

Consumer preference analysis and willingness to pay for artisanal produced corn tostadas in southern Mexico

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ABSTRACT: Tortillas are a representative element of the Mexican diet; in the south of Mexico, corn tortillas called tostadas are handmade. Discrete choice and psychological salience experiments were used to evaluate consumer behavior. Consumers prefer artisanal, healthy and natural tostadas and are willing to pay a premium price for them. Two consumer segments were identified: “Presentation Observers” and “Healthy Lovers”. There was no statistical difference between the symbolic and utilitarian psychological meanings. The representative utilitarian meanings were taste, appearance, dishes and pairing; and the symbolic meanings: appetite, process, hedonism and tradition.

Análisis de preferencias del consumidor y disposición a pagar por tostadas artesanales del sur de México

RESUMEN: Las tortillas son un elemento representativo de la dieta Mexicana, en el sur de México se elaboran artesanalmente unas tortillas de maíz denominadas tostadas. Se evaluó el comportamiento de los consumidores mediante experimentos de elección discreta y significados psicológicos. Los consumidores prefieren tostadas artesanales, saludables y naturales, por las cuales están dispuestos a pagar un sobreprecio, se identificaron dos segmentos de consumidores: “Observadores de la presentación” y “Amantes de lo sano”. Los significados psicológicos simbólicos y utilitario no presentaron diferencia estadística. Los significados utilitarios representativos fueron: sabor, apariencia, platillos y maridaje; y los significados simbólicos: apetencia, proceso, hedonismo y tradición.

KEYWORDS / PALABRAS CLAVE: Tortillas, traditional foods, discrete choice experiments, psychological meanings / Tortillas, alimentos tradicionales, experimentos de elección discreta, significados psicológicos.

JEL classification / Clasificación JEL: C93.

DOI: <https://doi.org/10.7201/earn.2026.01.05>

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Cite as: Martínez-Aquino, V. Zarate-Trujillo, H.M., Barrera-Rodríguez, A.I. & Espejel-García, A. (2026). “Consumer preference analysis and willingness to pay for artisanal produced corn tostadas in southern Mexico”. *Economía Agraria y Recursos Naturales*, 26(1), 260105. <https://doi.org/10.7201/earn.2026.01.05>

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Received in December 2024. Accepted in January 2026.

1. Introduction

Corn (*Zea mays* L.) is one of the most important crops in the world, grown in America, Europe, and Asia (Iuga *et al.*, 2019). The modern corn plant is the result of an evolutionary process from the wild grass Balsas teosinte (*Zea mays* ssp. *Parviglumis*), which was domesticated in ancient Mesoamerica, mainly in Mexico (Van Heerwaarden *et al.*, 2011). In this country, 59 native breeds and approximately 300 varieties of corn are preserved (Arnés & Astier, 2019). Corn is part of the Mexican food triad (corn, beans, and squash) and is the mainstay of the milpa, a fundamental element in the Mexican diet (Rodríguez-Calderon *et al.*, 2017). Corn is currently a staple food in Mexican cuisine and is used in more than 600 different preparations (Sánchez-Vega *et al.*, 2021). The most emblematic food representation of corn consumption is the tortilla, which accompanies, wraps, mixes, presses, and complements other foods, functioning as an edible spoon and cultural symbol, making it the most important component of the Mexican diet (Rodríguez-Calderon *et al.*, 2017).

The tortilla is produced using an ancient process called *nixtamalization* (from the Nahuatl: *nixtli* “ashes” and *tamalli* “dough”), which dates to pre-Hispanic times, between 1200 and 1500 BC. This procedure consists of cooking corn in an alkaline solution of water and hydrated lime (Ca(OH)₂), for as long as the type of corn and dish requires (Staller & Carrasco, 2010). In Mexico, several studies have been conducted on tortillas: Traditional practices in the production of artisanal comal tortillas in Michoacán (Arnés & Astier, 2019); Consumer preferences and sensory profile of different types of tortillas from Tlazala, Mexico (Iuga *et al.*, 2019); Production and consumption of tortillas as cultural heritage in San Pedro del Rosal, Mexico (Rodríguez-Calderon *et al.*, 2017); Consumer preferences for corn tortillas from Puebla, Mexico (Escobedo-Garrido & Jaramillo-Villanueva, 2019); Characterization of the tortilla consumer in the State of Mexico (Espejel-García *et al.*, 2016); Perception of corn tortilla in Mexico (Sánchez-Vega *et al.*, 2021); among others. However, Mexico’s gastronomic wealth surrounding tortillas is vast and varies regionally. In the south of the country, specifically in Santiago Textitlán, Oaxaca, a particular type of tortilla is produced, locally known as a “tostada”. This product is handmade by indigenous women using native creole corn that has been previously nixtamalized. To obtain the dough, the corn kernels undergo a prolonged nixtamalization process for 8 hours, and once this process is complete, the corn is left to rest in water for another 24 hours. Once the nixtamalization process is complete, the corn undergoes two grinding processes: i) in an electric stone mill, and ii) in a metate (a pre-Hispanic volcanic stone tool used to grind grains and seeds in Mexico), to obtain a fine, smooth dough. The tostadas are molded by hand, reaching an approximate diameter of 50 cm, and are cooked on clay griddles through a slow and prolonged process, which promotes moisture loss and gives the tortillas sensory characteristics such as a crunchy texture and a distinctive flavor. The final weight of each tostada is approximately 100 g. These characteristics differentiate tostadas from other tortillas and consolidate them as a representative element of the local gastronomic identity.

In the study of traditional Mexican foods, including Mexican foods, it is necessary to identify the factors that influence consumption decisions, which can be economic, biological, individual, and cultural (Ares *et al.*, 2015). In this context, the objective of this research was to identify valuation attributes and determine the willingness to pay for tostadas using the discrete choice experiment tool. It also sought to explore the utilitarian and symbolic psychological meanings, and their commonalities, that a sample of native consumers attribute to Oaxaca tostadas.

2. Material and methods

2.1. Design of discrete choice experiment (DCE)

A discrete choice experiment was used to identify consumer preferences regarding the relationship between labeling and the attributes that characterize traditional foods (Table1), origin, process, net content, nutritional information, and price (Guerrero *et al.*, 2009). Although no prior qualitative study was conducted, the attributes were validated according to the criteria described by Melo Guerrero *et al.*, (2020), through a specialized literature review of similar studies and the formation of focus groups with local producers. Physicochemical parameters such as moisture and fat content were assessed using FT-NIR spectrophotometry with a Multi-Purpose Analyzer (Bruker Corp., Billerica, Massachusetts, USA); Opus 7.8 software (Bruker Corp., Billerica, Massachusetts, USA) was used for data processing.

TABLE 1
Attributes used in the valuation questionnaire

Attributes	Level	Description	Selection Rationale
Origin	Santiago Textitlán Juchitán	Place of origin of the product, in relation to the place of origin of other types of tostadas and tortillas native to Oaxaca, Mexico.	Cultural and territorial relevance; origin is considered to influence the perceived authenticity of the product.
	San Antonio de la Cal		
Process	Traditional	The traditional type of process, in a manual way, contrasted with a type of process with a higher degree of industrialization and standardization of the elaboration process.	Differentiation between artisanal and industrial methods reflects values associated with traditional practices.
	Machine-made toast		
Quantity per package	5 pieces	Number of pieces presented in a retail unit package.	Practical variable for consumers; influences perceived value and convenience.
	10 pieces		
Cooking method	Frying	Type of cooking, which is related to the cooking process.	Associated with health and dietary preferences, cooking affects texture and flavor.
	Baking		

TABLE 1 (CONT.)

Attributes used in the valuation questionnaire

Attributes	Level	Description	Selection Rationale
Price	50.00 MXN	Price in Mexican pesos payable per package of tostadas.	Key economic variable enables estimation of willingness to pay and price sensitivity.
	100.00 MXN		
Fat content	With fat	Presence of fat or fat residues derived from processing.	Related to health and perceived quality; important in purchase decisions.
	Fat free		
Net content	150 g	Net contents in a retail unit package.	Influences perceptions of quantity and value; relevant for comparing similar products.
	200 g		

Note: The cooking process type affects the product’s final moisture: the baked product presents moisture between 5 and 8.50 %; whereas, in commercial frying processes, moisture levels of 5 to 12 % were identified; The product under study presents 5.80 % fat, whereas commercial fried tortillas contain between 20 and 30 % fat; The quantity per package was contrasted against the net content to evaluate the preference and convenience expressed by consumers.

Source: Own elaboration.

2.2. Attribute and level selection

The experiment design was based on a full factorial design considering the seven attributes and their respective levels, resulting in 192 combinations. However, applying an instrument with such several items represents a cognitive challenge for respondents. To reduce cognitive load, we employed a D efficient fractional design that generated 16 choice cards, grouped into 8 choice sets. This design allowed for the independent estimation of the main effects and interaction effects.

2.3. Survey design

The survey was structured in four sections: 1) Introduction: Participants were given a general description of tostadas and their cultural significance, as well as the purpose and implications of the study; 2) Choice experiment: The selected combinations were used to form eight choice sets, each consisting of two purchase alternatives and a non-purchase option (Figure 1); 3) Sociodemographic characteristics: Sociodemographic data were collected, including gender, age, educational level, occupation, monthly income, and place of residence; and 4) Psychological meanings: Respondents were asked to look at an image of the tostada and write down the first three words that the image evoked in them, in order to explore symbolic and utilitarian associations.

FIGURE 1

Combination of purchase choice alternatives in the experiment
(option C was a no-purchase alternative)

Option A



Origin: Santiago Textitlán, Oaxaca, Mexico
Process: Non-standard
Price: \$50.00 MXN
Contents: 10 pieces
Process: Fried
Fat content: With fat
Contents: 200 g

Option B



Origin: Juchitán Oaxaca, Mexico
Process: Standard
Price: \$100.00 MXN
Contents: 5 pieces
Process: Baking
Fat content: Fat free
Contents: 100 g

Option C



I would not purchase either option.

Source: Own elaboration.

2.4. Survey application

The survey was applied to a sample ($n \geq 200$) of Mexican consumers; this sample was selected under the criteria described by Martínez-García & Martínez-Caro (2008) for an infinite population, using maximum variance with a reliability coefficient of 95 %, a coefficient of variation of 50 %, and a margin of error of 7 %. The criteria for participating in the study were: willingness to participate, being a consumer of tostadas, and being of legal age (≥ 18 years). The questionnaire was administered virtually using Google® Forms. The sampling type was non-probabilistic, using the snowball technique for the distribution of the questionnaire, in which participants who met the selection criteria were identified, and they in turn shared the link to participate with other individuals who met the selection criteria. This process was repeated until the planned sample size was reached.

Snowball sampling is recognized as an effective technique for accessing specific or hard to delimit populations, reducing costs and time compared with probabilistic methods, especially when the sampling frame is not clearly defined (Biernacki & Waldorf, 1981; Salvatore, 2023). In this context, the choice of method responds to the exploratory nature of the study and the need to capture cultural perceptions in a group that exerts significant influence on the evolution of the market for traditional foods in Mexico.

2.5. Statistical analysis

Economic valuation of the attributes of the Tostadas

The data obtained from the DCE were analyzed using an econometric estimate with the multinomial logit model (MLM) (with interaction effects and without interaction effects), as this model has been considered the most appropriate when dealing with aspects related to attributes (Amaya-Amaya *et al.*, 2008). For the multinomial logit model without interaction, the following variables were used: a) dependent variable: consumer choice between the three alternatives (option A, option B, and the alternative of not purchasing), which took values of 1 when one alternative was selected and 0 for the remaining two alternatives; b) independent variables: attributes coded with their respective levels according to the experimental design. On the other hand, the following variables were used for the multinomial logit model with interaction: a) dependent variable: consumer choice among the three alternatives; b) independent variables: attributes coded with their respective levels according to the experimental design; and c) socioeconomic variables: age, occupation, education, and gender.

Consumer segmentation

A latent class logit model was applied to segment consumers into groups according to their preferences. Once the classes were obtained, consumers were characterized according to sociodemographic variables. To compare differences by class and between individuals, a kproportions test was applied using χ^2 as the test statistic, following the Marascuilo procedure. The analyses were performed with the XLSTAT statistical analysis software, version 2023.1.1 (Addinsoft®, USA).

Psychological meanings

The words expressed by consumers were classified using the word association technique described by Guerrero *et al.* (2010). To do this a panel of five specialists, trained and experienced in the use of affinity diagrams, organized and classified the terms expressed by consumers. Affinity diagrams were drawn up considering only those words that were mentioned at least twice, which were grouped into semantic categories and assigned a representative name. A K-proportions test was applied to the relative frequency of words in each category, using χ^2 as the test statistic. Marascuilo's procedure (Martínez-Aquino *et al.*, 2023) was applied to compare the proportions of the categories. The results were represented graphically using the wheel of commonalities of meanings. The analysis was performed using XLSTAT version 2023.1.1 (Addinsoft®, USA).

3. Results and discussion

3.1. Socio-demographic information

In the Table 2 shows the sociodemographic characteristics of the participants in this study. The consumer sample consists of men (54.7 %) and women (41.3 %), with most participants falling within the 18-35 age range (59.3 %) and having a high school education or equivalent (45.3 %). and their main occupations are employees (35.3 %), and students (35.3 %). Respondents (58 %) earn less than \$4,500.00 MXN, and most live in southern Mexico (44 %).

TABLE 2

Descriptive statistics of sociodemographic information of surveyed consumers

Variables	Categories	Sample (%)
Sex	Man	56.9
	Woman	43.1
Age	18 - 35 years old	59.6
	36 - 55 years old	34.6
	≥ 56	5.6
Schooling	No schooling	0.7
	Basic	17.3
	Upper middle	45.3
	Superior	28.7
	Postgraduate	8.0
Occupation	Student	35.3
	Housewife	15.3
	Employed	35.3
	Unemployed	8.7
	Retired	0.7
	Another	4.7
Monthly income	Less than \$4 500.00	58.0
	\$4 501.00 a \$10 000.00	24.0
	\$10 001.00 a \$20 000.00	15.4
	Greater than \$20,000.00	2.7
Residence	South	44.0
	Center	34.1
	North	21.9

Source: Own elaboration.

According to INEGI (2024), Mexico has a population of 130 million, of which 51 % are men and 49 % are women. The population aged 18 to 35 accounts for 25 %, only 68.51 % of Mexicans have completed high school education, and the average income of the economically active population is \$6,000.00 MXN, with marked inequality between regions and genders, as women earn on average 34 % less than men (INEGI, 2025).

The composition of the sample adequately reflects the target consumer profile of the product under analysis, as it is concentrated in young, digitally literate individuals who represent a dynamic segment with high influence on consumption trends. The use of an online questionnaire made it possible to reach participants distributed across the three regions of the country (south, central, and north), thereby providing geographic and cultural diversity. This strategy is consistent with recent studies indicating that young, connected consumers are key actors in the revalorization of traditional foods and in the adoption of innovative dietary practices (Feldman & Goodman, 2021; Kraak, 2025).

3.2. Economic valuation of the attributes of the Tostadas

The data generated after applying the multinomial logit model are shown in Table 3. The goodness-of-fit and adjustment statistics obtained are AIC = 3109.5 and Log likelihood = -1545.75. Although the AIC may seem high, it was the lowest coefficient among the models tested. On the other hand, the Log likelihood value is high, which indicates a parsimonious fit of the model (Hernández Valdivia *et al.*, 2023). McFadden's pseudo R^2 for the estimated model is 0.0619, a value that falls within the range commonly observed in discrete choice models. Although it is lower than typical R^2 values in linear regression, this level of fit is considered acceptable for multinomial logit models, given the complexity and heterogeneity of individual decisions (Train, 2009).

In the model, the variable associated with the origin of the product that did not show a statistically significant difference ($p \geq 0.10$) was *Juchitán* ($p = 0.5124$). On the other hand, the origin of San Antonio de la Cal ($p = 0.0525$) was statistically significant ($p \leq 0.10$). In this case, consumers prefer tostadas produced in *San Antonio de la Cal*. It is important to note that this municipality has a long tradition of producing soft tortillas called “*tlayudas*” (Vasconcelos-Ramírez *et al.*, 2019) so consumers may have associated the product with “*tlayudas*”. In contrast, the variable related to the manufacturing process showed statistically significant differences ($p \leq 0.05$). In particular, the non-standard process ($p = 0.0075$) had a positive effect on product evaluation ($\beta = 0.1078$), suggesting a preference for artisanal processes. This coincides with the findings described by Cappelli *et al.* (2022) who identified that current consumer trends are related to a preference for artisanal, traditional, and local food products.

Attribute content per package, a significant difference was identified ($p \leq 0.05$), observing that consumers positively value the presentation in packages of 10 units ($\beta = 0.2314$). Regarding the cooking process, statistical significance was also detected ($p \leq 0.05$); however, frying had a negative effect on the rating ($\beta = -0.2358$). On the other hand, the variable “net content” of the packaging showed significant differences ($p \leq 0.05$), with 200 g packages being rated more highly ($\beta = 0.1370$). Likewise, the fat content, linked to the manufacturing process, was statistically significant ($p \leq 0.05$) with a negative effect ($\beta = -0.2142$), which shows a preference for low-fat products. This indicates a preference for baked crackers, associated with healthier consumption habits that include a reduction in salt, sugar, and fat (Hossain *et al.*, 2025).

TABLE 3
Results of the multinomial logit model on “Tostadas”

Attributes	Coefficient (β)	Standard error	Z	Prob. Z >Z*	95 % Confidence Interval	
Origin: Juchitán	-0.0667	0.1018	-0.66	0.5124	-0.26628	0.13286
Origin: San Antonio	-0.1786*	0.0921	-1.94	0.0525	-0.35897	0.00191
Process: Non-standard	0.1078***	0.0403	2.67	0.0075	0.02876	0.18677
Contents: Ten pieces	0.2314***	0.0497	4.66	0.0000	0.13400	0.32884
Price	-0.7910***	0.1094	-7.23	0.0000	-1.00543	0.57652
Process: Fried	-0.2358***	0.0676	-3.48	0.0005	-0.36829	-0.10315
Contents: 200 g	0.1370***	0.0508	2.70	0.0070	0.03740	0.23660
Fat content: With fat	-0.2142***	0.0684	-3.13	0.0017	-0.34830	-0.08008
ASC	-2.0848***	0.1906	-10.94	0.0000	-2.45840	-1.71127
AIC = 3109.5						
Log likelihood = -1545.75						
R2 de McFadden = 0.0619						

Note: Level of significance, 1 % (***), 5 % (**) and 10 % (*).

ASC: Alternative Specific Constant.

AIC: Akaike Information Criterion.

Source: Own elaboration.

Positive coefficients in the attributes: non-standard process, ten-piece content, and 200 g content indicate that consumers are more likely to prefer and value foods with these characteristics (Rossi *et al.*, 2024). Conversely, the negative coefficients in the variables: fried process and fat content “with fat” show an inverse correlation

with the presence of fat, suggesting that consumers show a clear preference for fat-free foods. This behavior reflects a tendency toward healthier food choices, closely linked to consumers’ lifestyles (Lazo *et al.*, 2022). Likewise, food quality, including attributes such as origin and those related to health, show positive preferences and willingness to pay on the part of consumers (Menozzi *et al.*, 2022).

3.3. Willingness to pay for “Tostadas”

Because consumers were highly price sensitive, a willingness to pay (WTP) analysis was conducted for the tostadas, the results of which are presented in Table 4. The attributes non-standard process (artisanal), ten pieces, and 200 g content showed a positive WTP of \$0.13, \$0.29, and \$0.17 MXN, respectively. These results coincide with those reported by Jaramillo Villanueva (2016), who identified a willingness to pay \$0.10 to \$2.00 MXN for tortillas produced with organic corn in Mexico. The behavior of consumers in this study is related to that identified by Valero-Padilla *et al.* (2024), who found that Mexican consumers are willing to pay a premium for different types of tortillas.

TABLE 4
Estimates of willingness to pay

Attributes	Coefficients (β)	Standard error	Z	Prob. Z >Z*	WTP (\$MXN)	95 % Confidence Interval	
Process: Non-standard	0.1363**	0.0604	2.25	0.0241	0.13	0.01782	0.25468
Contents: Ten pieces	0.2926***	0.0805	3.64	0.0003	0.29	0.13482	0.45033
Process: Fried	-0.2980***	0.0603	-4.95	0.0000	-0.29	-0.41610	-0.17992
Contents: 200 g	0.1732**	0.0795	2.18	0.0293	0.17	0.01748	0.32893
Fat content: With fat	-0.2108***	0.0684	-3.96	0.0001	-0.21	-0.40485	-0.13674
AIC = 3109.5							
Log likelihood = -1545.75581							
R² de McFadden = 0.0619							

Note: Level of significance, 1 % (**), 5 % (*) and 10 % (*).

AIC: Akaike Information Criterion.

WTP= Willingness to pay.

Source: Own elaboration.

These findings are consistent with those reported by Iuga *et al.* (2019), who identified that consumers of Mexican tortillas value attributes such as origin, corn variety, and artisanal production processes. Similarly, Espejel-García *et al.* (2016) found that

consumers prefer tortillas made using traditional processes, such as nixtamalization, and produced with white corn. Both studies reflect behavior comparable to that observed in the present investigation.

On the other hand, the attributes “*fried process*” and “*fat content*” had a negative WTP of \$0.29 and \$0.21 MXN, respectively, which shows a preference for healthier foods. This trend coincides with the findings of Jaramillo Villanueva (2016), who reported that Mexican consumers are particularly willing to pay for organic tortillas that promote health and nutrition. It should be noted that tortillas are a staple food in the Mexican diet, and tostadas are associated with the concept of food well-being (Rojas-Rivas *et al.*, 2020).

3.4. Segmentation of Tostadas consumers

Consumer segmentation using latent class analysis reveals two clearly differentiated consumer groups: Class A “Presentation Observers” and Class B “Health Lovers” (Table 5). The goodness-of-fit statistics obtained are AIC = 2877.9 and Log Likelihood = -1419.95. The Log likelihood value is high and indicates a parsimonious fit of the model (Hernández Valdivia *et al.*, 2023).

This finding coincides with previous research indicating that heterogeneity in consumer preferences for traditional products is derived from the influence of factors such as presentation, production process, and health attributes, in addition to sociodemographic characteristics (gender, age, educational level, and income), familiarity, and consumer relationship with the product (Rossi *et al.*, 2024).

In Class A, “Presentation Observers”, preferences are dominated by extrinsic and packaging attributes. Positive and statistically significant effects are observed for non-standard (artisanal) processing ($\beta = 0.2571$; $p = 0.0033$) and for content: ten pieces ($\beta = 0.4236$; $p < 0.001$), along with a favorable assessment of the content: 200 g ($\beta = 0.2826$; $p = 0.0097$). Furthermore, this group does not penalize frying; on the contrary, it shows a slightly positive effect ($\beta = 0.1469$; $p = 0.0499$), suggesting that, for this segment, the experience of use/presentation and craftsmanship outweigh strict health criteria. This behavior is consistent with that reported by Sánchez-Vega *et al.* (2021) and Appendini & Quijada (2016), who highlight that processes such as nixtamalization and cooking on a comal are perceived as indicators of superior quality. Globally, this preference is in line with the trend toward “clean label” and artisanal products, which have experienced sustained growth in emerging and developed markets (Asioli *et al.*, 2017).

In contrast, Class B “Health Lovers” reveals a health-oriented pattern: it strongly penalizes the frying process ($\beta = -0.8116$; $p < 0.001$) and “fatty” fat content ($\beta = -0.7720$; $p = 0.0010$) and shows high price sensitivity ($\beta = -0.6214$; $p = 0.0002$). The attribute “content”: ten items have a small but significant negative effect

($\beta = -0.0230$; $p = 0.0042$), consistent with a preference for more controlled portions or formats with moderate calories. The effects for non-standard process (artisan) and content (200 g) are not significant, suggesting that, in this segment, craftsmanship is not valued and attributes related to well-being, such as healthy cooking methods (e.g., baking) and low fat content, are more important.

The behavior of this consumer segment coincides with the findings of Arnés & Astier (2019), who identified that tortilla consumers prefer them to be made naturally, using traditional processes (nixtamalization, cooking on a griddle) and without added fat. In addition, products derived from nixtamalization provide consumers with nutritional benefits, such as greater bioavailability of amino acids and niacin, and increased phosphorus and calcium (Zazueta *et al.*, 2002), which reinforces the link between tradition and nutrition.

The findings of this study confirm that two different choice logics coexist: one oriented toward presentation and signs of traditional quality (Class A) and another focused on health and nutritional control (Class B). From a strategic perspective, this suggests differentiated strategy designs: (i) for Class A, maintain and communicate the artisanal process, emphasize 10-piece formats and 200 g content, and explore sensory proposals that do not require giving up the preference for frying; (ii) for Class B, prioritize baking, low or no fat, smaller or modular portions, and pricing policies that mitigate high elasticity. Such guidelines are consistent with the literature that highlights the importance of segmenting by latent preferences in traditional and functional food markets (Asioli *et al.*, 2017; Rossi *et al.*, 2024).

Finally, it should be noted that, although McFadden's R^2 and AIC support the quality of the fit, potential sources of uncaptured heterogeneity remain (e.g., consumption habits, context of use, prior exposure to health campaigns), which could be explored in future research using mixed models or hierarchical specifications with sociodemographic and familiarity covariates (Rossi *et al.*, 2024).

Latent class analysis revealed significant differences between the segments, which are reflected both in their purchasing preferences and in their sociodemographic composition Table 6. These variations indicate that choice patterns are not homogeneous, but are conditioned by factors such as gender, educational level, and income, which confirms the influence of socioeconomic characteristics on the valuation of product attributes.

The Presentation Observers are composed mainly of women (60 %) and individuals with upper-secondary education (50 %), with a predominance of low income (66 %), which suggests that this group values extrinsic attributes such as quantity and presentation for reasons of convenience and price. In contrast, the Health Lovers show a higher proportion of men (52 %), higher educational levels (13 % postgraduate), and greater presence in middle-income ranges (34 %), which is consistent with their preference for healthy attributes such as baking and absence of fat.

TABLE 5
Results of the latent class logit model

Observers of the presentation				Healthy lovers			
Attributes	Coefficients (β)	Prob. Z >Z*	95 % Confidence Interval	Attributes	Coefficients (β)	Prob. Z >Z*	95 % Confidence Interval
Origin: Juchitán	-0.2940*	0.0827	-0.59119 0.00311	Origin: Juchitán	-0.3083	0.9887	-0.78526 0.16866
Origin: San Antonio	0.31707**	0.0298	0.03103 0.60312	Origin: San Antonio	-0.58697***	0.0089	-1.02694 -0.14699
Process: Non-standard	0.2571***	0.0033	0.14550 0.36865	Process: Non-standard	-0.1299	0.3186	-0.34524 0.08545
Contents: Ten pieces	0.4236***	0.0000	0.28275 0.56449	Contents: Ten pieces	-0.0230	0.0042	-0.25326 0.20728
Price	-0.3475**	0.7278	-0.68127 -0.01376	Price	-0.62140**	0.0002	-1.10638 -0.13638
Process: Fried	0.14685	0.0499	-0.05883 0.35252	Process: Fried	-0.81164***	0.0000	-1.12169 -0.50160
Contents: 200 g	0.2826***	0.0097	0.13468 0.43057	Contents: 200 g	0.0123	0.3743	-0.20718 0.23177
Fat content: With fat	0.1122	0.2879	-0.09928 0.32373	Fat content: With fat	-0.7720***	0.0010	-1.12176 -0.42233
ASC	-2.42882***	0.2912	-2.99956 -1.85808	ASC	-0.31200	0.4575	-1.13514 0.51114

Note: Level of significance, 1 % (***), 5 % (**) and 10 % (*).

ASC: Alternative Specific Constant.

Source: Own elaboration.

This pattern is consistent with studies indicating that educational level and income influence the choice of healthier and functional foods (Carrasco Quintero *et al.*, 2023). Likewise, the orientation toward artisanal and healthy attributes reflects global trends toward “clean label” products and traditional origin (Cappelli *et al.*, 2022). These findings suggest differentiated strategies: for Presentation Observers, emphasize tradition and large packages; for Health Lovers, communicate nutritional benefits and offer reduced formats with clear labeling, in line with recommendations for the valorization of traditional foods (Martínez-Aquino *et al.*, 2025).

TABLE 6

Sociodemographic segmentation of the study population

Variables	Categories	Presentation Observers (%)	Health Lovers (%)
Sex	Man	40a	52b
	Woman	60b	48a
Age	18 - 35 years old	60	61
	36 - 55 years old	35	34
	≥ 56	5	5
Schooling	No schooling	1	0
	Basic	17	18
	Upper middle	50a	38b
	Superior	27	32
	Postgraduate	5a	13b
Occupation	Student	37	30
	Housewife	17	13
	Employed	32a	43b
	Unemployed	11	5
	Retired	0	2
	Another	3	7
Monthly income	Less than \$4 500.00	66b	45a
	\$4 501.00 a \$10 000.00	18a	34b
	\$10 001.00 a \$20 000.00	14s	18b
	Greater than \$20,000.00	2	4
Residence	South	42a	48b
	Center	46b	31a
	North	12	25

ab* Different letters indicate statistical difference ($p \leq 0.05$) between the categories.

Source: Own elaboration.

3.5. Psychological meanings in “Tostadas” consumers

In the Figure 2a presents the results of the analysis of meanings attributed by consumers to tostadas. No statistically significant differences ($p > 0.05$) were found between utilitarian (49 %) and symbolic (51 %) psychological meanings, indicating that both types of meanings coexist in the perception of the product. In the case of utilitarian meanings, the categories with greater communality were flavor attributes (13.2 %), appearance attributes (13.2 %), and dishes and pairing (13.0 %). For symbolic meanings, the most prominent categories were hedonism (12.3 %), appetite (11.7 %), process (9.1 %), and tradition (6.8 %).

These results are consistent with previous studies on traditional Mexican products. For example, Torres-Salas *et al.* (2020) reported that, in *Añejo de Zacazonapan* cheese, the commonalities between symbolic (48.1 %) and utilitarian (59.9 %) meanings did not show significant differences. Similarly, Martínez-Aquino *et al.* (2023) found balanced proportions in *Seco Encerado* cheese (51.16 % symbolic vs. 48.84 % utilitarian). This behavior suggests that symbolic-utilitarian duality is common in Mexican foods with strong cultural roots.

In the case of tortillas, Sánchez-Vega *et al.* (2021) identified semantic associations linked to rurality (mainly related to the corn plant), traditional processes (related to the artisanal production of tortillas), sensory aspects (related to the category of hedonism), and culture (related to the categories of identity and tradition), categories that correspond to the symbolic and utilitarian dimensions observed in this study.

The presence of symbolic meanings such as tradition and process reinforces the idea that tostadas are not perceived solely as a functional food, but also as a cultural and emotional vehicle, associated with culinary practices and identity values. This finding coincides with the literature that points out that traditional foods play a dual role: satisfying physiological needs and reinforcing cultural ties (Asioli *et al.*, 2017; Guerrero *et al.*, 2010). On the other hand, the relevance of utilitarian attributes such as taste and appearance confirms that, even in products with strong symbolic significance, sensory criteria remain decisive in the choice (Menozzi *et al.*, 2022).

The preference for both psychological meanings indicates that consumption decisions are not explained solely by utilitarian benefits, but also by symbolic or intangible attributes, such as cultural and emotional values. The consumer behavior literature confirms that hedonic and utilitarian motivations simultaneously influence purchase intention and willingness to pay (Dhar & Wertenbroch, 2000). In this regard, the integration of quantitative analysis (DCE) and qualitative analysis (psychological meaning) enables the design of marketing strategies that balance both components: communicating sensory and functional attributes alongside narratives that emphasize the product's authenticity and cultural value. Such approaches are consistent with research highlighting the importance of cultural sustainability and symbolic differentiation in globalized markets (Cruz *et al.*, 2024).

FIGURE 2

Psychological meanings (symbolic and utilitarian) expressed by consumers of tostadas: a) Comparison of percentages of communalities of categories of meanings given to toast and their contributions to psychological meanings; b) meanings given to toast and their contributions to psychological meanings of women; and c) meanings given to toast and their contributions to psychological meanings of men



a, b, c* Different letters indicate statistical difference ($p \leq 0.05$) between the categories.

Source: Own elaboration.

In the Figure 2b shows the meanings attributed by consumers. No significant differences ($p > 0.05$) were found between symbolic and utilitarian meanings, indicating that women give equal weight to both aspects. Among the utilitarian meanings, the categories with the highest commonality were taste attributes (13.9 %), appearance attributes (13.9 %), and dishes and pairings (12.8 %). In terms of symbolic meanings, hedonism (11.7 %), appetite (10.6 %), process (8.1 %), and tradition (6.6 %) stood out. This pattern suggests that, for women, the sensory experience and functionality of the product are as relevant as cultural and emotional values.

In contrast, in the Figure 2c, shows that men present a significant difference ($p < 0.05$) between symbolic (55.7 %) and utilitarian (44.3 %) meanings, indicating a greater orientation towards symbolic aspects. In this group, the symbolic categories with the highest commonality were hedonism (12.8 %), appetite (12.8 %), process (10.3 %), and tradition (6.9 %), while in utilitarian meanings, taste attributes (12.3 %), appearance attributes (12.3 %), and dishes and pairing (12.8 %) remained relevant. This finding coincides with that reported by (Sánchez-Vega *et al.*, 2021b) who point out that women, being more involved in food preparation, prioritize functional and sensory aspects, while men tend to value the hedonic experience and enjoyment of consumption more.

These results are consistent with studies on traditional foods, which show that women associate products with practicality and sensory quality, while men link them with pleasure and tradition (Guerrero *et al.*, 2010). The greater relevance of hedonism in men can be interpreted as a search for immediate gratification, while in women the combination of utilitarian and symbolic attributes reflects a more comprehensive view of the product, which includes both functionality and cultural context.

4. Conclusions

This study identified the attributes most valued by consumers in relation to artisanal tostadas from southern Mexico, as well as their willingness to pay for specific product characteristics. The results show that consumers place a high preference on attributes associated with quality and health, such as the artisanal process, the presentation in packs of ten pieces, the net content of 200 g, baking, and the absence of fat. These findings reflect a trend toward seeking products that combine tradition and well-being, in line with health-oriented consumption patterns. The willingness-to-pay analysis confirms that consumers are willing to pay a premium for attributes that reinforce the perception of naturalness and convenience, while penalizing characteristics associated with less healthy practices, such as frying and fat content. This willingness suggests opportunities for the development of differentiation strategies based on the communication of functional and cultural benefits.

Likewise, consumer segmentation revealed the coexistence of two clearly differentiated profiles: “Presentation Observers”, who prioritize visual and quantity aspects, and “Health Lovers”, who base their decisions on attributes related to health and nutritional control. This heterogeneity in preferences underscores the need to design differentiated commercial strategies that respond to the expectations of each segment.

Finally, the analysis of psychological meanings showed that tostadas are not only perceived as a utilitarian food, but also as a cultural symbol laden with tradition and identity values. The coexistence of symbolic and utilitarian meanings confirms that the choice of this product responds to both sensory motivations and emotional and cultural ties, reinforcing its relevance in Mexican cuisine.

This study has some limitations that should be considered: i) the sample was obtained through non-probabilistic sampling and the snowball technique, which limits the representativeness and generalizability of the findings to the entire Mexican population; ii) the questionnaire was administered virtually, which may have excluded consumers without internet access or with low digital literacy, skewing the composition of the sample toward individuals with higher levels of education and connectivity; and iii) the analysis was based on stated preferences rather than actual purchasing behavior, which could lead to differences between intention and action in market contexts.

5. Recommendations

This study found that the consumption of traditional foods in Mexico presents a strategic opportunity to position products that combine cultural authenticity with health-related attributes—two factors that emerge as determinants of purchase decision-making. Artisanal tostadas from Oaxaca, produced through nixtamalization and slow-cooking processes, are perceived not only as functional foods but also as cultural symbols, in line with literature highlighting the utilitarian symbolic duality of traditional products (Asioli *et al.*, 2017).

Based on consumer segmentation, latent class analysis identifies two key segments: (i) Presentation-oriented consumers, guided by extrinsic attributes such as packaging and quantity; and (ii) Health conscious consumers, who prioritize health, low fat content, and oven-baked preparation. These findings support the application of the STP (Segmentation, Targeting, and Positioning) framework, widely recognized in strategic marketing (Mogaji, 2025). For the first segment, the value proposition should emphasize artisanship, tradition, and convenience; offer 10-piece packs (200 g total); preserve the artisanal process while exploring fried options without compromising the sensory experience; and adopt affordable pricing. For the second segment, the focus should be on health and wellness: smaller packs (5 pieces), oven-baked, fat-free, with clear nutrition labeling; align messaging with global trends

toward “clean label” and functional foods (Asioli *et al.*, 2017); consider organic production certification; and implement premium pricing.

Communication and promotion strategies should reinforce perceptions of authenticity (Guerrero *et al.*, 2009) through cultural storytelling for example, narratives about Indigenous women, nixtamalization, and the link to Mexican identity and convey the product’s functional benefits by highlighting health, nutritional control, and the absence of fat, aligned with wellness trends (Hossain *et al.*, 2025). Distribution is recommended through local markets to reach native consumers, as well as through specialized or differentiated channels (specialty stores, gourmet retailers, and organic markets).

Authorship contribution

Valeria Martínez-Aquino: Conceptualization, Methodology, Investigation, Data curation, Formal analysis, Visualization, Writing – Original draft, Writing – Review & editing, Validation. **Heidy M. Zarate-Trujillo:** Methodology, Validation, Data curation, Formal analysis, Writing – Original draft, Writing – Review & editing. **Ariadna I. Barrera-Rodríguez:** Conceptualization, Investigation, Resources, Data curation, Writing – Review & editing. **Anastacio Espejel-García:** Supervision, Conceptualization, Project administration, Funding acquisition, Writing – Review & editing.

Funding

Funding for this research was provided by the Universidad Autónoma Chapingo, through the Dirección General de Investigación y Posgrado, through project granted to the author (AEG).

Acknowledgements

The authors express their gratitude to the individuals who participated in this study by completing the surveys, and to the Universidad Autónoma Chapingo for the financial support granted. The authors also thank the anonymous reviewers for their insightful comments and constructive suggestions that greatly contributed to strengthening the manuscript.

Declaration of conflict of interest

The authors declare that they have no competing interests.

Data availability

All data analyzed in this study are contained within the published article. Further data may be obtained from the corresponding author upon reasonable request.

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