Colegio de Postgraduados

Market for non-traditional meats

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ABSTRACT

Objective: To determine the factors affecting the demand for non-traditional meats in the municipality of Iguala, Guerrero, Mexico.

Design/Methodology/Approach: A questionnaire was administered that included questions on sociodemographic and economic characteristics, as well as consumer tastes and preferences. A total of 511 surveys were conducted from February to July 2021 in the municipality of Iguala, Guerrero, Mexico. The information collected was used to perform a relative frequency analysis and to estimate a binary logistic regression model.

Results: The most consumed non-traditional meats were quail (26%), rabbit (23%), iguana (21%), deer (18%), and squab (12%). These meats were purchased mainly in local markets (45%), and their prices varied according to the place of purchase, time of year, and product presentation. The probability of consumption was determined primarily by price and gender. Consumption of these non-traditional meats was occasional and took place within a poorly developed regional market, although the products showed commercial potential.

Limitations of the Study/Implications: Further research is needed on the nutritional contributions of these meats to human health, as well as on their quality, in order to ensure public health.

Findings/Conclusions: The main limitations preventing these meats from achieving a greater market share are limited knowledge of their nutritional and health benefits, the lack of commercial dissemination strategies, and insufficient market availability to enable their integration into consumers' daily diets.

Keywords: non-traditional meats, demand, consumers.

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INTRODUCTION

The human diet consists of plant-based foods and foods of animal origin, including meat, which is a source of nutrients and protein whose contributions vary by type. Meat consumption in Mexico is high but disproportionate. In 2022, the highest *per capita* meat consumption was chicken (35.9 kg), followed by pork (21.1 kg), beef (15.2 kg), and, to a lesser extent, goat (301 g) and sheep (531 g) (Panorama Agroalimentario, 2023). This increase in demand has led to meat imports from other countries to meet domestic consumption, which affects national producers, raises consumer prices because of higher transportation costs, and has negative effects on animal welfare and the environment (La Gra *et al.*, 2016).

In Mexico, the market for traditional meats (beef, chicken, and pork) is concentrated in a small number of vertically integrated firms that, in oligopolistic fashion, control most of the production chain. This structure has resulted from the growth and modernization of these firms under public policies characterized by minimal government intervention (UNCTAD, 2013). Likewise, meat production in Mexico is classified according to the technology used, the levels of vertical and horizontal integration, and the markets served into three production systems: technified, semi-technified, and backyard. These systems, in turn, affect production costs and, ultimately, consumer prices at the end of the marketing chain (Sánchez and Salazar, 2016).

On the other hand, population growth and rising incomes increase demand for foods with greater added value, including relatively unfamiliar products whose introduction into the market requires a strong commercial strategy that highlights their advantages and benefits (Brambila, 2011). According to Tomek and Kaiser (2014), demand for a product is determined by its price; the prices of substitute and complementary goods; population size; per capita income; promotion; and consumer tastes and preferences. These factors can alter the behavior of the meat sector and create opportunities for new types of meat within the agrifood system. In this regard, there are alternative meat sources from backyard and even wild species (*i.e.*, quail, squab, rabbit, iguana, and deer), which provide consumers with alternative sources of protein that may offer greater health benefits and lower environmental impact at more affordable prices (Arcos-García *et al.*, 2010; SADER, 2019).

In this context, quail (*Coturnix coturnix*) exhibits early maturity, high egg production, and favorable productive performance (Vásquez and Ballesteros, 2007). Another option is squab (*Columba livia*), which can be raised in small spaces and has market potential (Meluzzi and Milandri, 1988). Rabbit (*Oryctolagus cuniculus*) is also a species whose consumption has increased; its meat is low in cholesterol and fat, high in protein, easily incorporated into a healthy and balanced diet, and suitable for all population groups (SADER, 2019). Similarly, the green iguana (*Iguana* L.) is a source of protein and is associated with medicinal attributes (Arcos-García *et al.*, 2010). In turn, deer (*Odocoileus virginianus*) is the most important game species in Mexico and North America, and its production is considered suitable for local and regional agricultural systems (Villareal *et al.*, 2011).

Although a trend toward alternative species has begun to emerge, including rabbit meat (Jaramillo *et al.*, 2015), iguana (Granados *et al.*, 2019), deer (García-Flores *et al.*, 2021), ostrich (Aguilar and Medina, 2013), and quail (Shiroma, 2021), these meats are still undervalued because they are perceived as having lower nutritional value and quality than traditional meats (Polawska *et al.*, 2012). Therefore, the objective of this study was to determine the factors influencing the demand for non-traditional meats in the municipality of Iguala de la Independencia, Guerrero, Mexico.

MATERIALS AND METHODS

The study was conducted in the municipality of Iguala de la Independencia, located in the northern region of the state of Guerrero, Mexico, at the geographic coordinates of 18° 20′41" N and 99° 32′34" W, at an altitude of 720 m (Gobierno del Estado de Guerrero,

2015). The sample size was calculated using the simple random sampling formula for finite populations proposed by McDaniel and Gates (2016).

$$n = \frac{N \times Z_{\alpha}^{2} \times p \times q}{d^{2} \times (N-1) + Z_{\alpha}^{2} \times p \times q}$$

where: N=total population of the study universe: 154,173 (INEGI, 2020); n=sample size; p=estimated proportion of positive variability (50%); q=estimated proportion of negative variability (50%); d=permitted estimation error (5%); and Z=value corresponding to the Gaussian distribution at a 95% confidence level (Z=1.96).

Substituting the values, $n = \frac{(154173)(1.96)^{2}(0.5)(0.5)}{(0.05)^{2}(154173-1)+(1.96)^{2}(0.5)(0.5)} = 383$

The sample size was 383 individuals; however, 511 surveys were conducted from February to July 2021. Respondents were selected at random and included individuals over 18 years of age. The questionnaire included sociodemographic items in the first section and questions on tastes and preferences in the second. The information collected was analyzed using relative frequency analysis in Excel® 2010, and a regression model was estimated using SPSS (Statistical Package for the Social Sciences®), version 21. Because the dependent variable was dichotomous, a binary logistic regression model was used to determine the probability of occurrence of the event of interest. Model fit was assessed using the Hosmer-Lemeshow test. The impact of each independent variable on the dependent variable was evaluated using the p value and the Wald statistic, as indicated by Pérez (2004).

RESULTS AND DISCUSSION

Sociodemographic characteristics of the respondents

Sixty-five percent of the respondents were women and 35% were men, ranging in age from 20 to 50 years. Regarding occupation, 42% were homemakers, 36% were public servants, 15% owned their own businesses, and 7% worked in the private sector. In terms of educational level, 38% had completed university studies, 25% had completed upper secondary education, 21% had completed secondary school, 12% had completed primary school, and 4% reported other levels of education. With respect to monthly income, 83% of the respondents reported earnings between MXN 5,000 and 10,000; 11% reported between MXN 10,001 and 15,000; and 6% reported incomes above MXN 15,001.

Cáffaro *et al.* (2018) reported that the socioeconomic and demographic factors influencing preferences for the consumption of traditional meats are related primarily to age and, to a lesser extent, sex, as well as place of residence and employment status. Thus, consumers of these meats are mainly women between 20 and 50 years of age, with monthly incomes ranging from MXN 5,000 to 10,000, who prefer meats that are tasty, easy to prepare, nutritious, and beneficial to their families' health. This finding is consistent with

Fasone and Privitera (2002), who indicated that consumers of non-traditional meats are individuals between 41 and 50 years of age, mostly women, who focus on purchasing safe meats with high nutritional value and good flavor, preferably from farm animals; however, they tend to have medium to high income levels.

Purchasing behavior characteristics

Quail meat (26%) was the most frequently consumed, whereas squab meat was the least consumed (12%) (Figure 1a). The main attributes consumers value when purchasing these meats are good flavor (38%) and, to a much lesser extent, price (5%) (Figure 1b). However, the attributes valued in this type of meat vary by species, although they are all primarily associated with flavor, perceived health benefits, and ease of preparation (Table 1). Therefore, the commercial strategy should focus on highlighting these attributes.

In this regard, Barragán *et al.* (2018) indicated that the decisive factors for consumers at the time of meat purchase are meat color and place of purchase. Likewise, Joe *et al.* (2013) reported that the determining factor in meat purchase is color, as it is associated with freshness and nutritional value. Similarly, Enciso and Bukart (2017) noted that 37.2% of consumers include chicken meat in their diet because of its health benefits, 21.5% because of its flavor, 12.2% because of its ease of preparation, 7.5% because of its price, and 21.6% because of other characteristics. In the same study, beef consumption was reported to be based on flavor (48.6%), habit (12.8%), ease of preparation (11.9%), variety of preparation (8.2%), and other characteristics (18.5%). These same authors also indicated that the consumption of pork and fish is primarily based on attributes related to flavor (44% and 50%), health benefits (26% and 30%), and nutritional quality (12% and 16%), respectively.

Place of purchase is determined by consumers' income level. High-income consumers tend to purchase meat products in shopping centers, whereas middle-income consumers buy them from butcher shops in regional or municipal markets (Arana *et al.*, 2012). In this regard, these meats are mainly purchased in local public markets (45%) (Figure 2a).

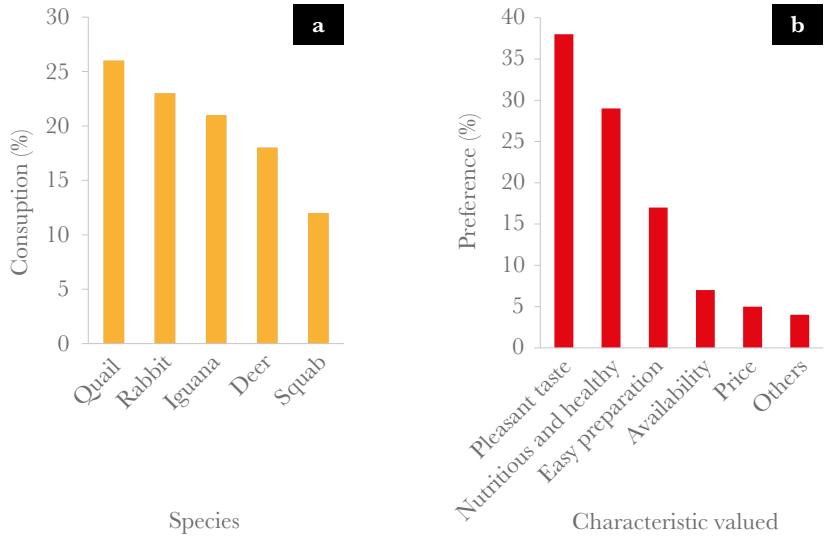

Figure 1. (a) Consumption preference; (b) Attributes valued in the purchase of non-traditional meats.

Table 1. Attributes valued in the purchase of non-traditional meats.

Species	Order of importance		
	1	2	3
Deer	Flavor	Nutrition and health	Ease of preparation
Squab	Flavor	Ease of preparation	Nutrition and health
Iguana	Flavor	Nutrition and health	Ease of preparation
Quail	Ease of preparation	Flavor	Nutrition and health
Rabbit	Flavor	Nutrition and health	Ease of preparation

These meat products come from farms and street vendors in communities near this municipality, mainly Cocula and Metlapa, as well as from small producers, organizations, and agricultural institutions located within the municipality itself. On the other hand, 18% of consumers reported obtaining these products through poaching, particularly in the case of deer and iguana meat. In this context, Joe *et al.* (2013) reported that the places where these types of meat are sold depend on consumer demands, as consumers seek safety and confidence that the product is harmless and complies with sanitary regulations. However, Enciso and Bukart (2017) indicated that the place of purchase varies according to species; for example, chicken is commonly purchased in traditional markets, whereas beef and pork purchases are more concentrated in supermarkets. Other authors have reported that most consumers purchase these meats from retail outlets (Cáffaro *et al.*, 2018).

With respect to consumption frequency, 57% of the respondents consume this type of meat one to five times per month (Figure 2b), which is consistent with Cáffaro *et al.* (2018), who reported that these meats are generally consumed once per month. These products are purchased by the kilogram (38%), as carcasses (32%), live (13%), and, to a lesser extent, by the piece (17%). In contrast, among traditional meats, chicken shows the

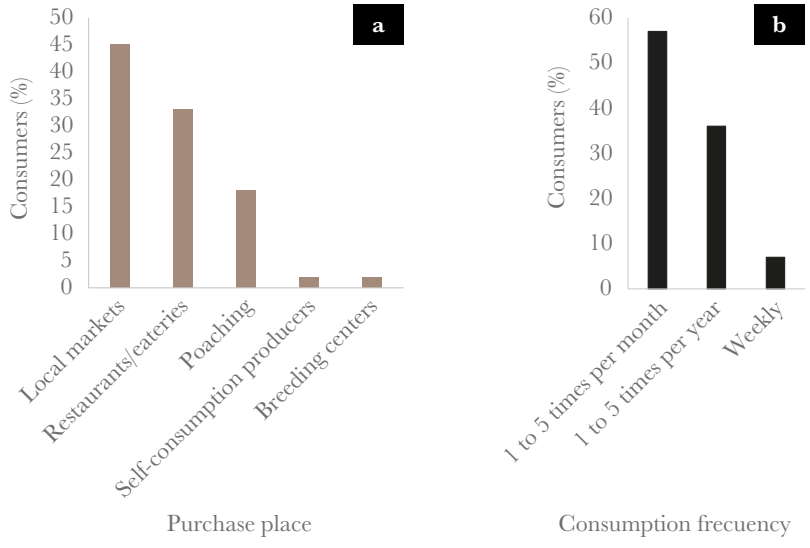

Figure 2. (a) Places of purchase; (b) Frequency of consumption of non-traditional meats.

highest level of consumption (47%), followed by beef (41%) and pork (12%), although the frequency of consumption is the same for all three types (three times per week) (Arana *et al.*, 2012). This pattern differs from the findings of Enciso and Bukart (2017), who reported that beef consumption (75.2%) exceeds that of chicken (63.7%), pork (56.5%), and fish (49.1%), all of which are consumed one to three times per week.

Prices vary according to species and form of purchase (Table 2). The results showed that squab, iguana, and quail meat are commonly purchased as carcasses, whereas rabbit and deer meat are more frequently purchased by the kilogram; deer meat is sometimes also purchased by the piece. Quail and squab meat are marketed in carcass packages; for example, 10 dressed quail cost MXN 220, 6 dressed quail cost MXN 135, and 4 dressed squabs cost MXN 215.

In this regard, Retana and Padilla (2018) reported that the price of deer meat in the subsistence market is around MXN 85 per piece, whereas in Wildlife Management Units (UMAs) it may reach MXN 220. In the same context, the price of iguana ranges from MXN 25 to 50 when sold live, depending on size; however, in the legal market, its price ranges from MXN 150 to 250 during periods of higher demand, such as Easter season (Orozco, 2019). This suggests that price is one of the most important factors determining demand, together with consumer income and the price of substitute goods (Cruz and Sánchez, 2014). In contrast, the main problem in the commercialization of deer and iguana is poaching, which causes the consumer market price to be lower than that of legal breeding operations. Price is therefore a determining factor in purchase decisions among low-income consumers (Arana *et al.*, 2012).

On the other hand, the reasons for not consuming this type of meat are as follows: (1) lack of legalization for the sale of meat, particularly in the case of deer and iguana; (2) failure to comply with certified quality standards, such as Federal Inspection Type (TIF), ISO standards, standards established by the Ministry of Agriculture and Rural Development, México Calidad Suprema, and other certifications; (3) lack of packaging with nutritional information; (4) limited knowledge of product traceability and production standardization; (5) insufficient dissemination, advertising, and promotion; (6) lack of year-round availability; (7) limited points of sale and distribution channels; (8) unaffordable prices, particularly in the case of deer meat; (9) limited awareness of the benefits to human health; (10) lack of assurance of compliance with sanitary regulations; and (11) limited knowledge of how to prepare dishes using these meats.

Table 2. Price of non-traditional meats in Iguala, Guerrero, México.

Specie	Carcasses	Kilogram	Live	Piece ($)
	$ MXN			
Deer	25-80	30-130	30-100	ND
Squab	ND	80-400	ND	50-900*
Iguana	35-80	25-100	20-30	ND
Quail	50-250	80-300	50-120	ND
Rabbit	70-130	50-120	80-150	ND

*Price variation according to the cut or body part of the animal. ND: Not detected. MXN: Mexican pesos.

Similar reasons were reported by Ruano (2011), who stated that the production and limited commercialization of non-traditional meats (*e.g.*, deer meat) are due to the lack of marketing plans, insufficient financial support for producers, inadequate management systems, limited or nonexistent producer training, lack of reforms to the legal and institutional framework governing the use of meat and breeding stock, and limited added value in the final product. In contrast, Arana *et al.* (2012) argued that meat consumption is related to food safety attributes valued by consumers, including meat handling at the point of sale, slaughter date, and the animal's disease history.

Logistic regression statistical model

According to the Hosmer-Lemeshow statistic, the estimated model produced a value of 0.72. Likewise, the estimators with values greater than zero (education, income, age, and gender) increased the probability of purchase (Table 3). In other words, for each additional year of education, the odds of purchase increased by 1.015 times, or 1.5%; for each one-unit increase in income, the odds of purchase increased by 1.082 times, or 8.2%; and for each additional year of age, the odds of purchase increased by 1.009 times, or 0.9%. In addition, the *p* values and the Wald statistic indicated that the factors with the greatest statistical significance for the probability of consumption were price (0.000) and gender (0.020).

Table 3. Parameter estimates obtained using the logistic procedure.

Parameter	Estimate	Standard error	Wald	p-value	Odds ratios
Intercept	20.016	20007.8	0.000	0.999	
Education	0.015	0.031	0.239	0.625	1.015
Income	0.079	0.219	0.128	0.720	1.082
Price *			115.076	0.000	
Price 1	−21.755	20007.8	0.000	0.999	0.000
Price 2	−19.060	20007.8	0.000	0.999	0.000
Price 3	−17.101	20007.8	0.000	0.999	0.000
Age	0.009	0.010	0.857	0.355	1.009
Gender	0.580	0.249	5.422	0.020	1.786

*Price 1: de $1-100 MXN; Price 2: $101-200 MXN; Price 3: $201-300 MXN; MXN: Mexican pesos.

The statistical values are considered acceptable, in accordance with Pérez (2004). Likewise, the observed signs that explain the direction of each variable are consistent with economic theory, indicating that as education, income, and age increase, the probability of consumption also increases, whereas as the selling price increases, consumption decreases (Tomek and Kaiser, 2014).

CONCLUSIONS

The consumption of non-traditional meats in Iguala, Guerrero, is characterized as occasional, with a regional and underdeveloped market. This situation is due, on the one

hand, to the limited availability of these meats and, on the other, to the lack of commercial strategies that highlight their nutritional attributes and health benefits in order to increase consumption. Price and gender are the factors that most strongly determine the probability of consuming these non-traditional meats.

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