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RESEARCH ARTICLE

Informational Nudges to Promote Preferences for Goat Meat

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Abstract
Goat meat consumption has grown in recent years due to dietary and cultural changes. US demand has surpassed domestic supply, presenting an opportunity for industry expansion. This study provides valuable insights into consumer preferences for goat meat. A sample of 1,015 Floridians was randomly assigned to a control and three treatment groups that included information about the health and/or environmental benefits of goat meat. Results show a significant difference in willingness to pay for goat meat under different information treatments. Persuasive marketing campaigns can increase consumers' preferences for goat meat by raising awareness of the health and environmental benefits.

Keywords: Choice experiments; market segmentation; specialty meat; willingness to pay

JEL classifications: D12; M31; Q13

Introduction

Changes in dietary habits, cultural traditions, and religious beliefs have led to an increase in goat meat consumption, making it one of the most consumed meats worldwide (Knight et al., 2006; USDA, Animal, and Plant Health Inspection Service, 2012). In the United States (US), the demand for goat meat has increased in recent years, exceeding the domestic supply (Knight et al., 2006; Luginbuhl, 2015b; McMillin and Pinkerton, 2022). Since 1991, US imports of goat meat have exceeded exports, making it a net importer (Gipson, 1999) and highlighting the potential for the goat meat industry to expand domestic production to fulfill the increasing demand (Knight et al., 2006).

The US goat meat industry is an emerging industry that has been gaining increasing attention in recent years. Despite this attention, there has been limited research that focuses on US consumers' preferences and willingness to pay (WTP) for goat meat (Ekanem et al., 2013; Ibrahim, 2011; Knight et al., 2006; Rhee, Myers, and Waldron, 2003). Previous studies have found that the main target market for goat meat is older consumers who prioritize healthier meat options (Knight et al., 2006; Liu, Nelson, and Styles, 2013). Additionally, consumers highly value the availability, quality, safety and freshness of meat (Ekanem et al., 2013; Ibrahim, 2011; Tackie, Bartlett, and Adu-Gyamfi, 2015). Studies show that customers in the Southern states, particularly in Florida, Alabama, South Carolina, and Georgia, are willing to pay a premium for goat and beef meat that is certified as locally or regionally produced (Richards and Vassalos, 2023; Tackie et al., 2017; Tackie, Bartlett, and Adu-Gyamfi, 2015; Tackie et al., 2018). This helps provide the motivation for a contemporary study to examine market opportunities to help justify a shift in current livestock production to increase the domestic supply of goat meat.

This study advances the literature by examining consumer WTP for goat meat compared to beef. We investigate how the persuasive marketing strategies highlighting the health and/or environmental benefits of goat meat, can increase WTP for goat meat compared to beef. This was done by randomizing a sample of 1,015 respondents across a control and three information treatment groups. A choice experiment was conducted to elicit consumers' preferences for the following meat attributes: local production, quality, organic certification, USDA inspection, and price. Additionally, we constructed a latent class analysis (LCA) model to identify three consumer segments (general beef, niche beef, and goat consumers) that differ in their attitudes toward goat and beef consumption.

This study focused on consumers in Florida, which is among one of the top 10 states in the US and among the top 5 in the Southeast in the production of goat meat (FDACS, 2016). With a volume of 54,700 goats in 2023, there has been a 27% rise in goat inventory compared to 2014 (USDA NASS 2015; 2023). Florida has potential to increase goat meat production (USDA NASS 2023). Southeastern goat producers enjoy the benefit of being able to pasture goats year-round, as the regional climate is well-suited for extended grazing (Qushim, Gillespie, and McMillin, 2016). Furthermore, local goat producers have a competitive advantage as they can offer fresh goat meat compared to the frozen imported meat that has historically dominated the market (Bactawar, 2018). According to a study by Tackie et al., 2017, consumers in Florida were found to be willing to pay a premium of up to 10 cents for beef or goat meat certified as locally or regionally produced. Furthermore, the demand for goat meat in Florida was predicted to stay strong as the ethnic population grows (Bactawar, 2018).

We expect that findings from this study can offer insights to local goat meat producers to better position and promote goat meat in a competitive market. Moreover, the study provides insights into persuasive marketing techniques that could be used for promoting Florida's emerging goat meat industry.

Literature review

Goat meat is widely produced in the world and plays a significant role in the meat supply chains. Asia and Africa have the greatest numbers of goats; 579 and 489 million respectively, which represents 43 and 51% of goats worldwide (Aziz, 2010; FAOSTAT, 2020; Miller and Lu 2019). More specifically, China, India, Pakistan, and Bangladesh account for the largest number of goats in the world, indicating the importance of raising goats in these cultures (Aziz, 2010).

The popularity of goat meat consumption can be explained by the fact that consumers have become more health-conscious and have sought healthier and more sustainable food alternatives For these reasons, goat meat serves as an important source of protein, while also being beneficial for people with health-related challenges, due to its potential to reduce health risks (Anaeto et al., 2010; Casey, 1992; Ivanovic, Pavlovic, and Pisinov, 2016; McWhinney, 2018). Moreover, compared to other red meats, goat meat is low in saturated fatty acids but high in healthy unsaturated fatty acids, which are associated with a reduced risk of stroke and coronary diseases (Anaeto et al., 2010; Malekian et al., 2014).

Recent immigration trends are another element influencing goat meat consumption. Typically, the White middle-class population consumes a small amount of goat meat, and prefers other small ruminant meats such as high quality lamb cuts (Ekanem et al., 2013; USDA ERS 2020). In the US, the majority of demand for goat meat is derived from other ethnic groups and mainly from elderly consumers (Liu, Nelson, and Styles, 2013). According to the US Department of Agriculture Economics Research Service (USDA ERS, 2020), the primary goat meat consumers in the US are Middle Easterners, Caribbeans, and Northeastern Africans. Depending on ethnic group and religious identity, consumers have differing preferences for goat meat. For example,

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Mexican-Americans, Chinese, and Koreans prefer young goats, while African immigrants prefer older goats (Ekanem et al., 2013).

Despite the rising demand for goat meat, the domestic supply was somewhat limited. In 2021, the goat inventory totaled 2.59 million heads, with a meat inventory totaling 2.05 million heads (USDA NASS 2021b). For comparison, the cattle and calve inventory totaled 93.6 million heads, with over 40.00 million beef cows (USDA NASS 2021a). Notably, while domestically slaughtered goats decreased by 6%, imports of goat meat almost doubled (McMillin and Pinkerton, 2022). The main importers of goat meat were Australia, Mexico, and New Zealand (McMillin and Pinkerton, 2022).

Compared to other farm animals, goats are cheaper and environmentally friendly to raise. Estimated annual cost of raising goat is $350/ per doe (Howland, 2023; Kutchman, 2019), while the approximate cost of raising a calf is $972/ per cow (6–9 months) (AgTech, 2022; Ross, 2023). Goats require less grazing area compared to cattle (Backyard Goats Contributor, 2022). Some goat species also require little feed because they can utilize bushes, shrubs, and range vegetation (Morand-Fehr et al., 2004). Moreover, goats are among the most efficient water users when compared to other livestock (Peacock and Sherman, 2010). The resilience and capacity of goats to adjust to new conditions make them a significant resource to ensure sustainable production (Mazhangara et al., 2019; Peacock and Sherman, 2010). Moreover, incorporating grazing of goats and cattle can further contribute to the improvement of rangeland quality, decrease the gastrointestinal parasitic load, and lead to increased profits (Hintze, Bir, and Peel, 2021; Luginbuhl, 2015a).

The existing literature includes insights regarding some sociodemographic characteristics that correlate with preferences for goat meat. These insights suggest that consumers of specific age groups, cultural background, and healthier dietary habits prefer goat meat (Knight et al., 2006; Liu, Nelson, and Styles, 2013; McLean-Meyinsse, 2003; Regmi, 2001; Richards and Vassalos, 2023). In their study, Liu, Nelson, and Styles (2013) revealed that in the US, individuals aged 55–64 and females are more likely to consume goat meat than other demographic groups. In contrast, Knight et al. (2006) found a higher preference for goat meat consumption among males, and individuals in age groups other than 18–24, including those in the 25–44, 45–64, and 65 and over. Furthermore, they found that Hispanics are more likely to consume goat meat compared to Blacks (Knight et al., 2006). Similarly, McLean-Meyinsse (2003) revealed that goat meat consumption tends to be more prevalent among older respondents and males. However, McLean-Meyinsse (2003) also showed that African Americans have the highest levels of goat meat consumption. In their study on local meat consumption, Richards and Vassalos (2023) discovered a different trend: local meat consumers tend to be younger, and increase in age reduces probability of consuming local meats. However, there were no significant results regarding age and WTP for goat meat. Similarly, Tackie, Bartlett, and Adu-Gyamfi (2015, 2017, 2018) found that for consumers in Alabama, Florida, and Georgia age has no significant impact on WTP premium for locally produced beef or goat meat.

Our study advances the literature by investigating consumer preferences and looking into persuasive marketing aimed at nudging consumers toward purchasing goat meat. The expansion of goat meat demand could promote more sustainable and healthier dietary options. For instance, these could include reducing the pressure on natural resources and mitigating the negative impacts associated with the production of other livestock.

Data and methods

Experimental design

To analyze consumer preferences for attributes of goat meat, an online survey was conducted between July 14, 2021, and September 25, 2021. Data was collected using Qualtrics, which

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	Beef Option	Goat Option	None
Price	$4.99	$4.99	I would
Fresh From Florida	No	Yes	NOT
Quality	Higher	Higher	choose
Organic Certified	No	Yes	either of the
USDA Certified	Yes	No	two options.
	Beef Option	**Goat Option**	**Neither Options**
I would choose the:	○	○	○

Figure 1. Example of choice decision scenario with three product options.

implemented quotas on gender, age, income, ethnicity and race, based on the FL population for an accurate representation of the sample. Survey respondents were required to be adult (ages 18 and above) residents of Florida. An overall sample of 1,015 adult Floridians, who consumed meat products and were the primary shoppers in their household (i.e., responsible for at least 50% of grocery shopping decisions), was obtained. To maintain survey data quality, respondents were required to successfully complete the attention check questions (Figure S1) and confirm their willingness to provide their best answers to the survey questions.

Respondents were randomly assigned to a control and three information treatments. The first treatment ("health") emphasized the health benefits of goat meat. The second treatment ("environment") highlighted the environmental benefits of goat meat. The third treatment ("health and environment") combined information about the health and environmental benefits of goat meat. The order of the information highlighting health and environmental benefits was randomized across respondents assigned to the third treatment to control for ordering effects. The information about health and environmental benefits of goat meat is presented in the supplementary materials (Figures S2 and S3).

A choice experiment design was included in the survey to elicit consumer preferences for the following attributes: Price (3.49, 3.99, 4.49, 4.99, 5.49; $/1 lb), Fresh from Florida (yes or not), Quality (higher or lower), Organic Certification (yes or no), and USDA inspection (yes or no). Before making decisions in the choice experiment, respondents were given definitions and levels of the attributes. Price was defined as the cost of the product in USD per pound. Fresh from Florida was a binary attribute representing whether the product was produced in Florida or not. Quality was defined based on the marbling level, juiciness, and eating experience. Higher quality meat was described as having more marbling, which would provide a juicier and more satisfying eating experience. Conversely, lower quality was defined as having less marbling but was still considered high quality meat that would provide a good eating experience. Organic certification was a binary attribute representing whether the product was certified organic by the USDA or not. USDA certified was a binary attribute representing whether the product was inspected and passed Federal requirements. If the meat does not have a USDA certified label, it suggests that the meat was exempt from inspection requirements and was processed by a custom exempt operation.

Prior to the choice experiment, respondents were provided with an explanatory example of a choice set to become familiarized with the procedure and followed by a cheap talk script (Cummings and Taylor 1999) to reduce hypothetical bias. Each participant was shown a total of five shopping scenarios, each with three choice options (beef, goat, and an option for none to opt out). Participants were asked to choose the option with which they would be most satisfied when purchasing 1 pound of shoulder-cut meat for household consumption. The shoulder cut was chosen based on its availability and popularity. According to USDA National Retail Reports (2024), shoulder cut is one of the most popular cuts and is presented in over 8000 stores. An example of a choice set is presented in Figure 1.

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Econometric methods

A random parameter logit model was used to analyze the choice experiment data. This econometric approach allows coefficients to vary randomly across individuals (Revelt and Train, 1998). Thus, the model allows for heterogeneity in consumer preferences. Following the random utility framework (McFadden, 1974), we define the utility function:

$$U_{nit} = V_{nit} + \varepsilon_{nit} \tag{1}$$

where V_{nit} is a deterministic component (i.e. $V_{nit} = \beta_n' X_{njt}$, where β_n is a vector of coefficients that vary over n individuals, X_{nit} is a vector of observed alternative variables related to individual n and alternative i on choice occasion t), and ε_{nit} is an independently and identically distributed random term (McFadden, 1974; Revelt and Train, 1998). It is assumed that individual n will choose alternative i if it provides higher utility than all other alternatives ($U_{nit} > U_{njt}, \forall i \neq j$). Using this framework, we can express the probability of individual n choosing alternative i in choice occasion t as:

$$P_{njt} = P\left(\varepsilon_{nit} - \varepsilon_{njt} > V_{njt} - V_{nit}; \forall\ i \neq j, \forall\ j \varepsilon C\right). \tag{2}$$

We specify V_{nit} as following:

$$V_{nit} = \beta_0 no\ product + \beta_1 price + \beta_2 flfresh + \beta_3 quality + \beta_4 organic + \beta_5 USDA + \beta_6 goat, \tag{3}$$

where *price* is a variable representing the fixed price attribute, *flfresh* is a variable representing the Fresh from Florida attribute, *quality* is a variable representing quality attribute, *organic* is a variable representing certified organic attribute, *USDA* is a variable representing USDA certified attribute, *goat* is a variable representing goat meat choice, and *noproduct* is a variable representing a choice of no purchase. We choose beef as the reference category, considering our research objectives.

Based on this model, we calculated the mean WTP estimates as:

$$WTP_k = -2 * \left(\frac{\beta_k}{\beta_{price}}\right), \tag{4}$$

where β_{price} is the coefficient estimate of the price and β_k is the coefficient estimate of an attribute.

We utilized the parametric bootstrapping approach proposed by Krinsky and Robb (1986), to obtain 1,000 WTP values for each attribute. This analysis was used to construct 95% confidence intervals for the WTP estimates, the lower and upper bounds of a 95% confidence intervals were given by the 26th and 975th sorted 1,000 WTP estimates (Hole, 2007). This allows us to then use the complete combinatorial approach, proposed by Poe et al. (2005), to examine differences in mean WTP between treatment groups.

We also conducted a quantile regression (Koenker, 2005; Segovia, Grashuis, and Skevas, 2021) to explore heterogeneity across individual WTP for goat meat. The individual preference estimates for each attribute were generated, followed by the estimation of WTP for goat meat. This was then regressed on variables representing treatment effects using a quantile regression. Quantile regression allows for the analysis of different population segments, providing a more comprehensive understanding of how the response distribution is affected by predictors (Hao and Naiman, 2007). We focused the quantile regression on estimating the treatment effects on subsamples with WTP for goat meat in the bottom 10%, the median, and the upper 10% of the distribution.

Finally, we used Latent Class Analysis (LCA) (Greene and Hensher, 2003; Wedel and Kamakura, 2000) model to segment consumers into different groups based on sociodemographic characteristics, particularly gender, age, race, ethnicity, income, and education. The optimal number of latent classes was identified using Bayesian Information Criteria (BIC). Given our data, the LCA model failed to converge for five or more classes. Based on the graph of BIC results (Fig 2)

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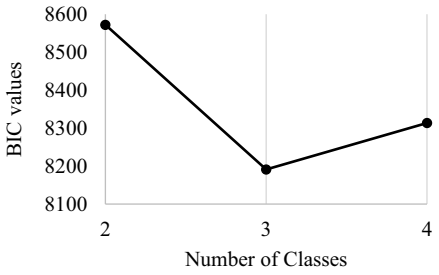

Figure 2. Bayesian information criteria.

there was an "elbow" point in the model fit in the 3rd class, which indicated a good fit (Nylund-Gibson and Choi, 2018). Therefore, we decided to estimate the LCA model with three classes.

Results and discussion

Characteristics of the sample

Demographic and socioeconomic characteristics are summarized in Table 1. The demographics of the respondents were similar to the FL population according to US Census (US Census Bureau, 2021). Compared to FL population our sample had a higher percentage of White respondents, and a lower percentage of Hispanic, Latino or Spanish respondents. However, when considering the Hispanic, Latino or Spanish respondents, their representation roughly matched the US population which was 19% as reported by the US Census Bureau (2021). More than half of the respondents (54%) were female, which is reasonable considering that females are usually the primary shoppers in the household. The survey participants were primarily aged 55 and over, with 17% of respondents aged 55–64 years, and 27% aged 65 and over. Participants were asked questions about their household income level, which was presented in eight categories based on the US Census Bureau Survey categories. The two large categories comprised respondents whose household income is less than $25,000 (20%) and $50,000–$74,999 (20%). The highest level of education attained was represented in six categories from which the largest category comprised college graduates with Bachelor's degree (27%), followed by some college but no degree earned category (24%).

We performed a nonparametric Kruskal-Wallis test to check for statistically significant differences in sociodemographic characteristics across treatment groups. As shown in Table 1, *p*-values demonstrate balance between treatments in all sociodemographic characteristics considered, which is necessary to obtain unbiased estimates of the average treatment effects.

Besides demographics, we asked respondents about their meat consumption patterns. According to the data, 92% of respondents bought beef during the last 12 months for their household consumption, whereas only 13% bought goat meat. However, 32% of respondents reported that they tried goat meat and approximately 82% like it. In general, 64% of respondents had neutral (36%) or positive (28%) attitudes about goat meat.

Estimated willingness to pay for goat meat

The estimated means and standard deviations from the random parameter logit model are presented in Table 2. The model was estimated using a full sample of respondents, as well as separately for each treatment subsample (i.e., control, health, environment, and health and environment). For most cases, the signs and significance of coefficient estimates were consistent across the full model and models over treatment groups. The coefficient estimate of price was statistically significant and negative, indicating that a higher price decreases the likelihood of

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Table 1. Descriptive statistics

Variable	Full Sample	Control	Health	Environment	Health & Environment	p-value	FL census
Sample Size	1,015	255	252	254	254		
Gender (%)						0.210	
Male	46	44	48	50	42		49
Age (%)						0.251	
18–24	9	10	6	10	8		10
25–34	16	16	14	15	19		16
35–44	16	15	18	19	14		15
45–54	15	16	14	15	15		16
55–64	17	15	18	20	17		18
Over 65	27	29	31	22	28		25
Income level (%)						0.334	
Under $25,000	20	19	19	18	22		18
$25,000 –$34,999	12	13	12	11	13		9
$35,000 –$49,999	14	14	12	15	15		12
$50,000 –$74,999	20	21	20	21	20		18
$75,000 –$99,999	14	12	16	14	14		13
$100,000 –$149,999	11	8	14	12	11		15
$150,000 –$199,999	6	8	8	6	4		6
$200,000 or more	3	5	2	2	2		8
Education level (%)						0.486	
Less than high school	2	3	4	2	2		10
High school diploma or equivalent	19	18	23	16	20		28
Associate degree	12	13	12	12	11		10
Some college but no degree	24	23	19	27	28		19
Bachelor's degree	27	30	28	28	22		21
Graduate or professional degree	16	14	15	16	17		13
Race (%)						0.877	
White	83	84	86	84	80		56
Black or African American	10	9	11	12	10		15
Asian	2	2	1	2	2		3
Other Race	4	4	3	3	8		26
Ethnicity (%)						0.711	
Hispanic, Latino, or Spanish	17	17	18	19	15		27

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Table 2. Random parameter logit model

Variable	Full Parameter (Sd. Err.)	Control Parameter (Sd. Err.)	Health Parameter (Sd. Err.)	Environment Parameter (Sd. Err.)	Health & Env. Parameter (Sd. Err.)
Mean of Estimates					
Price	−0.533***	−0.457***	−0.446***	−0.623***	−0.657***
	(0.048)	(0.097)	(0.089)	(0.102)	(0.097)
Fresh from Florida	0.118***	−0.042	0.120*	0.185**	0.206**
	(0.031)	(0.064)	(0.061)	(0.064)	(0.064)
Quality	0.750***	0.728***	0.646***	0.830***	0.817***
	(0.052)	(0.100)	(0.101)	(0.105)	(0.112)
Organic Certified	0.002	0.011	−0.077	0.043	0.038
	(0.033)	(0.068)	(0.064)	(0.066)	(0.082)
USDA Certified	0.451***	0.463***	0.451***	0.555***	0.364***
	(0.046)	(0.098)	(0.091)	(0.094)	(0.083)
Neither Option	−3.847***	−3.163***	−3.548***	−4.141***	−4.786***
	(0.246)	(0.489)	(0.460)	(0.517)	(0.528)
Goat Option	−2.059***	−2.637***	−1.871***	−2.236***	−1.590***
	(0.148)	(0.350)	(0.282)	(0.288)	(0.254)
Standard Deviation of Estimates					
Fresh from Florida	0.359***	0.389**	0.368**	0.337**	0.384***
	(0.062)	(0.123)	(0.115)	(0.130)	(0.116)
Quality	0.593***	0.471**	0.615***	0.633***	0.646***
	(0.075)	(0.181)	(0.144)	(0.156)	(0.148)
Organic Certified	0.094	0.297*	0.104	0.041	0.032
	(0.167)	(0.145)	(0.283)	(0.211)	(0.220)
USDA Certified	0.453***	0.519***	0.495***	0.489***	0.289
	(0.063)	(0.136)	(0.123)	(0.130)	(0.157)
Neither Option	1.876***	1.919***	1.612***	1.630***	2.344***
	(0.116)	(0.228)	(0.222)	(0.205)	(0.272)
Goat Option	2.645***	2.616***	2.616***	2.654***	2.723***
	(0.167)	(0.357)	(0.333)	(0.324)	(0.323)
Log Likelihood	−4214.7	−1071.1	−1059.9	−1037.3	−1015.0
Observations	5075	1275	1260	1270	1270

Notes: *, **, *** represent statistical significance at the 5, 1, and 0.1% respectively.

choosing goat meat and beef. The coefficient estimates were positive and statistically significant for Fresh from Florida, quality, and USDA attributes. This indicates that respondents were more likely to choose meat that was freshly produced in Florida, high in quality and USDA inspected. On the other hand, preference for organic certification was not statistically significant implying

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Table 3. Willingness to pay estimates ($/lb.)

	Full	Control	Health	Environment	Health & environment	*p*-value		
Variable	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]	Mean [95% CI]	1	2	3
Fresh from Florida	0.44	0.18	0.54	0.59	0.63	0.03	0.01	0.01
	[0.21, 0.68]	[−0.75, 0.35]	[0.03, 1.09]	[0.18, 0.99]	[0.22, 0.99]			
Quality	2.81	3.19	2.90	2.66	2.49	0.68	0.83	0.89
	[2.41, 3.15]	[2.34, 4.05]	[2.04, 3.80]	[1.94, 3.31]	[1.77, 3.14]			
Organic Certified	0.01	0.05	−0.35	0.14	0.12	0.83	0.38	0.41
	[−0.24, 0.24]	[−0.56, 0.62]	[−0.91, 0.15]	[−0.29, 0.62]	[−0.30, 0.50]			
USDA Certified	1.69	2.03	2.02	1.78	1.11	0.53	0.68	0.97
	[1.37, 2.02]	[1.16, 2.89]	[1.22, 2.73]	[1.22, 2.41]	[0.62, 1.58]			
Neither Option	−7.22	−6.92	−7.96	−6.65	−7.28	0.75	0.43	0.66
	[−8.17, −6.32]	[−8.85, −4.81]	[−9.82, −5.87]	[−8.30, −5.06]	[−8.99, −5.79]			
Goat Option	−3.86	−5.77	−4.20	−3.59	−2.42	0.05	0.01	0.00
	[−4.37, −3.34]	[−7.28, −4.33]	[−5.36, −2.82]	[−4.51, −2.72]	[−3.19, −1.68]			

Notes: 1 represents difference between health and control groups, 2 represents difference between environmental and control group, 3 represents difference between health and environmental and control groups.

that this attribute did not significantly influence consumer choices in our study. The high significance of the estimated standard deviations points to significant heterogeneity in preferences across consumers and indicates that the random parameter logit model is appropriate in this data analysis.

The parametric bootstrapping method proposed by Krinsky and Robb (1986) was employed to simulate 1,000 WTP estimates for each attribute, which were subsequently used to construct 95% confidence intervals (Table 3). The WTP results showed that, on average, consumers assign an economic value for quality, USDA certified, and Fresh from Florida attributes. Specifically, participants were willing to pay an average of $2.81/lb for high quality attribute, $1.69/lb for USDA-inspected attribute, and $0.44/lb for Fresh from Florida attribute. Our results also indicate that consumers were not willing to pay a premium for organic certified meat. In general, participants were willing to buy goat meat with a $3.86/lb discount compared to beef. This implies that, relative to the average US price for shoulder-cut beef ($5.80/lb) (USDA AMS 2024), consumers are willing to buy goat meat with a 66.6% discount compared to beef.

Turning to the comparison of results across treatment groups (Table 3), we found that in the control group, respondents were willing to buy goat meat with a $5.77/lb (99.5% discount) discount compared to beef. Upon receiving the information about health benefits, and environmental benefits the discount for goat meat decreased to $4.20/lb (72.4 % discount), and $3.59/lb (61.9% discount), respectively. Notably, the group that received information about both health and environmental benefits showed the highest reduction in the discount for goat meat compared to the control, where average WTP for goat meat in this treatment was only $2.42/lb lower than beef.

For a better understanding on potential heterogeneity in consumer WTP for goat meat, we estimated quantile regression for 10th, 50th and 90th percentiles (Table 4).

For respondents in the lowest 10% WTP distribution, information treatments had no impact, this effect changes for 50th and 90th percentiles. The 50th percentile, which corresponds to the

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Table 4. Quantile regression on willingness to pay (WTP) for goat meat

Quantile	Coefficient WTP for goat meat	Value	Std. Error
0.1	Intercept	−16.331***	0.019
	Health Treatment	0.031	0.023
	Environmental Treatment	0.035	0.033
	Health and Environmental Treatment	0.017	0.032
0.5	Intercept	−13.198***	1.082
	Health Treatment	6.280**	2.126
	Environmental Treatment	4.677**	1.914
	Health and Environmental Treatment	6.226***	1.856
0.9	Intercept	1.139***	0.054
	Health Treatment	0.822	1.188
	Environmental Treatment	0.765*	0.420
	Health and Environmental Treatment	5.144***	0.472

Notes: *, **, *** represent statistical significance at the 10%, 5%, and 1%, respectively.

median regression, shows that there was a positive relationship between WTP for goat meat and all information treatment groups. The effect of information treatments changes at the 90th percentile, where a statistically significant and positive relationship was observed only between WTP for goat meat and the health and environmental treatment. These results were consistent with previous findings and show that giving respondents information about the health and environmental benefits of goat meat positively affects their WTP.

To further advance our findings, we examine the model separately for respondents who have previously tried goat meat and those who haven't (Table 5).

As expected, respondents with prior experience in trying goat meat were willing to buy it at a lower discount. As in the full sample model, the implementation of persuasive marketing information about health and environmental benefits significantly decreased the discount on goat meat. While the discount elicited for goat meat compared to beef in the health and the health and environmental groups was not significant, it is important to acknowledge the influence of the relatively small sample size in this subsample on these findings. Despite this limitation, compared to the control group, the discount for the environmental group decreased significantly.

Notably, among respondents who had not previously tried goat meat, the observed estimates closely resemble the estimates in the overall sample, presented in Table 3, confirming the robustness of our findings.

Moving to the discussion of LCA model results, we first present summary statistics for observable variables for the three classes in Table 6, along with the estimated fraction of respondents belonging to each class. The first class, representing 16.1% of our sample, preferred beef to goat meat, and are hence labeled beef consumers. Additionally, the majority of respondents in this class prefer quality and USDA certified attributes. The second class represents approximately 32.3% of the sample and was labeled as niche beef consumers since they strongly prefer beef. In contrast to the other two classes, consumers in this class were indifferent toward the price attribute. Finally, the remaining 51.6 % of respondents were named goat meat consumers, as they prefer goat meat over beef. Respondents in this group prefer high quality compared to low, and Fresh from Florida meat compared to alternatives that do not have this attribute.

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Table 5. Willingness to pay estimates for subsamples ($/lb)

WTP for goat meat compared to beef	Mean [95% CI]	*p*-value
Respondents have tried goat meat (n = 328)		
Full	−0.83	
	[−1.41, −0.24]	
Control	−2.64	
	[−4.31, −0.84]	
Health	−0.54	0.04
	[−2.07, 1.20]	
Environment	−1.06	0.06
	[−2.00, −0.07]	
Health & Environment	0.25	0.002
	[−0.66. 1.22]	
Respondents have NOT tried goat meat (n = 687)		
Full	−4.60	
	[−5.25, −3.96]	
Control	−6.20	
	[−7.93, −4.11]	
Health	−4.45	0.08
	[−5.82, −3.14]	
Environment	−3.94	0.03
	[−5.05, −2.90]	
Health & Environment	−3.45	0.01
	[−4.46, −2.49]	

Notes: (1) Krinsky and Robb parametric bootstrapping approach were used to construct 95% confidence intervals; (2) p-value represents difference between treatment and control groups.

Table 6. Latent class model with three classes

	Beef consumers	Niche beef consumers	Goat meat consumers
Variable	Coef. Est. (Std. Error)	Coef. Est. (Std. Error)	Coef. Est. (Std. Error)
Price	−0.638***	−0.610	−0.343***
	(0.118)	(0.897)	(0.042)
Fresh from Florida	0.012	−0.621	0.101***
	(0.083)	(0.823)	(0.028)
Quality	0.878***	1.401*	0.613***
	(0.087)	(0.703)	(0.072)
Organic Certified	0.216**	0.009	−0.132**
	(0.072)	(0.669)	(0.041)

(*Continued*)

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Table 6. (*Continued*)

Variable	Beef consumers Coef. Est. (Std. Error)	Niche beef consumers Coef. Est. (Std. Error)	Goat meat consumers Coef. Est. (Std. Error)
USDA Certified	1.226***	−0.056	0.075
	(0.096)	(0.808)	(0.041)
Neither Option	−2.190***	−7.320*	−3.100***
	(0.564)	(3.400)	(0.209)
Goat Meat	−3.303***	−6.082***	0.216***
	(0.223)	(1.274)	(0.055)
Class Membership %	**16.1**	**32.3**	**51.6**
Male		0.874***	1.203***
		(0.095)	(0.087)
Age		−0.132***	−0.4444***
		(0.033)	(0.029)
Black or African American		0.993***	1.594***
		(0.238)	(0.212)
Asian		−0.606	−0.366
		(0.375)	(0.274)
Other Race		−0.346	−0.540**
		(0.234)	(0.208)
Hispanic		1.018***	1.367***
		(0.187)	(0.166)
Income		−0.047	0.084***
		(0.027)	(0.024)
Education		−0.188***	−0.001
		(0.036)	(0.032)

Notes: (1) *, **, *** represent statistical significance at the 5%, 1%, and 0.1%, respectively; (2) Log likelihood = −3929.2.

In comparison to beef consumers, the niche beef and goat meat consumer groups had a higher fraction of black or African American, and Hispanic males. Notably, compared to beef consumers, goat meat consumer groups had a higher fraction of younger respondents. This might be explained by the fact that elderly individuals are less interested in cooking new dishes (Meneely, Burns, and Strugnell, 2009; Richards and Vassalos, 2023). Compared to the other two groups, goat meat consumers had a higher fraction of individuals with high income.

Conclusion

An increase in demand for goat meat creates an opportunity for market expansion. In response to increasing demand, one strategy that farmers can adopt is adding goats to existing beef herds. This approach could assist in meeting the rising demand while also improving the pasture quality, reducing the gastrointestinal parasite worm load, and increasing profitability. Our study investigates the effect of information treatments, highlighting the health and environmental

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benefits of this meat option, on consumer preferences for goat meat. It also measures WTP for other meat attributes including locally produced, quality, organic certified, and USDA inspected. The findings from this study help improve understanding of consumer preferences for goat meat. Higher demand stimulates higher domestic goat meat production, which would not only provide additional income to goat meat producers, but would also promote sustainable and healthy dietary options.

We find that persuasive information about health and/or environmental benefits can positively impact consumer perceptions and preferences toward goat meat. This type of information messaging can reduce the discount that consumers apply to goat meat compared to beef. Notably, the combination of information about health and environmental benefits appears to be the most effective in promoting goat meat. Thus, future persuasive marketing campaigns that emphasize the health and environmental benefits of goat meat can be an effective method to increase demand for goat meat products among US consumers.

When it comes to meat, consumers prefer a lower price, Fresh from Florida, high quality, and USDA-inspected attributes. Among these attributes, quality is the most important to consumers, indicating a preference for meat with greater marbling. Furthermore, consumers are indifferent about whether a product is organically certified or not. To increase goat meat demand, it is important for stakeholders – such as producers, agribusiness marketers, and distributors – to understand their target market. Our results provide evidence that males, black and African Americans with higher incomes, as well as those who are of Hispanic descent, are more likely to prefer goat meat. In addition, our results suggest that goat meat consumers (51.6 % of the survey respondents prefer goat meat over beef) value quality, and Fresh from Florida attributes in meat. With the results of this study, producers, agribusiness marketers, and distributors should engage in more active communication about the advantages of this specialty goat meat as an option for consumers, especially those who are more likely to prefer goat meat over other options. Engaging consumers with health-related, environment-related, or both, drives demand for goat meat and stimulates food choice decisions.

The findings of our study can benefit the Florida goat meat industry. Our research provides insights that can guide stakeholders towards effective marketing strategies to promote higher demand for Fresh from Florida goat meat. It also uncovers consumer groups who have a higher inclination to choose goat meat, and the present a potential target market for Florida goat meat producers.

One limitation in this study is that the scope was restricted to Florida consumers. This can provide direction for future research to extend our study to a national level. Additionally, future studies may benefit from evaluating WTP for goat meat using incentive-compatible methods to eliminate any potential issues from hypothetical bias. While our study offers valuable insights within the defined attributes, we encourage future studies to look further into alternative representations of the quality attribute. While marbling is commonly associated with quality in beef, it may not have the same application or significance in the context of goat meat. In our study, we used marbling to provide a more consistent basis for consumers' interpretation of high quality. We also used general descriptions such as "juicy" and "more satisfying eating experience" to provide a more comprehensive view of quality. Future research can potentially focus on these general descriptions without explicit mention of marbling or explore other more specific metrics related to goat meat quality. Future studies can also examine alternative framing of our health treatment, which was formatted in persuasive language. Finally, according to CDC's declaration, COVID-19 public health emergency ended on May 11, 2023 (CDC, 2023), hence we acknowledge the potential for pandemic bias in our data obtained in 2021. While recognizing the impact of the pandemic, we believe that our research contributes to a better understanding of consumer preferences for goat meat. Given that there are very few studies in this area, we believe our study can serve as a foundation for future research and comparison to post-pandemic analysis.

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Data availability statement. The data that support the findings of this study are available upon request from the authors.

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