, and governmental policies and regulations will make WTP estimates more robust.

The Ramallah and Al-Bireh governorate is located in the middle of the West Bank with an estimated population of 279,730 with 52,834 households. This governorate contains two main cities, Ramallah and Al-Bira, with a further 71 villages, and five refugee camps (Palestinian Central Bureau of Statistics, 2012). Regarding Bethlehem governorate, it is located in the south of the West Bank with an estimated population of 199,463 and with 32,667 households. This governorate contains three main cities: Bethlehem, BeitJala and Beit-Sahour, with a further 38 villages, and three refugee camps (PCBS, 2013). Accordingly, a two-step stratified random sample is adopted in this study with a population that includes urban, rural, and refugee camps.

Choice experiment

The research questions of this study focus on awareness of the importance of ensuring / securing the environment. How many households in the West Bank purchase organic tomatoes, reasons for which households may be willing or not willing to pay more for organic tomatoes, and the main socio-economic variables that affect the households willingness to pay for organic tomatoes when making organic tomatoes choices. Moreover, thus, price per kg, levels of minerals and vitamins, taste, shape, texture and how and where tomatoes where grown were selected as the main attributes for inclusion in the choice experiment.

Illichmann and Abdulai (2013) use a choice experiment approach to investigate consumers' preferences and WTP for organic food products. They apply mixed logit and latent class models to investigate preference heterogeneity of organic food products. The main result revealed significant heterogeneity in preferences for organic apples, milk, and beef product attributes among consumers.

A functional experimental design is used to maximize the information collected from the stated preference choice experiment. The objective of using fractional factorial design is to create efficient choice sets, including how to combine attribute levels into product profiles and how to put profiles into choice sets (Louviere et al., 1998).

Theoretical background

According to Train (2009), an individual i receives utility U when choosing an alternative j with a group of attributes Xij from a choice set. The utility is usually modelled with two components: an observed deterministic component Vij and an unobserved stochastic component ε_{ij} of the utility function. The utility received from alternative j is represented by:

$$U_{ij} = V_{ij} + \varepsilon_{ij} \quad (4)$$

Where, $V_{ij} = f(X_{ij})$, the deterministic component, is a function of the attributes of the alternatives. In the choice model, individual I faces a choice of one alternative from a limited choice set C. The probability P_{ij} that alternative j will equal the probability that the utility gained from this choice is no less than the utility of choosing another alternative in the finite choice set. The probability of individual i choosing alternative j is expressed as:

$$P_{ij} = Prob\ \{V_{ij} + \varepsilon_{ij} \geq V_{ik} + \varepsilon_{ij};\ for\ _j \neq _k,\ and\ k \epsilon\ C\} \quad (5)$$

Attributes and levels

Given this, the base model above identifies the utility function with the main effect variables in the choice experiment. As specified before, seven attributes are included in this choice experiment, which are price, level of minerals and vitamins, taste, nutrition, shape, texture and whether the tomatoes were certified organic. These attributes include different levels which are all dummy-coded, and they become the main variables to test the effects of each attribute in the random utility function. However, the seven attributes are separated into two dummy variables equal to 0 if the household selects conventional tomatoes and one if the household selects organic tomatoes, otherwise equal to 0 (Non-purchase option). The model also contains some socioeconomic variables including income (Table 1).

This study focuses on the households' health and taste related to the choice of organically grown tomatoes, so the tested product should contain the main attributes such as taste and nutrition of organic products (Annunziata and Vecchio, 2016).

In this study, the organic tomatoes have two levels for each attribute. The attribute level of each attribute is as follows: the price of organic tomatoes are double compared with the price of conventional one, contain a higher level of minerals and vitamins are more tasty, more nutritious, less perfect-looking, the texture is matt, and are certified organic. Conventional tomatoes have seven attributes tomatoes with two levels each: the price of conventional tomatoes compared with the price of organic tomatoes, a lower level of minerals and vitamins, less tasty, less nutritious, perfect-looking, the texture is smooth and not organically certified.

The main effect is the independent effect of a particular treatment on the dependent variable, the choice. The measurement of the main effect is by the estimated parameter of that treatment variable. An interaction effect is the combined effect of two or more treatments upon the dependent variable. The interaction effect could be measured by the estimated parameter of the combined variables. The main effects and interaction effects determine the degrees of freedom of the experiment, which is directly related to the design of the minimum number of profiles. The number of profiles needs to be sufficient to estimate both the main effects and

Table 1. Attributes and Levels in Choice Experiment.

Attributes	(Organic fruits or vegetable)	(Conventional fruits or vegetable)	Non-purchase option
Price per Kg	3 NIS	1.5 NIS	I Do not Know
Please choose one of these choices.	☐	☐	☐
Levels of minerals and vitamins	Contain higher level	Contain lowe level	I Do not Know
Please choose one of these choices.	☐	☐	☐
Tasty	Very Tasty	Tasteless	I Do not Know
Please choose one of these choices.	☐	☐	☐
Nutritious	Nutritious	Less nutritious	I Do not Know
Please choose one of these choices.	☐	☐	☐
Shape	Less perfect looking	Perfect looking	I Do not Know
Please choose one of these choices.	☐	☐	☐
Texture	Matt	Smooth	I Do not Know
Please choose one of these choices.	☐	☐	☐
How tomato where grown	Certified Organic	Not Organic	I Do not Know
Please choose one of these choices.	☐	☐	☐

interaction effects.

Model specification and statistical analysis

In the course of this paper, consumer i faces the choice of one alternative among organic tomatoes, regular tomatoes and the no purchase option, given various attribute level combinations in each choice set. The probability of consumer i choosing alternative j equal the probability that the utility received from alternative j is greater or equal to the utility when choosing conventional tomatoes or not making a purchase.

McFadden (1974) developed the conditional logit model to estimate these probabilities assuming the stochastic error term is independent and follows a Type-I extreme value distribution. Assume the observed deterministic component V_{ij} is a linear function of perceived product attributes X_j, so $V_{ij} = \beta X_j$. The choice probability of consumer i choosing alternative j in the conditional logit model is formed as:

$$\mathbf{U_{ij} = X_{ij}ß + e_j} \quad (6)$$

Where, ß is a vector of estimated parameters, Xij represents a vector of the selected attribute levels in the choice set, e_j is the error term associated with the utility brought by alternative j, which cannot be captured by the attributes.

Given the specified attributes and levels of organic tomatoes and vegetables in this study, a linear indirect utility function of consumer i choosing alternative j in one choice set is specified as:

$U_{ij} = ß_1$ (NoPurchase Option) + e_j where j = (no purchase)

U_{ij} = (1 – No Purchase) * ($ß_1 Price_j + ß_2 LevelsOfMineralsAndVitamins_j + ß_3 Taste_j + ß_4 Nutritionj + ß_5 Shape_j + ß_6 Texture_j + ß_7$ TomatoesCertifiedOrganic$_j$) +α_1 Income$_i$ + α_2 Education$_i$ + α_3 FamilySize$_i$ + α_4 Employment$_i$ + e_j ($j \neq$ no purchase) (7)

Willingness-to-pay

Willingness-to-pay is the amount of money a person is willing to pay to get or avoid something other than the status quo. The aggregation of all stakeholders' willingness-to-pay is what is sought in identifying the net benefits of a policy. If someone was made worse off as a result of the change, we could introduce the notion of compensation to bring them back to at least the same level of well-being even if others' well-being was improved. If, after performing the analysis, there are any estimated net benefits, this would imply that the proposed change would be a Pareto improvement over the status quo.

With a linear random utility function, the marginal utility of income is independent of income and prices, and that income effect is negligible, i.e., the compensated (Hicksian) demand curve and the Marshallian demand curve approximate each other, (Small and Rosen 1981) as shown in Figure 1. If this were the case, the price of tomatoes would appear in equation 3, but income would not.

Willingness-To-Pay (WTP) is often adopted by researchers to jointly interpret the estimated parameters and identify the money values associated with changes in each attribute. The marginal WTP indicates the maximum amount that the respondent would be willing to pay in order to receive/avoid a particular attribute of the product (Burton et al., 2001). The marginal WTP can be derived from equation three as follows:

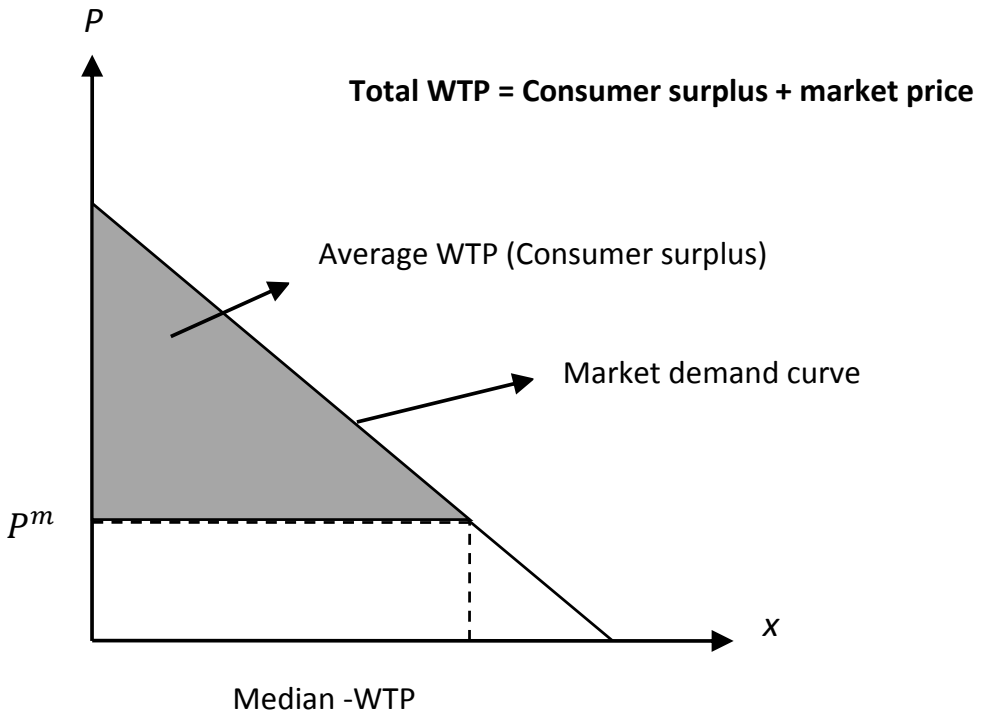

Figure 1. Marshallian demand curve, consumer surplus and WTP.

$$\boldsymbol{WTP_{x_k}} = \frac{\boldsymbol{\beta_k}}{\boldsymbol{\beta_{price}}} \quad (8)$$

Where, β_k is the estimated parameter of the attribute $x_k$moreover, βprice is the parameter for the price,WTP_{x_k} represents the money value that respondents are willing to pay for the attribute x_k of the product characteristics.

Some studies (Ryan and Huges, 1997; Ryan, 1999; Peracchi F, 2001; Lee, 2002; Johnson et al., 2000) have also calculated the WTP arising from a change in all levels of a product as follows:

$$\boldsymbol{WTPmedian} = \sum \frac{\boldsymbol{\beta_k}}{\boldsymbol{\beta_{price}}} \quad (9)$$

Because of its simplicity, median willingness to pay is a popular measure of central tendency for the probit/logit model. Also, the median willingness to pay appears to be less sensitive to distributional misspecification in a referendum framework.

Substitutions of the model

Equations 10 and 11 represent the functional relationship among variables adopted in this study.

$U_{ij} = \beta_0$ (Nopurchase option) + ε, *where j = No purchase*
U_{ij} = (1- No purchase) * (β_1 $Price_j$ + β_2 Levels of Nutritional $Uncertainty_j$ + β_3 $Taste_j$ + β_4 $Nutrition_j$ + β_5 $Shape_j$ + β_6 $Texture_j$ + β_7 $Certifies\ Organic_j$) + ε, (10)

Where, j = No purchase

$$U_{ij} = X_{ij}\theta + U_j \quad (11)$$

Where, θ is a vector of estimated parameters, Xij represents a vector of the selected attribute levels in the choice set and uj is the error term associated with the utility brought by alternative j, which cannot be captured by the attributes.

EMPIRICAL FINDINGS

Variables of the estimation models

This section presents estimation results for the utility models developed to answer the following research questions and hypotheses; (1) Palestinian households pay a premium for organic tomatoes; (2) Palestinian households are willing to pay for organic tomatoes and (3) Palestinians household socio-economic variables have a significant effect on WTP for environmentally green products of organic tomatoes. The choice models examine the responses of consumers in term of the health claim, attitudes and income level. Also, the models used in this study are: (1) the Mixed Logit model and Willingness-To-Pay (WTP) for random parameters; (2) the Mixed Logit model with interaction effects between main variables for fixed parameters. However, Table 2 shows the Variables used for the Estimation Models.

Table 2. Summary of the variables for the estimation models.

Attributes	Abbreviation	Description
Price	x1	The price adopted in the choice experiment for a kg of organic and conventional tomatoes. Also, the household must pay double for organic tomatoes.
Nutritious	x4	One if the tomatoes are organic, otherwise 0.
Shape	x5	One if the tomatoes are organic, otherwise 0.
Educational level	x11	The level of education of Palestinian households in the West bank are classified into four main categories: 1) Completed primary school or less 2) Completed diploma degree 3) Completed bachelor degree 4) Completed master degree or higher
Monthly income	x12	The level of income for the Palestinian households in the West Bank. **Note**: the ―Income‖ variable is measured by the value of New Israeli Shekel (NIS) in all estimation results.
Family size	x13	The household family size of Palestinian households in the West Bank.
Employment status	x14	The Employment status of Palestinian households in the West Bank. One if the household works, otherwise 0.

Table 3. Basic tomato model: ML Estimations and WTP.

Variables	Coefficients	Standard Error	Z-value	P>|z|	[95% Conf. Interval]	
					Lower	Upper
Price	0.6764433	0.0299105	22.62	0.000	0.6178197	0.7350668
Nutritious	0.2349293	0.0408706	5.75	0.000	0.1548245	0.3150341
Shape	0.127888	0.0270699	4.72	0.000	0.0748319	0.1809441
Constant	0.0133135	0.0343863	0.39	0.699	-0.0540824	0.0807093
Log-likelihood		41.465059				
Pseudo-R^2		0.187478				
Median WTP		0.53636 (NIS)				

Respondents' willingness to pay

The study results show that about 33% of respondents are willing to pay a premium price for organic tomatoes. This result is relatively acceptable compared with Marangona et al. (2016) who revealed that only 8% of respondents are willing to pay a premium price for vegan breadsticks and that there is the opportunity to develop local chains for vegan niche markets (Engjell et al., 2017).

Tomato Model (ML) estimates and willingness to pay

Tomato model contains the effects of the main attributes in the choice experiment measured on it, including the price, nutrition, and shape of a tomato. However, Table 3 shows the CL and WTP results for the tomato model. The value of the Log Likelihood Function is 41.465059, and the Pseudo-R^2 is 0.187, indicating that the goodness or fitness of this model is moderately good (Train, 2009). All coefficients are statistically significant at the 5% level, the household's willingness to pay 0.54 (NIS) for organic tomato.

According to the estimation results in Table 3, consumers are more likely to prefer organic tomatoes. Palestinian consumers might believe that organic tomatoes are better for health and environment than conventional tomatoes based on Table 4, 46 discussed in the previous section. Palestinian consumers can pay 0.53 for organic tomato more than conventional tomatoes; they believe that the organic tomatoes are more nutritious than conventional tomatoes and the less perfect shape of organic tomatoes does not be an obstacle to pay for organic tomatoes.

Tomato Model (ML) estimates and WTP interaction effects

Table 4 shows a basic model for all random affects

Table 4. Tomato ML Estimations and WTP with interaction effects.

Variables	Coefficients	Standard Error	Z-value	P>|z|	[95% Conf. Interval]	
					Lower	Upper
Educational level	0.0201369	0.0269285	0.75	0.455	-0.032642	0.0729157
Monthly income	0.000031	0.0000145	2.14	0.032	2.65e-06	0.0000594
Family size	0-.012092	0.0121056	-1.00	0.318	-0.0358185	0.0116345
Employment status	-0.0246058	0.0733299	-0.34	0.737	-0.1683298	0.1191181
Constant	0.6066177	0.1139031	5.33	0.000	0.3833718	0.8298636
Log-likelihood		-212.27546				
Pseudo-R^2		0.017356				

variables that urge Palestinian consumers to WTP organic tomatoes. The estimation results in Table 4show the interaction effects for the main socioeconomic and demographic variables in the choice experiment.

According to Table 4, all interaction variables are not significant except that the income level was significant at the 5% level, indicating that Palestinian consumers educational level, family size, and employment status do not play a role when the purchase option of organic tomato has been made. Also, the main decisive factor affecting the consumer purchasing option is the income level of this consumer.

DISCUSSION

In Palestine, this study is, to the best of my knowledge, the only one that has used CEM by using econometric analysis to accomplish its objectives. The overall objective of this study is to develop policy background information on the demand for organic tomato. The goodness or fitness of the study model is moderately good (Train, 2009), so that It is argued that consumers 'growing interest in organic foods provides value-added growth opportunities to the Palestinian agricultural sector (Agriculture and Agri-Food Canada, 2009). Consumers' response to organic tomato is a relatively new research area with many unanswered questions regarding the household's awareness of this kind of food. Given the nature of organic tomato, nutrition and taste of it play a primary role in helping consumers making consumption choices. This study has examined the household WTP of tomato through an analysis of consumers 'stated preferences for specific characteristics', which is likely to be consistent with the results in other previous research (Marangona et al., 2016). Also, some other potential influences on consumers 'decisions were considered, such as attitudes towards organic tomato, consumers' health status and knowledge, trust in organic food benefits and socio-demographic variables affect the purchasing decision Skreli et al. (2017). However, the empirical evidence of this study is to introduce solutions and scenarios that may be of exceptional and great value to researchers and decision makers.

Conclusions

The growing market around the world for organic foods, especially tomato products, provides a potential opportunity to improve health and environmental saving of Palestinians and enable the development of a new value-added food sector. With the growing interest among consumers in the relation between the green environment and health, and the knowledge of the attributes benefits in organic food products is likely to play a critical role in consumers' choices. The results estimated in this study have answered the research questions related to the demand for organic tomatoes as described. However, ML is a discrete choice model based on random utility theory.

As discussed before, we indicate that consumers' growing interest in organic tomatoes provides value-added growth opportunities to the Palestinians agricultural sector. Given the credence nature of organic tomatoes, price, nutrition and the shape of them play a crucial role in helping consumers make consumption choices.

Households spend about 10% of their monthly income, which is about 4170 (NIS), on conventional fruits and vegetables without knowing the ultimate effects of them compared to the benefits of organic products. At the same time, households are willing to pay 0.54 (NIS) as a premium for organic tomatoes over the conventional ones when knowing the ultimate benefits of the organic products in the West Bank.

Information asymmetry of respondents can appear if they are uncertain about the validity of the health claim so that public policymakers should be aware that the verification of health claims plays a vital role in reducing households' uncertainty and making health claims more credible.

The government is advised to (1) increase the income

level of Palestinian households. If not, the government should cover the difference in prices between organic and conventional tomatoes of producers; (2) label the organic product in terms of the quality perception of consumption is significantly essential, which is likely to consistent with other previous research (Thai and Pensupar, 2015); and (3) provide organic tomatoes all the year round.

Limitations

This article focuses on examining the Palestinian households WTP of tomato in West Bank through using the choices experiment methodology of research. One limitation of this study is associated with the hypothetical nature of the stated preference approach since respondents are asked to state their preference values, but actual choice behaviour may differ. Consumers may provide silly statements if there is no cost to over (or under-) stating their willingness to pay. Estimation bias may be present due to strategic behaviour by respondents, especially when consumers are unfamiliar with the product (for example a food product with a new functional attribute), their stated willingness to pay may be inaccurate. However, other methods, such as experimental auctions, have been widely discussed in the literature associated with economic evaluation methods and could be used in future research on this topic. As discussed by Hu et al. (2006), it is broadly believed that the use of experimental auctions in consumer research can capture the real willingness to accept a product and reduce the bias caused by strategic behaviour. However, the costs of conducting auctions on representative samples are usually relatively higher than the Stated Preference Method, and as a result, sample sizes tend to be smaller. Thus, another limitation of this study only two organic vegetables and one organic fruit were investigated due to time and budget constraints. Future studies should consider the WTP for other organic products. Also, Ramallah and Bethlehem governorates were examined, future studies should be replicated for other governorates in the country to determine the overall market size and consumers WTP for organic fruits and vegetables. However, some of the Variables tested in the WTP model were not statistically significant probably due to the sample size. To address the statistical limitation, future studies should consider a large sample size in order to increase the degree of freedom. Future research should focus on the cost-benefit analysis of organic farming so that the financial viability of organic farming in Palestine based on percentage willingness to pay could be explored.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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