Analysis of consumption preference of goat products in different regions of Mexico

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ABSTRACT
Objective: To characterize and determine the consumption preferences for goat products in different regions of Mexico.
Design/methodology/approach: An exploratory study was carried out through a survey addressed to 300 consumers. The sample was obtained through convenience sampling. The semi-structured questionnaire was divided into the following sections: sociodemographic information, willingness to consume, type of derivative products known, and frequency of consumption. The Kruskal-Wallis test was applied to determine significant variables.
Results: It was found that milk, cheese, and meat are the most relevant foods for goat consumption. These products are ideal for expanding the diversification of consumption in Mexican regions.
Limitations on study/implications: To deepen the analysis of the sociodemographic and consumption characteristics, it is necessary to consider a greater number of variables.
Findings/conclusions: Knowing the products that are consumed most frequently allows more effective and efficient strategies to be generated and, in turn, opens the pattern for consumption diversification.

Keywords: Goats, diversification, consumer preferences.

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INTRODUCTION

In Mexico, the efforts to improve productive and management aspects in goat production systems are limited (Tajonar *et al.*, 2022). This activity takes place more frequently in rural zones with high marginalization (Parrilla *et al.*, 2022), and its greatest influence is seen in arid and semi-arid zones, particularly under extensive production systems (*Servicio de Información Agroalimentaria y Pesquera* [SIAP], 2020).

These production systems are characterized by a low productivity and scarcity of natural resources (Salinas-González *et al.*, 2016). However, it is an activity of utmost importance for the low-income population, since it benefits around 1.5 million people (Ramos-Martínez *et al.*, 2020).

Another important aspect of these production systems lies in that they generate standing, meat and dairy livestock, which can be used for auto-consumption or for dietary diversification through products such as cheese and sweets (*Secretaría de Agricultura y Desarrollo Rural* [SADER], 2019).

However, there is a problem in that there is no specific information available about the inclusion of goat products in the diet of the Mexican population (Estévez-Moreno and Miranda-de la Lama, 2022). This makes the development of strategies to improve the production and management of productive systems difficult.

Likewise, according to Anzaldo-Montoya (2020), goat production is distant from social research, which is unpromising due to the role it has as an economic activity for marginalized families and with few alternatives, which is why permanence in the long term is uncertain (Barrera *et al.*, 2018).

Some strategies to improve this situation include the generation of byproducts or meat and milk derivatives, as well as promoting and raising awareness about the functional benefits of goat products (Ruiz *et al.*, 2019). Therefore, it is necessary to promote, diversify and recognize goat products (Castel *et al.*, 2010; Ruiz *et al.*, 2019), which will help to optimize the profitability of the production and at the same time, generate flows in the short and long term. The objective of this study was to characterize and to determine the consumption preferences of goat products in the different regions of Mexico.

MATERIALS AND METHODS

An exploratory study was conducted in the four main geographic regions of Mexico.

According to the National Institute of Statistics and Geography (*Instituto Nacional de Estadística y Geografía*, INEGI) (2023), they are distributed in the following way: 1) Central Region (Mexico City, Guerrero, Hidalgo, Estado de México, Morelos, Puebla, Tlaxcala and Oaxaca); 2) Central-West Region (Aguascalientes, Colima, Guanajuato, Jalisco, Michoacán de Ocampo, Nayarit, Querétaro, San Luis Potosí and Zacatecas); 3) North Region (Baja California, Baja California Sur, Chihuahua, Coahuila, Durango, Nuevo León, Sinaloa, Sonora and Tamaulipas); and 4) Southeast Region (Campeche, Chiapas, Quintana Roo, Tabasco, Veracruz de Ignacio de la Llave and Yucatán).

Data gathering and participants

In 2020, a digital survey based on Google forms was generated, designed and developed as an evaluation instrument. The survey was available online from May to July of that year (2020), and the link was distributed through social networks.

The data gathered were anonymous and personal identification information was not used. The participation was voluntary and the survey respondents had the opportunity to abandon the survey at any time. In addition, the analysis only included people over 18 years old.

For the sample size, a non-probabilistic technique called convenience sampling was used. It is based on the selection of those cases that are available and willing to participate, and also in the ease of access and the proximity of the subjects to the researcher (Otzen and Manterola, 2017). Therefore, the number of survey respondents was 300 people, from different regions in Mexico.

Development of questionnaires

The questionnaire had 12 multiple choice questions and it was divided into the following sections: (1) sociodemographic information (geographic region of residence, age, sex and willingness to pay for goat products); (2) willingness to consume; (3) type of derived products that are known and frequency of consumption.

Before implementing the final questionnaire, 10 pilot surveys were carried out to evaluate the clarity of the questions, the accuracy of the response options, and the general flow of the survey.

Statistical and data analysis

The data gathered were grouped to form categories and a contingency table was prepared that determined the different associations between the variables studied. The categorical and ordinal data were presented as percentages. The statistical analysis was conducted through the statistical package SPSS (2023), Statistics version 29.0.0.0 (241), and Excel (2023) version 16.69.1 (23011600). The Kruskal-Wallis test ($p \leq 0.05$), a non-parametric statistical test, was used to determine if there were differences between the means or the medians of the variables (López, 2013).

RESULTS AND DISCUSSION

Sociodemographic and consumption characteristics

The sociodemographic and consumption characteristics obtained from the surveys carried out are presented in Table 1. Most of the survey respondents belonged to the north region (59%).

The study found that goat production and consumption have greater presence in this region because it is an animal that has adapted adequately to the adverse conditions of the zone, and in addition, it is a species that is rooted in the population's culture (Andrade-Montemayor, 2017; Zapata-Campos and Mellado-Bosque, 2021; Torres-Hernández *et al.*, 2022).

Most of the participants were men, with the exception of the central-west region where there was a percentage of male participation of 31.8%.

The age of the survey respondents is predominantly 20 to 29, and 30 to 39 years old, which indicates that the consumption preferences towards products derived from goats happens especially in middle-aged people.

Most of the survey respondents consume this type of products and a high willingness to consume was found, since the percentage of those that were "highly willing" or "moderately willing" to consume them was higher than 60%.

Table 1. Sociodemographic and consumption characteristics evaluated by region.

	Participants			
	Center	**Central west**	**North**	**Southeast**
Variable (%)	25.0	7.3	59.0	8.7
Gender				
Man	50.7	31.8	59.3	76.9
Women	49.3	68.2	40.7	23.1
Age				
20-29	40.0	36.4	33.9	26.9
30-39	45.3	50.0	32.8	38.5
40-49	8.0	9.1	14.7	19.2
50-59	4.0	4.5	14.1	3.8
More than 60	2.7	0.0	4.5	11.5
Consumption of goat products				
Yes	69.3	63.6	65.0	73.1
No	30.7	36.4	35.0	26.9
Willingness to consume goat products				
Highly willing to consume	48.0	45.5	41.2	42.3
Medium	26.7	31.8	27.7	26.9
Indiferent	21.3	13.6	21.5	23.1
Low willingness to consume	2.7	4.5	5.6	7.7
Unwilling to consume	1.3	4.5	4.0	0.0
Price that consumers would pay for the purchase of goat products (Mexican pesos)				
$50-100	52.0	45.5	49.7	42.3
$101-200	36.0	36.4	36.7	50.0
$201-300	9.3	13.6	10.7	7.7
More than $301	2.7	4.5	2.8	0.0

The willingness to consume is justified based on the variability of products and byproducts from goat (SADER, 2019); also, from the versatility in the diets of Mexicans (Estévez-Moreno and Miranda-de la Lama, 2022).

The price that the survey respondents are willing to pay ranged between low values, with the strata of $50-100 and $101-200. This indicates that consumers are sensitive to the price, so there is not a high willingness to pay.

The geographic region influenced the variables presented. However, the sex of the survey respondent showed important significant differences. In this regard, the west region showed a higher participation of women (68.2%), which was reflected in a greater willingness to consume products derived from goat, with "highly willing" and "moderately willing" strata, which together represented a willingness to consume of 77.3%. Likewise, the price that would be paid for the acquisition of products was higher in the last two strata ($201-300 and more than $301).

Therefore, a Kruskal-Wallis test was conducted with the group variable "gender of the survey respondent" and it can be stated that the significant variables are given by age,

region and willingness to consume (Table 2). Understanding the socioeconomic variables allows generating schematic designs based on stratification (Ramos-Martínez *et al.*, 2020). Types of products consumed and frequency of consumption

Results from Figure 1 show that the goat products are present in the consumption of the survey respondents. These include cheese, meat, milk, ice-cream and soft toffee. Cheese was the product with highest presence, followed by meat and milk, indicating that Mexican people have a broad variety of goat products to satisfy their tastes and dietary needs. Some studies suggest that goat meat, milk and cheese have characteristics that make them potentially accepted and marketable foods (Aréchiga *et al.*, 2008). In the same way, they are a viable option in the high-quality food market (Tajonar *et al.*, 2022).

To evaluate the impact of the willingness to consume, a Kruskal-Wallis test was conducted (Table 3).

The results showed that the willingness to consume had a significant impact on all the foods registered, which suggests that consumers have a preference for certain products and that this willingness is a factor of great relevance to understand the behavior of survey respondents and their relationship with them.

Figure 2 shows the frequency of consumption there is in food products that were statistically significant, obtaining six different strata.

Table 2. Kruskal-Wallis test statistics with the grouping variable "Gender of the respondent".

	Age	Region	Willingness to consume
Kruskal-Wallis H	14.589	7.05	9.325
Asymp. Sig	<0.001	0.007	0.002

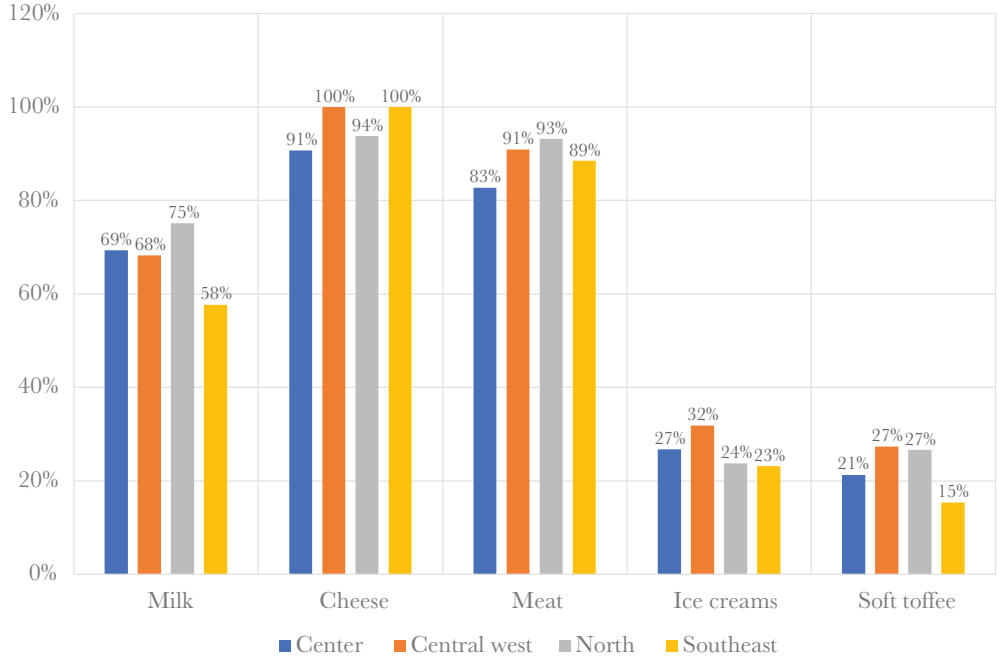

Figure 1. Goat products consumed by region and frequency of consumption.

Table 3. Kruskal-Wallis test statistics with the grouping variable "Willingness to consume".

	Cheese	Meat	Ice creams	Soft toffee	Milk
Kruskal-Wallis H	40.187	49.701	42.269	45.818	37.977
Asymp. Sig	<.001	<.001	<.001	<.001	<.001

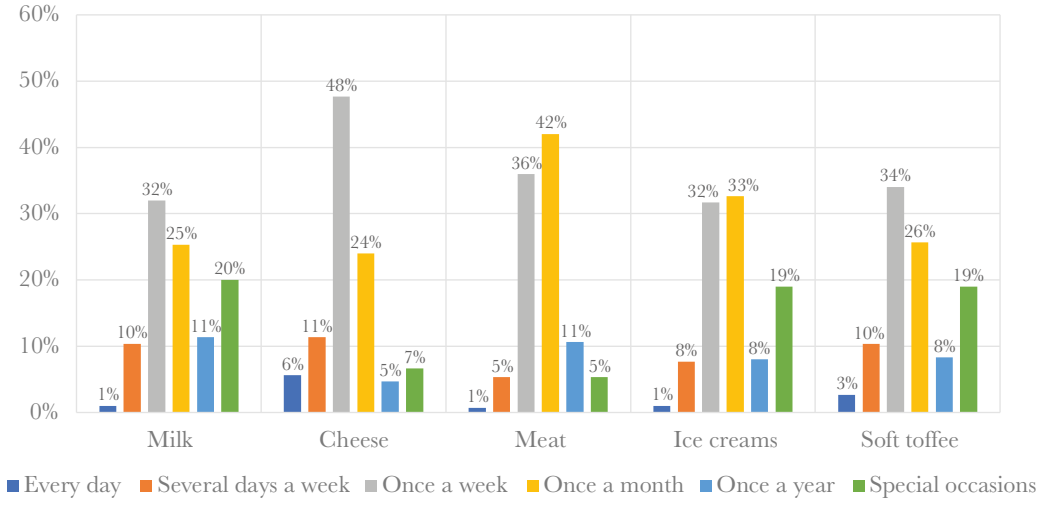

Figure 2. Frequency of consumption of goat products.

The frequency of consumption stratified into "every day", "many days per week", "once per week", and "once per month", together represent a percentage that can be considered as a strategic factor in the consumption of these products, which agrees with the results obtained from Figure 1; the ones of most importance are again cheese (84%), meat (84%), and milk (68%).

Taking into account these results, it is important to optimize the commercialization channels. Aréchiga *et al.* (2008) show that it is crucial to explore plans that increase added value, in order to improve the consumption and the production of goat livestock and their byproducts.

The goat products found, as well as the frequency of consumption, are ideal to amplify the diversification of consumption in Mexican regions. According to Miller and Lu (2019), production and consumption can be increased through management, cooperation, organization and access to markets.

Although some authors point to goat production being at a standstill, it is also considered that it has the potential of becoming an activity of high productivity and profitability, even under unfavorable conditions (Aréchiga *et al.*, 2008; Barrera *et al.*, 2018; Palomares *et al.*, 2021). In this sense, it is necessary to have effective strategies for the attainment of different objectives that lead to this purpose (Castel *et al.*, 2010; Ruiz *et al.*, 2019).

CONCLUSIONS

It was found that goat products are known and consumed in the different regions of Mexico. Cheese, milk and meat were the most important foods in the study, which points to these being ideal to increase the diversification of consumption.

On the other hand, to promote the growth of the goat industry and to contribute to the economic development through this type of products, it is essential to analyze the sociodemographic and consumption characteristics of potential clients, to determine which variables are significant, and what is their degree of influence. With this, more efficient marketing strategies could be developed.

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