



JOURNAL OF SOCIAL SCIENCES DEVELOPMENT

www.jssd.org.pk



CONSUMERS' WILLINGNESS TO PAY FOR ORGANICALLY GROWN TOMATOES IN DISTRICT LAHORE, PAKISTAN

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KEYWORDS	ABSTRACT
Food safety, Organic Vegetables, Environmental sustainability.	Food safety, health, environmental sustainability, and product quality have gained greater attention in the context of the rising consumer demand for organic foods. Organic tomatoes are more relevant since consumers are increasingly linked to the reduced application of chemical residues, the improvement in nutritional value, and environmentally responsible production. Their price, however, is relatively high, making them not easily available to the public, and consumers may not be the only ones which are uncertain about their authenticity and certification. Consumer preferences and WTP were analyzed in this study for organic tomatoes in Lahore, Pakistan. To collect primary data, the sample size was N=250, and the respondents were taken from five big stores in Lahore through a convenience sampling technique. Two methods were used: binary logistic regression to determine factors associated with consumers' willingness to pay for organic tomatoes and WTP estimation to determine consumers' willingness to pay a premium. Health and environmental considerations, product quality, freshness, shelf life, labelling, accessibility, and socio-economic characteristics are all factors to consider in the decision-making process of consumers. Accessibility was positively and significantly correlated with WTP, while availability was negatively and significantly related to WTP. The results also show that consumers' WTP decreases as price premiums increase. Based on this data, it is observed that the market of organic tomatoes has great potential in Lahore. Better accessibility of the product and consumer awareness, credible labelling, certification, and market availability could help to boost consumer confidence and the organic tomatoes market.
ARTICLE HISTORY	
Date of Submission: 15-08-2026 Date of Acceptance: 20-09-2026 Date of Publication: 26-09-2026	
	
	https://doi.org/10.59075/jssd.v5i7.312
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DOI	https://doi.org/10.59075/jssd.v5i7.312
Volume/Issue	5(7), 2026, 432-447

Introduction

Background of Organic Vegetables

Vegetables are integral to a healthy diet and serve as a source of nutrients such as vitamins, minerals, dietary fiber and other compounds which are important in human nutrition. Vegetable cultivation is an important livelihood activity in Pakistan as vegetables are relatively short duration crops and can be grown on small land holdings. In 2022, the thesis suggests that Pakistan's production of vegetables was around 7.07 million tons, which reflects a significant increase in production from the previous decades. Even in this production, the average vegetable consumption in Pakistan is still far less than the recommended dietary level which is 285 g/day as reported by the Government of Pakistan (2022) while the average is around 100 g/day.

The consumer preference for food has also been shaped by food safety concerns and the potential risks of overuse of agrochemicals, along with the growing awareness of environmental sustainability concerns. Consumer knowledge about pesticides and farming techniques has led to growing interest in organically grown food. Recent studies show that consumers have become more health-conscious, with an increasing focus on food safety, environmental impact, and production methods when it comes to organic vegetables (Akinwehinmi *et al.*, 2021; Zayed *et al.*, 2022).

Importance of Tomatoes

Tomato (*Solanum lycopersicum*) is a significant vegetable crop, both economically and nutritiously. It is rich in dietary fiber and minerals, provides other nutrients and is used in the domestic diet. The crop is also economically significant due to its short production period, high yield potential, less labor requirement, farm income contribution etc. Tomato production in Pakistan increased to 541.28 thousand tons in 2021-22, out of which 130.84 thousand tons were produced in Punjab (Agriculture Statistics of Pakistan, 2022).

Tomatoes are a suitable product to analyze the willingness of consumers of organic food since they are offered in both organic and conventional varieties. Furthermore, a study in Karachi, Lahore, and Faisalabad showed that tomato quality and safety properties, along with price-related ones, are of high importance for consumers in their purchase decisions (Badar *et al.*, 2021).

Consumer Shift Toward Organic Tomatoes

The rising popularity of organic tomatoes can be attributed to growing health consciousness, concerns about pesticide residues, and awareness regarding environmental sustainability. Organic tomatoes are possibly viewed as more safe and environmentally friendly products due to their focus on minimizing the use of synthetic agricultural chemicals. New research has revealed that factors such as price, chemical-residue reduction, certification, freshness and taste can have a significant impact on consumer choices and willingness to pay for organic vegetables (Akinwehinmi *et al.*, 2021).

Product characteristics are also important in shaping preferences for organic tomatoes. Consumers might think that organic tomatoes are nutritionally superior, have higher quality, are fresher, taste better and are more shelf stable. The research clearly defines freshness, shelf life, taste, and perceived purity as factors that can be considered in the consumers' willingness. These characteristics align with the findings of recent studies that indicated health and quality were important factors about tomato purchasing (Badar *et al.*, 2021). Furthermore, recent studies on tomato consumption have considered the multidimensional aspects of consumer acceptance, such as product traits and perceived quality, to better understand how these factors influence the process of consuming tomatoes and their consumption experience (Latino *et al.*, 2022).

Willingness to Pay

Willingness to pay (WTP) is the highest price a consumer is willing to pay for a given amount of a product. In the case of organic food, WTP becomes of particular significance as consumers are likely to have to pay a premium for perceived health benefits, food safety, environmental sustainability aspects, certification, and better product quality. According to the study, WTP is the highest price that an individual is willing to pay for a given amount of a product.

It is valuable to producers, retailers, marketers, and policymakers as it reflects the economic value that consumers place on certain product characteristics. In a global meta-analysis of 80 studies, Li and Kallas (2021) reported an average willingness-to-pay premium of 29.5% for sustainable food products, but given the variation in sustainability attributes, consumer characteristics, geographical region, and food product, the magnitude of the premiums was found to vary. Therefore, consumers' willingness to pay a premium is highly related to the perceived benefits of organic products compared to the extra price they are willing to pay.

Research Gap and Problem

Though organic foods are gaining popularity, there is not much authentic information available about organic tomatoes in the consumer level at Lahore. Several interrelated elements are holding the growth of the organic tomato market back: Fairly high prices, limited access and availability, uncertainty about certification and labelling, and lack of reliable information. The research suggests that availability of organic tomatoes in nearby retail stores was not guaranteed and rather was higher in larger stores, limiting consumers' access.

Consumer uncertainty is especially significant because some attributes like production method, chemical-residue status, nutritional value cannot be verified at the point of purchase. Therefore, with the help of certification and clear labelling, consumers can have information and confidence about the authenticity of organic products. Tomato consumers are willing to pay premiums for organically grown and certified safety characteristics and income, age, and education can shape preferences (Joya *et al.*, 2022). Likewise, studies on organic vegetables reveal that the degree of certification, reduction of chemical residue, freshness, and cost are key factors affecting consumer preference (Akinwehinmi *et al.*, 2021).

There is therefore a need for consumer-level evidence from Lahore that shows the socioeconomic, psychological, product, and market factors that are related to the willingness to pay for organic tomatoes. An understanding of these factors can help to overcome the current barriers to the market and offer a better foundation for designing pathways to boost consumer acceptance and demand for the market.

Objectives

The study aims to: (i) identify the factors that affect consumers' preferences towards organic tomatoes; (ii) estimate consumers' willingness to pay for organic tomatoes; and (iii) propose market-oriented strategies to boost the sales and acceptance of organic tomatoes. The investigation particularly concentrates on the Lahore consumers and considers Socio-economic, Psychographic, Product and market related characteristics.

Literature Review

Awareness of Organic Food

Organic food preferences have been increasingly linked to health consciousness, environmental awareness, food safety and perception of food quality. Organic vegetables might be given preference by consumers because they believe that these vegetables are safer, healthier, and not exposed to synthetic agricultural chemicals. In the choice experiment conducted in the Southwest of Nigeria, Akinwehinmi *et al.* (2021) observed that the chemical residues attribute of foods was among the most significant food-safety attributes that affected consumers' choices and willingness to pay. They also found age and awareness of organic products to be factors that led to the variation of consumer preferences.

Another important factor influencing organic-food preference is concern about the environment. Demographic indicators such as educational level and income were significant factors in predicting consumers' buying of organic vegetables, whereas environmental concern was more significant than health motivation in doing so (Ariadi *et al.*, 2021). Organic-food preferences can also be enhanced by information and awareness. Adawiyah *et al.* (2021) discovered that the provision of consumer information had a positive impact on consumer awareness and preferences for organic vegetables, resulting in a higher interest in purchasing organic vegetables. Likewise, Zayed *et al.* (2022) showed that health awareness, environmental responsibility, attitudes and related behavioral factors were relevant to the purchase intentions of organic food. From these results, it can be concluded that socio-economic, knowledge, health perceptions, and environmental values interact in the determination of preference for organic food among consumers.

Socioeconomic Determinants of WTP

Socio-economic factors have been reported as significant factors influencing consumer organic and safer food purchase readiness. The conceptual framework of the study suggests that the following consumer characteristics are relevant for understanding the preferences for organic

tomatoes: gender, age, education, job status, income and family size. But the relationship can be positive or negative, and the strength of the relationship can differ by market and customer segment.

Age may affect WTP by affecting the health priorities, purchasing behavior and willingness to accept new food attributes. Akinwehinmi *et al.* (2021) discovered age as a heterogeneity factor for preferences of organic vegetables. WTP may also be influenced by gender. Yue *et al.* (2021) discovered that gender and income exhibit a significant difference in the WTP for vegetables during the COVID-19 period when studying Chinese consumers.

This is especially relevant in the field of education as consuming individuals with a higher education level will have more accessibility to information regarding food safety, certification, nutrition, and environmental impacts. Education and income were important demographic indicators in organic vegetable consumption and WTP identified by Ariadi *et al.* (2021). In a similar way, Wijesinghe and Senarathna (2022) found that education level and monthly income have significant impact on WTP for organic vegetables in Sri Lanka.

Income is likely to affect the purchasing power of consumers for buying premium-priced organic products. In a meta-analysis of 80 studies (Li & Kallas, 2021), it was determined that WTP estimates vary depending on the characteristics of the consumers and the context of the sustainable food products, with average premiums of 29.5% overall, but with higher premiums being found in the West and in food contexts involving people who already eat sustainably. Household food needs and expenditure rates, as well as disposable income and frequency of purchase, may also be influenced by household size and employment. The literature in this research shows that household size, income, age, and other socioeconomic factors can influence WTP for organic food.

Product Attributes

Product attributes are the characteristics that consumers can assess either directly or indirectly when they are deciding to purchase a product. On the other hand, organic tomato quality, freshness, taste, shelf life, nutritional value, purity, packaging and labelling/ certification are important attributes. The research framework separates product attributes from other factors that influence WTP and highlights appearance, taste, health and environmental properties, packaging and labelling.

These are important traits in tomatoes, as evidenced by recent research. By analyzing the consumer preferences in tomato attributes, Badar *et al.* (2021) found that there is significant difference among the consumers of tomato in Karachi, Lahore and Faisalabad in their preferences of tomato attributes and highlighted the importance of providing undamaged, fresh and acceptable quality tomatoes in the targeted markets. Another example of premium value added to tomatoes being generated is as wholesome, organic, certified and sold in supermarkets, as shown by Joya *et al.* (2022).

Production practices and chemical-residue status are not directly visible by consumers of organic products, and packaging and labelling play a special role for them. In their study, Ariadi *et al.* (2021) reported that informative packaging and labeling can increase consumer confidence in the product, but there were some aspects that did not show a positive effect on the consumer's willingness to pay for the product. The multidimensionality of tomato acceptance was also shown by a systematic review conducted by Latino *et al.* (2023), who categorized the tomato attributes into price, product features, packaging, convenience, sensory properties, sustainability, origin, safety, health, and production processes.

Market Attributes

The market characteristics affect the consumers' ability and willingness to buy organic tomatoes. Accessibility, availability, price, labeling and retail outlet are important factors. The study clearly defines the market attributes as an explanatory category, and considers shopping convenience and market offers relevant to WTP.

Accessibility is crucial as people might wish to buy organic food, but if they cannot find or afford to buy it, then it doesn't do them any good. Perceptions of quality and safety can also be affected by retail channels. Joya *et al.* (2022) concluded that the price premiums for tomatoes purchased from wet markets were lower than those sold at supermarkets, and certified and organic attributes also commanded premiums. Price is still a significant factor as a high value might make it less affordable. Adawiyah *et al.* (2021) have found that organic vegetables are relatively expensive and this has led to reduced willingness of organic vegetables while information and awareness have increased the interest of consumers in buying organic vegetables.

Research Gap and Conceptual Basis

Previous research shows that no single consumer attribute or product attribute is good at predicting WTP for organic tomatoes. Recent research indicates that psychographic variables, like health consciousness, environmental concern, and food-safety perceptions, are linked to socioeconomic variables, such as age, gender, education, and income. The characteristics of the products, including the quality, freshness, taste, certification, packaging and labelling, also contribute to the formation of consumer value; the accessibility, availability, price and retail channels contribute to the possibility of reaching organic products in practice.

But there is not much evidence available to combine these dimensions particularly for organic tomatoes in Lahore, Pakistan. The current study builds on consumers willingness for fresh tomatoes conducted in Pakistan and has unique focus to measure and compare the socioeconomic, psychographic, product and market factors influencing WTP for organic tomatoes. In view of the above, the conceptual framework of the present study is:

Socio-demographic attributes + Psychographic attributes + Product attributes + Market attributes → Consumer WTP for organic tomatoes

These four categories are a direct match with the four categories in the research conceptual model, where the four categories are the independent variables and WTP is the dependent variable.

Materials and Methods

Study Area

This study was carried out in Lahore, Punjab, Pakistan. Due to its size and diversity of urban consumers and its significance as a market for fresh vegetables and new organic food products, Lahore was chosen as the study area. The study highlights Lahore as the second largest city of Pakistan with about 13 million population, which is important for the study of consumer preferences and willingness to pay (WTP) for organic tomatoes. Financial and logistical factors also played a role in the choice of Lahore; this was the only major Pakistani city to be studied.

Research Design

The research design used was a quantitative, cross sectional design to investigate consumer preferences and WTP for organic tomatoes. The primary data were collected directly from the consumers by using structured questionnaires with mostly closed ended questions. In developing the questionnaire, the researcher considered the objectives of the study and conducted pre-testing prior to data collection. It consisted of four parts: respondents' socioeconomic background, preferences and willingness to pay for the consumption of organic tomatoes, problems and suggestions for consumers.

Sampling and Sample Size

Lahore was purposively selected and a convenience sampling technique was used for respondents. The initial sample size requirement for the study was a sample size of 254 respondents to be used for the survey at a 95% confidence level with a 20% assumed proportion of consumption and a margin of error of 5%. It was thought that 250 respondents would be adequate for the survey. The sample for the data collection was the five major retail outlets in Lahore which were Mall of Lahore, Packages Mall, Avenue Mall, Emporium Mall, and Imtiaz Mega Store. A total of 250 consumers were interviewed, with fifty respondents interviewed at each outlet – providing a balanced sample. The sample consisted only of consumers who are familiar with organic vegetables.

Variables and Conceptual Framework

The explanatory variables were grouped into four main categories, namely socio-demographic, psychographic, product and market attributes and WTP for organic tomatoes was included as the dependent variable. Socio-demographic characteristics which were included were age, gender, education, income, household size, and employment status. Psychographic characteristics included consumers' perceptions of health, environment, nutrition and risk. Product attributes comprised quality, freshness, taste, shelf life, packaging and labelling, while market attributes

comprised accessibility, availability, price and retail related considerations. This framework was the groundwork for assessing the determinants of consumers' willingness to pay a premium for organic tomatoes.

Econometric Model

The dependent variable of WTP was dichotomously measured, so a binary logistic regression model was used. The value of each respondent willing to pay a premium for organic tomato was assigned as '1' and the value of each respondent unwilling to pay a premium for organic tomato was assigned as '0'. This binary logit approach is suitable for modelling the probability of a binary consumer choice in the presence of many explanatory variables. The discrete-choice and regression based methods have also been found to be useful tools in assessing consumer reactions to the organic and food-safety attributes in recent WTP research.

The willingness to pay for organic tomatoes can be represented as the probability that consumer (i) would be willing to pay for organic tomatoes:

$$[P_i (WTP=1) = \frac{1}{1 + \exp[-Z_i]}]$$

where:

$$[Z_i = \beta_0 + \beta_1 SD_i + \beta_2 PSY_i + \beta_3 PROD_i + \beta_4 MKT_i + \beta_5 PP_i + \epsilon_i]$$

In this case, (SD) refers to socio-demographic, (PSY) to psychographic, (PROD) to product, (MKT) to market, and (PP) to the organic price premium. The coefficients (β) show the direction of the relationships between the explanatory variables and the probability of WTP, and the magnitude of the relationships. A binary model is considered for the maximum likelihood estimation in the thesis.

WTP Estimation

The model parameters were estimated with the maximum likelihood estimation (MLE) method. The estimation of consumers' WTP followed the study method and adopted the approach related to Hanemann's utility-difference framework, which is based on the estimation of a price coefficient to calculate the monetary value consumers attach to the product attributes in question. To account for consumers' willingness to pay extra over the conventional tomato price, the price premium that consumers are willing to pay for the organic product was added to the WTP model. The study highlights the highest observed price premium for the organics, and the estimated coefficient of the price-premium variable as the two important variables of the WTP calculation.

Interpretation of the regression results was based on the estimated coefficients, as well as the marginal effects. Coefficients represent a direction of association between an explanatory variable and WTP, while marginal effects signify the magnitude of the change in the predicted probability of willingness to pay for a unit change in an explanatory variable. This method is in

line with the latest WTP studies conducted among consumers, which address socio-economic factors, food-safety beliefs, product characteristics and food price premiums to capture consumers' buying intentions (Joya *et al.* 2022; Li & Kallas 2021).

Results and Discussion

Respondent Socio-Demographic Profile

An understanding of socio-demographic characteristics of the 250 respondents is important for interpreting consumer preferences and willingness to pay (WTP) for organic tomatoes. A moderately higher number of male respondents (57%) than female (43%) were included in the sample. In terms of age, 117 respondents (47%) were below 30 years, while 128 (51%) were between 31 and 60 years of age. Five (2%) of the respondents were over 60 years old. Therefore, the consumer sample was largely made up of economically active consumers.

As per the income distribution, 51% (i.e. 127 respondents) earned monthly income less than PKR 100,000, 41% (i.e. 103 respondents) earned income between PKR 100,000–200,000, and 8% (i.e. 20 respondents) earned income of more than PKR 200,000. Educational attainment was moderately high with 150 respondents (60%) having graduated up to a Masters' level and 81 (32%) having intermediate-level education, 19 (8%) were less educated.

The profile thus reveals that the consumers surveyed were mostly educated and concentrated in the younger and middle age groups. These descriptive characteristics should not be blindly assumed to be indicative of a higher WTP on their own, however. These conclusions must be made on a statistical basis using the estimated regression model. Previous studies have also established that socioeconomic factors can lead to differences in consumer willingness to pay, but there is no consistency in the direction and magnitude of the impact by market and product (Li & Kallas, 2021; Joya *et al.*, 2022).

Table 1 Socio-demographic Characteristics of Respondents

Socio-demographic Characteristics	Category	Frequency (n)	Percentage (%)
Gender	Male	142	57
	Female	108	43
Age	Below 30 years	117	47
	31-60 years	128	51
	60 years and above	5	2
Monthly Income	Less than 1 Lac	127	51
	1-2 Lac	103	41
	More than 1 Lac*	20	8
Education	Graduation/Masters	150	60
	Intermediate	81	32
	Less Educated	19	8

Total	250	100
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Consumer Perception and Preferences

Health, nutrition, environmental, safety and product quality issues were highly correlated with consumers' perceptions of organic tomatoes. The study contains some of the main factors which influence WTP, namely: environmental knowledge and concern; health aspects; perceived nutritional value; product quality. These perceptions are especially important for organic tomatoes since consumers might link the production of this tomato variety to lower exposure to synthetic agricultural products and to better safety or health options.

Health and food-safety concerns seem to be crucial for comprehending demand for organic tomatoes. Pesticide exposure is seen to be a benefit to consumers, and environmental benefits are an indirect benefit to the collective. This is also consistent with Akinwehinmi *et al.* (2021), which showed that consumers' preference and willingness-to-pay for organic vegetables was more related with chemical residues reduction. They also found that age and awareness were found to affect heterogeneity of preferences.

Consumers also took into consideration nutritional value and quality. In Sri Lanka, recent evidence shows that perceptions of healthiness and nutritiousness with the presence of certifications significantly impact WTP (Wijesinghe & Senarathna, 2022). In the same way, the study carried out in Pakistan has revealed that the quality attributes of tomato play significant role in terms of consumer value; and that the consumers consider fresh and undamaged, visually appealing tomatoes as significant parts of the tomato value (Badar *et al.*, 2021). The results of the present study indicate that the WTP for organic tomatoes is not only influenced by the organic production claim but it is influenced by the health, nutritional, environmental and physical quality benefits consumers may attribute to the product.

Table 2 Consumer Perceptions and Preferences for Organic Tomatoes

Attribute	Respondents Willing to pay extra (n)	Percentage (%)
Better Quality	238	95.2
Fresher than conventional tomatoes	195	78.0
Longer shelf life	217	86.8
Easy accessibility	197	78.8
Availability	126	50.4
Clear Price Tag	97	38.8
Premium Labeling	183	73.2

Product Attributes and WTP

The estimated model indicates that some of the characteristics of the tomato product have played an important role in shaping consumers' WTP for organic tomatoes. The research shows a positive coefficient of 0.36 for product quality, meaning that there is a positive relationship between perception of product quality and willingness to pay. This is of economic significance because there is a possibility that the organic purchasing decision could be linked to specific enhancements of the product quality perceived by consumers. When consumers believe there are benefits associated with an organic claim, it is likely to be more useful.

The coefficient of freshness was 0.94 and the marginal effect was 0.21. The positive coefficient in the model implies that an increase in freshness led to an increase in the probability to WTP, and the marginal effect is an increase of about 0.21 in the predicted probability for a unit change in the measured variable of freshness while holding the other variables fixed. Consumers will see the freshness of tomatoes at the point of purchase and this is a quality signal that is easily observed. This finding is like Badar et al. (2021) who conducted a study of tomato consumers in Lahore, Karachi and Faisalabad and highlighted that the fresh, undamaged and unblemished tomatoes are very significant in fulfilling the consumers need.

There was also a positive relationship between shelf life and WTP with coefficient 1.08 and a marginal effect of 0.25. This means that the consumers attached importance to tomatoes with longer shelf life. A longer shelf life can help to reduce household food waste and the frequency of tomato purchases by consumers, thus enhancing the perceived value of the organic product.

The coefficient of the labeling premium variable is 1.01, and the marginal effect is 0.22, suggesting a positive relationship between favorable labeling considerations and WTP. This is significant because the organic attribute is hard for consumers to ascertain based on physical inspection alone. Certification and believable labelling systems can thus serve as information cues to mitigate uncertainty about production practices. Akinwehinmi *et al.* (2021) confirmed the preference of consumers for third-party organic certification, and recent studies have found third-party certification type to affect consumers' willingness to pay and their trust in third-party certifications.

The overall product-attribute results confirm that consumers WTP is not simply a function of the organic label, but rather a function of a combination of product quality, freshness, durability, and credible product information.

Market Attributes and WTP

Some of the most striking results of the study were found in the variables related to the market. The coefficient of accessibility was 2.70 and the marginal effect was 0.38, indicating a strong positive relationship with WTP. The relatively high positive coefficient indicates that consumers had a significantly higher WTP when tomatoes were easily obtained that were considered

organic. Accessibility is not just a distribution problem; it can have an impact on whether the consumer's preference is realized.

Table 3 Logistic Regression Results for Factors Affecting Willingness to Pay for Organic Tomatoes

Attribute	Variable	Coefficient	z-value	p-value	Direction
Psychographic	Environmentally friendly	-1.69	—	—	Negative
	Soil fertility	1.36	—	—	Positive
	Save water resources	1.22	—	—	Positive
	Reduce risk of illness	2.84	—	—	Positive
	High nutrient contents	0.58	—	—	Positive
Product	Better quality	1.51	—	—	Positive
	Freshness	0.94	—	—	Positive
	Shelf life	1.08	2.05	0.048	Positive*
Market	Accessibility	2.70	4.33	<0.001	Positive*
	Availability	-1.39	-3.58	<0.001	Negative*
	Price tag	0.31	0.79	0.421	Positive, NS
	Labeling premium	1.01	2.34	0.023	Positive*

Accessibility is especially relevant in emerging organic markets where consumers' attitude to organic food might be positive, but they face problems in finding a trustworthy retailer. Factors related to the product and consumer were also significant in the organic vegetable buying behavior and WTP, according to Ariadi *et al.* (2021), in which they argued better product quality and informative labeling are essential to enhance consumer confidence in purchasing organic vegetables.

Availability, on the other hand, had a coefficient of -1.39 , a z-statistic of -3.58 and a probability value of < 0.001 , which suggests a statistically significant negative relationship with WTP in the estimated model. Care must be taken interpreting this result. In the study, accessibility and availability are correlated but are different variables. Accessibility refers to the ease by which consumers could access or obtain the product, while availability is the measured market attribute responded to in the questionnaire. Thus, the negative availability coefficient should be taken to mean that consumers do not like the product. Instead, it suggests that, given the other variables in the model, the availability variable measured was negatively related to the likelihood of WTP.

The z-statistic for the price-tag variable was 0.79 and the p value was 0.421. So, it was not considered to be statistically significant. This finding differs from the negative and statistically significant effect of the organic price premium that the research finds. This is the key difference: the price-tag variable reflects consumers' reactions to the price information variable used in the regression, while the price premium is the extra amount consumers spend when buying an organic tomato. The latter clearly reflects the economic costs of selecting the organic option.

The negative effect of the premium is in line with economic theory and recent empirical research. Akinwehinmi *et al.* (2021) reported that the price of vegetables increased that drove a downward shift in consumer preferences for organic options; Li and Kallas (2021) carried out a meta-analysis of 80 studies, finding that the average WTP premium for sustainable food was positive, but that the results were highly variable between products, by region and by consumer characteristics. Hence, consumers appreciate the advantages of organic tomatoes; they are still reluctant to pay more for them due to the premium price.

Most Influential Factors

The overall model results suggest that accessibility, availability, health-related benefits, environmental attributes, product quality, freshness, shelf life and price were significant factors in the consumers' willingness for organic tomatoes. The market variables obtained one of the highest positive values, which is accessibility with 2.70 coefficient and 0.38 marginal effect. The study also indicates that accessibility and availability are the two most observed X-values in the market and are important factors in consumer choice.

Health concerns also a major feature. The study sees a reduction in the risk of illness as a very positive criterion and environmental friendliness as a very important one of consumer preference. These findings indicate that organic tomatoes are not only appreciated as an alternative production system, but also as a product perceived as having personal and environmental benefits.

The negative and significant price-premium effect also highlights a crucial constraint to market growth. While consumers can see the benefits of organics tomatoes, are not willing to pay the premium price tag. This presents a practical challenge for producers and retailers: organic tomatoes must be able to offer benefits that are convincing and apparent, and still be available to price-sensitive consumers, at a premium.

Table 4 Marginal Effects and Relative Importance of Factors Affecting Willingness to Pay

Attribute	Variables	Marginal Effect	X-Value
Psychographic	Environmentally friendly	-0.25	0.896
	Soil fertility	0.32	0.856
	Save water resources	0.29	0.904

		0.60	0.836
	Reduce risk of illness		
	High nutrient contents	0.13	0.864
Product	Better quality	0.36	0.952
	Freshness	0.21	0.780
	Shelf life	0.25	0.868
Market	Accessibility	0.38	0.212
	Availability	-0.28	0.504
	Price tag	0.06	0.388
	Labeling premium	0.22	0.732

Comparison with Previous Studies

The results of the present study are generally in line with recent international and Pakistani evidence, but there are differences in the market conditions and in the research methods, which lead to variations in the relative importance of the individual determinants. Based on the results of 275 consumers from Karachi, Lahore, and Faisalabad, Badar *et al.* (2021) observed that consumers were highly interested in tomato quality attributes and highlighted the demand for good quality and undamaged tomatoes, which are also acceptable to them. This has a bearing on the present findings of quality and freshness.

The results of the present study are also in line with Joya *et al.* (2022) who conducted a DCE survey among 490 respondents and obtained positive WTP for organic tomatoes and other food-safety attributes. In addition, their findings highlighted that WTP was different across income, age, and education levels further supporting the importance of consumer heterogeneity in the assessment of the demand for organic tomato products.

More especially, the present findings were strongly supported by Akinwehinmi *et al.* (2021) who discussed the health and safety aspect of the findings. Their choice experiment revealed that the least chemical residues were a dominant preference and WTP attribute, and that certification had an impact on consumer choice. Likewise, Ariadi *et al.* (2021) found that product factors and demographic factors impacted the WTP for organic vegetables, and education and income were among the key demographic indicators.

The findings of the present study are also consistent with the ones that came from the study conducted by Wijesinghe and Senarathna (2022), which revealed that income and education were significant factors affecting WTP for organic vegetables while perceptions about health, certification, and nutritional value were important factors. Lastly, Li and Kallas (2021) have reported the mean premium for a WTP for sustainability of 29.5% across 80 studies and identified the presence of heterogeneity based on gender, region, sustainable attributes, and food category. Combined, these comparisons imply that the Lahore market shows some of the trends found in the rest of the world: consumers appreciate health, safety, quality, environmental, and certification advantages, but are price-sensitive to economic cost and market access.

Conclusion and Recommendations

Conclusion

Based on the findings of this study, the use of organic tomatoes in Lahore is possible in the market due to its potential but is limited by price and market-related concerns. Perceptions about health benefits, environmental attributes, nutritional value, and product quality were all related to the willingness to pay (WTP). The socio-economic factors, such as age, gender, education, income, and household-related factors, were also an essential component of the consumer decision framework.

Consumer preferences were related to product characteristics. Quality, freshness, and shelf life had positive relationships with WTP, as did labeling considerations. Organic tomatoes that were easily available proved to be one of the most positive market influences. In contrast, the organic price premium negatively and significantly affected WTP, showing that the extra financial cost is still a significant barrier for consumer uptake. The results also show that consumer confidence and product information are key for building the market of organic tomatoes. Overall, there is a possibility that the development of organic tomato consumption in Lahore could be supported by enhancing consumer confidence through providing reliable information, credible label and, improving the quality of the product and making facilitation available in the market.

Practical Recommendations

Based on the results of this research, some suggestions can be given for the stakeholders of the organic tomato supply chain. Producers need to continue the organic production practices and enhance the quality attributes of the product, especially freshness and shelf life. More reliable supply will also help to overcome market constraints. Retailers need to make organic tomato more accessible in nearby market. Packaging, labeling and even organic certification, if visible, can help consumers differentiate between organic and conventional tomatoes and boost consumer confidence in buying organic tomatoes.

Relevant authorities should enhance organic certification and establish accurate and trustworthy labeling procedures. Consumer awareness campaigns can transmit the health, food-safety, nutritional and environmental information of organic production. Policy support for the organic producer may also boost supply and support market development.

Limitations and Future Research

This study was confined to Lahore, and the convenience sampling technique was employed thus, it cannot be generalized to the entire country based on the findings generated among the sample of 250 respondents. Future research should necessarily incorporate a larger group of participants and multiple cities across Pakistan to investigate this phenomenon more effectively. In addition, it is essential to elaborate on the differences in the WTP across regions and assess organic tomato markets in several Pakistani cities.

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