

# CONSUMER PERCEPTIONS TOWARD MEXICAN GARLIC: AN EMPIRICAL ANALYSIS WITH PLS PATH MODEL

Joel Espejel-Blanco,  
University of Sonora, Mexico  
[jespejel@pitic.uson.mx](mailto:jespejel@pitic.uson.mx)

Dena Camarena-Gómez,  
University of Sonora, Mexico  
[dena.camarena@eca.uson.mx](mailto:dena.camarena@eca.uson.mx)

Manuel Chávez-Cajigas,  
INIFAP, Mexico  
[chavez.manuel@inifap.gob.mx](mailto:chavez.manuel@inifap.gob.mx)

## ABSTRACT

*In the last years, the supply of garlic available is at retail Mexican outlets having spread, including new varieties and formats of presentation. As a result, consumers can choose within a wide range of alternatives, according to their quality perceptions.*

*The purpose of this research paper is to analyzed two aims: (1) the description of the current commercial supply of garlic, and (2) satisfaction and consumers trust across quality perceptions toward Mexican garlic. To reach the first objective, we visited 19 of the main distribution stores located in northwest of Mexico (September and October 2009). For the second aim, data collection was obtained using structured questionnaire to consumers of Mexican garlic (between February and March 2010).*

*To evaluate the commercial supply we examined brands assortment, sale formats, garlic origin, price and package. For the second empirical analysis we used Structural Equations Models (SEM) using PLS path model to determine the perceived quality across the intrinsic quality (e.g. colour, flavour, appearance, freshness, scent) and extrinsic quality (e.g. garlic origin, label, price, and brand) on satisfaction and consumer trust.*

## INTRODUCTION

Garlic is a vegetable in high demand in the international market. It is used as a basic ingredient in dishes from different cuisines, and its properties related to the circulation and production of antiseptic substances in the human body make it a crop with high market potential. Garlic agronomic requirements allow its production in different areas of the world. The world's largest producer is China, with a contribution of 76.4% of the total. Production characteristics of this country have their annual-growth rate in 5.2% standing itself as one of the countries with highest productive potential. Other countries such as Argentina, Spain and Chile are considered major producers, but their contribution is significantly lower than Asian country.

In Latin-American the production of garlic has decreased drastically in the last few years, even countries like Argentina, Chile and Brazil garlic has been considered as an unprofitable farming. This situations it's due to a largely oversupply of Chinese garlic, which in some cases it's considered incurred in *dumping* practices. Hence, various agencies are proposing the establishment of mechanisms for the regulation and marketing of this crop (Eguillor, 2008; Fundación Promendoza, 2004).

Mexico, has not remained unaware this situation and as a consequently the garlic acreage and the production volumes have been reduced

significantly. To address this, government and private agencies are developing an action plan which intends to establish the allocation of quotas or the definition of a seasonal sales period, which allows controlling imports of garlic (SAGARPA, 2009). Currently, domestic production is 49.526 tons of garlic which 27% goes to international markets, 63% for fresh consumption and 10% for industrial use (Chávez, 2010). That is, the fresh garlic is the type most demand in the country. Mexico currently ranks as the fourth largest producer in Latin-America, a situation that gives it special importance in terms of production (SIAP, 2010; FAOSTAT, 2009).

Nationally, there are seven regions that produce 93% of the total country garlic (Guanajuato, Zacatecas, Aguascalientes, Querétaro, Puebla y Sonora) (SIAP, 2009). One of the major areas in production and tradition in the cultivation of garlic is Sonora, besides of being free of white rot, a disease that causes significant losses in the rest of the country. In this region, the agro-climatic characteristics and soil characteristics are suitable for crop production; hence it has a grand tradition and economic importance among the inhabitants

of rural areas. However, in recent years have seen a significant decline in production, one of the main reasons which attributes this trend is related to the increased supply of Chinese garlic, a situation that is compounded by other factors such as increased production costs, lower production yields associated with degeneration of seed, lack of modernization in farming techniques and the lack of a comprehensive marketing (INIFAP-UNISON, 2007).

These features, together have led to a falling production in Sonora, from a production of 4.800 to 2.269 tons from 2000 to 2008 (SIAP, 2010). Therefore, has prompted an abandonment of a business with deep roots and tradition in the region. Currently, it remains about 70 farmers who continue producing garlic, although in most cases they do it in a complementary manner with other crops and exceed 20 hectares. If this trend continues, the expectations for Mexico are that the production of garlic, decline to the point that it becomes more convenient to import rather than produce it.

Against this backdrop of falling production is a clear need to implement measures to address this situation and ensure the continuity of planting garlic. In this sense, we are carrying out various actions to this aim, first have established new cultivation techniques and new varieties that are more competitive and attractive in the market, such as garlic marbled Tocumbo presented better adaptation, higher yields and characteristics appropriate for national and international market.

Furthermore, research has developed a market analysis to find out the notion and perception that Mexican consumers of garlic produced in the region. All of this with the aim of establishing a regional brand, which allows future strategies of product differentiation and will sustain a culture with a long tradition in the region.

## **THEORETICAL MODEL**

### **The relationship between perceived quality, consumer satisfaction and consumer trust.**

According to Steenkamp and van Trijp (1989; 1996) when purchasing a food product, a consumer forms an impression about the product expected fitness for consumption. The quality expectation of the multiples products alternatives is an important factor in consumer choice behaviour (Grunert *et al.*, 2004; Espejel *et al.*, 2007). Thus, the consumer evaluates the quality of food products considering intrinsic and extrinsic attributes. Firstly, we are going to centre our attention on intrinsic attributes.

Quality perception is a complex process that begins with the acquisition and classification of signs that are associated with the intrinsic attributes such as appearance, colour, and flavour or product presentation. Nevertheless, some of these attributes cannot be perceived adequately by the individual until the consumption of the product (e.g. flavour and smell). Therefore, it seems reasonable to think that the level of perceived quality associated with the intrinsic attributes, will be able to increase across the process of consumption. As a consequence it might raise the satisfaction and the trust towards a product with PDO. We may thus propose the following hypotheses:

*H1. The perceived quality of the intrinsic attributes of a traditional food product has a positive impact on consumer satisfaction.*

*H2. The perceived quality of the intrinsic attributes of a traditional food product has a positive impact on consumer trust.*

For traditional food products, and particularly those protected under a PDO, a substantial part of the higher quality perception arises as a result of its extrinsic attributes. In particular, is especially important the fact that the product has been elaborated in a concrete region, with specific geographical conditions, climatology, tradition and know how (Calvo, 2001). All these aspects may increase consumers' desire to buy the product (Fandos and Flavián, 2006). In addition, we have to notice that extrinsic attributes such as the place of origin, the image of traditional product and the associated know-how, are distinctive and unique elements which difficult the imitation process for other competitors in an international context. In this regard, we have to note that differentiation is a growingly important objective in traditional food markets. In fact, for a competitive company, should not be enough to offer simply products and services, but it should strain for creating value for consumer. The more distinctive and inimitable the product is the more possibilities of having trust consumers will have (Bigné *et al.*, 2000). As a result of these previous reasoning we suggest that the perception of quality associated with symbolic attributes of a product will influence positively consumer satisfaction and trust. Thus, the following hypotheses are formulated:

*H3. The perceived quality of the extrinsic attributes of a traditional food product has a positive impact on consumer satisfaction.*

*H4. The perceived quality of the extrinsic attributes of a traditional food product has a positive impact on consumer trust.*

#### **The relationship between consumer satisfaction and consumer trust**

In the marketing literature, the existence of a close relation between the variables trust and satisfaction has been confirmed. Diverse authors have postulated that greater satisfaction leads to a higher degree of trust (e.g. Garbarino and Johnson, 1999; Ranaweera and Prabhu, 2003; Leisen and Hyman, 2004).

Likewise, it is widely accepted that greater satisfaction with the seller who has recommended a product may lead to higher consumer trust after consuming the traditional food product. Therefore, consumer trust in a certain product, seller or company will increase if the client is more satisfied with these agents (Garbarino and Johnson, 1999).

In this way, the degree of satisfaction will be a consequence of the capacity of the company to make consumers trust in the products that it elaborates. Therefore, consumer trust and satisfaction can be considered to be different variables, though they are concepts that refer to attitudes, feelings or global evaluations of one party in a relationship toward the other (Selnes, 1998). As a consequence of the reasoning above, we suggest that consumer satisfaction will positively influence consumer trust. Therefore, we propose the following hypothesis:

*H5. Consumer satisfaction with a traditional food product has a positive impact on consumer trust.*

## **METHODOLOGY**

### **Design Methodology 1: The description of the current commercial supply of garlic**

To characterize the regional market of garlic, we conducted a structured empirical research on the analysis of supply and demand. In a first phase, and to know the characteristics of the supply of garlic was a linear path was realized in the main retail areas of Hermosillo (city in the state of Sonora and commonly used as sample scenario of what happens in the northwest). The information collected is on product characteristics, presentation and pricing. In total 19 shops have been visited in terms of its distribution in the city, contrary to what might be thought establishments of the same trade shows provide differentiated marketing policies based on their geographic location in the city, and that depending on the consumer catchment area may belong to a

socioeconomic status or another. The information was collected during the months of September and October 2009.

In a second phase, and to identify the buying habits and consumption of garlic, as well as their attitudes and level of acceptance towards regional varieties, a survey was targeted at consumers over 18 years, regular buyers of food. The investigation was carried out in the city of Hermosillo, Sonora during February and March 2010. The questionnaire consists of four sections; the first is related to purchasing habits, consumption and types of presentation or packaging preferred. The second section refers to the product (knowledge about properties and attitudes), the third to the perceived quality to the variety and the fourth section is on socio-demographic characteristics. The types of responses are dichotomous, multiple choice and open and scale. In total 271 surveys were obtained, which were obtained by a simple random sampling with a sampling error of 7%.

### **Design Methodology 2: Structural model of Mexican garlic**

#### *Data collection*

With the intention of testing the above hypotheses, we proceeded as follows. Firstly, a focus group was formed to learn the opinions of a small number of consumers. We developed the scales to quantify the concepts of intrinsic perceived quality, extrinsic perceived quality, trust, satisfaction. The scales developed were submitted to the opinion of various external marketing specialists with expert knowledge of issues associated with traditional food products.

Data collection was carried out using a structured questionnaire containing closed questions. This questionnaire was designed to gather information about the quality perceptions (scored in terms of intrinsic and extrinsic attributes), satisfaction and trust of Mexican consumers of traditional garlic. Garlic consumers were asked to indicate their level of agreement or disagreement with a series of statements based on a seven-point Likert scale. In addition, the questionnaire sought information on frequency of purchase; prefer packaging garlic that was bought and other information that could allow us to know their purchasing behaviour. We conducted the interviews outside malls and public places, parks in this kind of product.

#### *Data analysis*

The methodology used for the data analysis was the Structural Equations Model (SEM).

The SEM was estimated using the Partial Least Squares (PLS) latent path model (Wold, 1985). We selected PLS because this technique can accommodate small samples and it provides measurement assessment. Recently, the PLS path modelling technique has been widely used in marketing literature (e.g. Guenzi, *et al.*, 2008; Wittmann *et al.*, 2008; Ngo and O’Cass, 2009; Aspara and Tikkanen, 2011).

In this study, we check the face and content validity. First, ten expert judges from within the agro-marketing discipline were given conceptual definitions of four constructs with their corresponding items and a set of instructions for judging their face validity. Second, to check the content validity, we carried out an exhaustive literature review which allows us to guarantee the obtaining of satisfactory results.

For the data analysis, we use the statistical software PLS-Graph version 3.00 to assess the relationships between the constructs and the predictive power of the conceptual model. According to Barclay *et al.* (1995), a PLS path model must be analyzed and interpreted in two stages: (1) the assessment of the reliability and validity of the measurement model, and (2) the assessment of the structural model.

For the measurement model, we perform the following tests: (1) internal validity through the reliability of the individual items; in this assessment we calculated the factorial loading ( $\lambda$ ) or simple correlations of indicators with their respective construct; (2) internal consistency, and (3) construct validity: convergent and discriminant validity.

With reference to the reliability of all the individual items, to accept them as members of a construct, they must possess a factorial loading larger than or equal to 0.550 (Falk and Miller, 1992), which indicates that the covariance between the construct and the all its indicators should be greater than the variance of error. Taking into account the previous criterion of acceptance ( $\lambda \geq 0.550$ ), it was necessary to eliminate one of the items belonging to the scale of intrinsic quality, namely, QINT\_5 ( $\lambda = 0.373$ ). Also, for the extrinsic quality scale eliminated the following items: QEXT\_10 ( $\lambda = 0.541$ ), QEXT\_12 ( $\lambda = 0.542$ ), QEXT\_13 ( $\lambda = 0.525$ ), QEXT\_14 ( $\lambda = 0.500$ ).

The internal consistency is considered satisfactory when the Composite Reliability ( $\rho_c$ ) is superior to the Cronbach Alpha ( $\alpha$ ) (Fornell and Lacker, 1981). In our study, all the measurement scales demonstrate adequate internal consistency. The scale reliability is considered acceptable when the Composite

Reliability ( $\rho_c$ ) coefficient is above 0.70 (Nunally, 1978). For this reason, the scale reliability of the research model is upheld. Likewise, the empirical criterion of obtaining a  $\rho_c$  value above 0.65 is ratified (Bagozzi and Yi, 1988; Steenkamp and Geyskens, 2006).

To check the construct validity, it is necessary to test the convergent and discriminant validity for each of the scales considered in the study. The convergent validity is considered satisfactory when the Average Variance Extracted (AVE) coefficient is above 0.50 (Fornell and Lacker, 1981). All AVE coefficients exceed this empirical condition. The AVE coefficients assess the amount of variance that the construct captures from its indicators relative to the amount due to measurement error.

Discriminant validity indicates the extent to which a given construct is different from other latent variables (Sánchez and Roldán, 2005). To assess discriminant validity, AVE Discriminant validity indicates the extent to which a given construct is different from other latent variables. To assess discriminant validity, AVE should be greater than the variance shared between the latent construct and other latent constructs in the model (i.e. the squared correlation between two constructs) (Barclay *et al.*, 1995). All latent variables satisfy this condition. For this reason, we maintain the discriminant validity of the latent constructs of the models.

All the measurement model results are acceptable and suggest that it is appropriate to proceed with the assessment of the structural model.

## RESULTS

### Results 1: The description of the current commercial supply of garlic

#### a) Supply

Of all establishments visited, 55.1% sell garlic with brand marketing, especially hypermarkets and membership clubs, while 46% usually sells in bulk form. Regarding the presentations, predominantly sold in bulk as 46% of establishments use this method, followed by packaging mesh (38%), plastic bags (8%) and glass plastic/bottles (4%). In membership clubs there is a greater supply of bottled garlic, peeled, possibly because it was associated with better image and quality. Also, in these establishments there is a high proportion (44% of references) of garlic packed in pieces, being basically non-existent presence of garlic in bulk or per kilo. Identifying characteristics of the product, we found that only 10.3% of establishments offer some form of garlic,

including expiration date and only 24.1% of stores visited, garlic provide nutritional information in your presentation.

*b) Consumers*

From the consumers who participated in the study, 43.5% have incomes of between 5.000 and 10.000 Mexican pesos per month (\$1 US dollar = 11.90 Mexican pesos, Banxico, 2011), 14.4% are in the range of 30 to 34 years old and 12.9% in the section between 35 and 39. 34.2% of consumers surveyed have university education, 32.9% with high school (secondary school), while 14.0% have graduated from a technical as well as elementary (primary). Regarding garlic products that consumers tend to buy more often stresses the garlic salt (24.4%), followed by the garlic in bulk (23.8%) and garlic in mesh (14.4%).

As most important attributes when making their purchase, the consumers highlight the color and external appearance with an average score of 4.7 on a Likert scale of 5. It is followed by quality (4.6), price (4.2) and the size (4.1). Other issues such as tenders, the number and size of teeth, and the range are also valued but less than the previous ones (see Table 1). It is noteworthy that even though the price of garlic has increased, the quantities purchased by consumers reduce consumption but not stop because of the importance as a staple of Mexican cuisine, features a product with inelastic demand. Shopping sites are the most common supermarket and hypermarket (average score of 3.8 on a scale of 5), while the grocery or convenience stores (2.2), the stalls (1.9) and markets (1.9) are more unusual places to purchase, being in the case of the latter a place of purchase for those consumers who purchase large volumes especially of garlic.

**Table 1. Attribute valuation**

Characteristics	Media
<b>Color and external appearance</b>	4.72
<b>Quality</b>	4.67
<b>Price</b>	4.24
<b>Caliber and/or size</b>	4.11
<b>Offers</b>	3.86
<b>Number and size of teeth</b>	3.74
<b>Variety (white, purple, speckled, etc.)</b>	3.70

In the purchase frequency, 38.1% of consumers tend to buy once a month, the 18.8% once every two weeks, while 14.3% and 15.7% purchased by each week and every three months, respectively. Also, the most common purchase amount is the garlic pieces (57.4%),

followed by amounts less than half a kilogram (12.6%) or one kilogram (10.3%). These data reveal that the predominant frequency of purchase is common on casual and consumers prefer small amounts, possibly because it is a commonly used product thereby ensure freshness.

**Results 2: Structural model of Mexican garlic**

We note that in our analysis, all the explained variances ( $R^2$  results) have predictive power. As for the assessment of the structural model, we analyze two basic indexes: the  $R^2$  value and the standardized path coefficients ( $\beta$ ) (Johnson *et al.*, 2006). According to Falk and Miller (1992), the explained variance of endogenous or dependent variables ( $R^2$ ) must be equal to or greater than 0.1. In addition, Chin (1998) suggests that the  $R^2$  results of 0.67, 0.33 and 0.19 for latent endogenous variables in the structural model can be described as “substantial”, “moderate” and “weak”.

The results of the GoF index of the structural model can be considered acceptable. Tenenhaus *et al.* (2005), Esposito *et al.* (2008) and Tenenhaus (2008) suggest a global criterion to calculate the Goodness of Fit (GoF) index of the structural model and propose that this index should be calculated via the geometric mean of the AVE and the average  $R^2$ .

Given that measures related to the goodness of fit do not exist in PLS models, we use parametric skills of re-sampling to analyze the stability of model parameters (Brown and Chin, 2004). We evaluate the *t-statistics* obtained from the bootstrapping technique (re-sample: 500 cases, Chin, 1998) (see Table 2). For the standardized path coefficients, Chin (1998) proposes that the path coefficients or the weights of the standardized regression must reach a value of at least 0.2 for them to be considered significant. For our analysis, the following causal relationships do not have predictive power: extrinsic quality-satisfaction and extrinsic quality-trust. The other causal relations that we propose as hypotheses about the latent variable have satisfactory predictive power (see Table 2).

**Table 2. Bootstrap Technique: Parameter estimation of the PLS model**

Hypotheses	Path Coefficients ( $\beta$ )	<i>t-value</i> (bootstrap)
<b>H1: Intrinsic quality → Satisfaction</b>	0.5169***	4.7645

<b>H2: Intrinsic quality → Trust</b>	0.5348***	4.8408
<b>H3: Extrinsic quality → Satisfaction</b>	0.1053 n.s.	0.9407
<b>H4: Extrinsic quality → Trust</b>	0.0748 n.s.	0.6156
<b>H5: Satisfaction → Trust</b>	0.6956***	7.9426
<b>Note:</b> *** <i>t</i> value > 2.576 ( <i>p</i> < 0.01) (based on <i>t</i> (499), one-tailed test); ** <i>t</i> value > 1.960 ( <i>p</i> < 0.05) (based on <i>t</i> (499), one-tailed test); * <i>t</i> value > 1.645 ( <i>p</i> < 0.10) (based on <i>t</i> (499), one-tailed test); n.s. = not significant.		

With regard to the hypotheses tested, the influence of intrinsic perceived quality on consumer satisfaction (H1:  $\beta = 0.5169$ ;  $p < 0.01$ ) and consumer trust (H2:  $\beta = 0.5348$ ;  $p < 0.01$ ) presents the expected effect. The results suggest that satisfaction and consumer trust with Mexican garlic is influenced by the intrinsic perceived quality (e.g. colour, flavour, garlic variety). Nevertheless, we do not find evidence to support the influence of extrinsic perceived quality on consumer satisfaction (H3:  $\beta = 0.1053$ ;  $p = \text{n.s.}$ ) and consumer trust (H4:  $\beta = 0.0748$ ;  $p = \text{n.s.}$ ). This result shows that for some consumers the extrinsic attributes (e.g. price) have a target weight when assessing the expectations of a traditional food product. The level of satisfaction gained more dependent on wine sensory attributes. In this regard, strongly influence the consumers' levels of involvement and experience with the traditional garlic analyzed. Finally, H5 which relates consumer satisfaction with consumer trust positively and significantly, has been confirmed ( $\beta = 0.6956$ ;  $p < 0.01$ ). In this sense, the main contribution of this paper focused on defining the antecedents of consumer trust has been endorsed. Therefore, it appears that higher levels of satisfaction with traditional garlic across intrinsic cues, requiring higher levels of trust to food product.

## CONCLUSIONS

The aim of this research paper was to describe the general characteristics of demand and supply of garlic in the state of Sonora. Moreover, we analyze the causal relationship between the intrinsic qualities (eg. color, appearance, taste) and extrinsic (eg. price, label, brand) on levels of satisfaction and consumers trust towards the food product. In the first analysis found that of all establishments visited, 55.1% sell garlic with brand marketing, especially hypermarkets and membership clubs, while 46% usually sells in bulk form. These results show that almost 50%

of the supply of garlic in Sonora does not have a defined marketing strategy. It is therefore recommended that producers develop a market research with the strategic objective of determining consumer behavior toward a particular product, such as garlic.

The second analysis indicates that consumers are satisfied with the organoleptic properties of garlic -ingredient in the Sonoran cuisine-, which in turn is reflected in the trust indices. On the contrary, because the garlic is sold in bulk, consumers do not perceive the extrinsic quality signals. Therefore, it is suggested that producer's create a regional brand to target consumers identify Sonoran garlic.

## Managerial implications

Garlic producers should emphasize the nutritional and health benefits of garlic consumption. Proof of this is that consumers prefer to buy functional and nutraceutics products. The entrepreneurs should also emphasize the nutritional value and health claims of food product through health specialists, such as nutritionists, doctors, and psychologists.

Finally, garlic entrepreneurs should design and implement marketing strategies that highlight the organoleptic properties of garlic with the aim of positively influencing the consumer's mind.

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