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Prospects for Enhancing the Market for Goat Meat Products: Analysis of the 2019 Goat Meat Survey

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PROSPECTS FOR ENHANCING THE MARKET FOR GOAT MEAT PRODUCTS:

ANALYSIS OF THE 2019 GOAT MEAT SURVEY

A Master's Thesis

Presented to

The Graduate College of

Missouri State University

In Partial Fulfillment

Of the Requirements for the Degree

Master of Science, Agriculture

By

Ashton Mackenzie Light

December 2020

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Agriculture

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ABSTRACT

The objective of this study was to identify goat meat product attributes and sociodemographic drivers of consumers' willingness to buy to goat meat products. To do so the study used a nationwide consumer survey on goat meat preferences. A binary logit model was used to examine the factors affecting willingness to buy. Results show that gender, age, region, primary shopper, and product attribute preference for quality, price, leanness, cholesterol, and freshness significantly affect consumer willingness to buy goat sausage, jerky, burger, and patties.

KEYWORDS: goat meat consumer preferences, willingness to buy goat meat products, socio-demographics, health preferences, freshness, skinless, singed

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In the interest of academic freedom and the principle of free speech, approval of this thesis indicates the format is acceptable and meets the academic criteria for the discipline as determined by the faculty that constitute the thesis committee. The content and views expressed in this thesis are those of the student-scholar and are not endorsed by Missouri State University, its Graduate College, or its employees.

ACKNOWLEDGEMENTS

TABLE OF CONTENTS

LIST OF TABLES

INTRODUCTION

Goat meat is one of the most widely consumed meats in the world but remains one of the least consumed in the United States. An increase in US interest in goat meat production began in the 1990's and production increased significantly in the following years (Qushim, Gillespie, Paudel et al., 2016). Production of all goats in the US peaked in 2008 (US Department of Agriculture, 2020b). The number of meat goats produced in the US has decreased since 2012, but the number of meat goat farms and the value of meat goat sales has increased (US Department of Agriculture, 2017). The average price per pound of imported goat meat is approximately $3 as compared to domestically produced ground goat meat prices between $11 and $20, and leg steak between $15 and $30 (Food and Agriculture Organization of the United Nations, 2018; US Department of Agriculture, 2020a). However, because lower prices for imported goat meat and several challenges facing US meat goat production (Gillespie et al., 2013; Nyaupane et al., 2017), the US imported over 15,000 tons of goat meat in 2018 (Food and Agriculture Organization of the United Nations, 2018;). According to World City (2017), fresh, chilled, or frozen imports of goat and sheep meat, mostly from Australia and New Zealand, increased by 27% in 2017 from the previous year (as cited by Ibrahim et al., 2018).

Although the US is a net importer of goat meat, there are reasons to encourage production of meat goats in the US. Goats are often utilized on farms as both primary and secondary livestock. Goats can be raised on forages unsuitable to other livestock or can be used for brush control as a secondary purpose on existing cattle farms (Gillespie et al., 2016). As reviewed by McMillin and Brock (2005), goats have a positive ecological image which is becoming an important trend among consumers.

As a net importer, the US can put strategies in place to bridge the gap between domestic supply and demand. Puduri et al. (2009) found in the face of food imports, most consumers trust the regulations in the US more than they do international regulations. In US consumers' minds, domestic production has higher food safety than imported meat products (Ibrahim et al., 2018; Puduri et al., 2009). Goats fall under the U.S. Federal Meat Inspection Act but have no quality or yield grades (US Department of Agriculture, 2011). Development of a regulatory grading system, similar to beef, could enhance consumer comfort with domestically produced goat meat.

Increases in goat meat demand, as indicated by the increases in imports into the US, could be attributed to several factors, as a shift of consumer trends toward healthier food choices (Knight et al., 2006). Specifically, there is a shift toward low-fat, low-cholesterol and low-carb diets As a healthy meat alternative, goat meat could capitalize on the current popularity of this trend (McLean-Meyinsse, 2007; Sande et al., 2005; Spencer, 2008; West et al., 2002). Although the meat diet trend is changing, consumers want to eat healthier than they have in the past without sacrificing taste (Guerrero et al., 2014; Smith and Middleton, 2008).

Goat meat is unfamiliar among most US consumers. Unfamiliarity leads to the associated risk of the flavor being unsatisfactory and not knowing how to prepare the product. This factor, among others, are what keeps the demand for goat meat in the US increasing at a slow rate. However, Guerrero et al. (2014) found that lamb was preferred over goat only because consumers were familiar with lamb, but there was no statistical difference in the perception of flavor between the two meats. Meanwhile, McMillin and Brock (2005) found the higher the fat content, the more intense the flavor attribute which is considered less desirable in goat. Therefore, a lower-fat goat meat alternative should have more acceptable flavor for those buying goat for the first time.

Along with flavor and perceived healthiness, another important factor impacting the future demand of goat meat is overall consumer trends in food consumption. Goat meat bought for the purpose of diversifying diets, along with the seasonal nature of demand, leads to less regularity in demand when compared to other conventional meat products (West et al., 2002). Senauer et al. (1991) suggest the risk of flavor acceptance can be moderated by providing taste test samples at local stores as consumers only fully trust their acceptance after tasting the product.

Compared to conventional meats, such as beef, pork and poultry, a paucity of literature regarding consumer preferences for goat meat is available. The following study is timely as it broaches on the need to understand specific consumer preferences that will be responsible for propelling goat meat to be part of the wider US meat market. The objective of the current study is to identify the drivers of goat meat consumption in the US in terms of the product attributes, regulations, and the socioeconomic characteristics of consumers.

LITERATURE REVIEW

Goat is a major meat source for developing countries, notably Southeast Asia and Africa (Guerrero et al., 2014; Qushim et al., 2016; Qushim, Gillespie, Paudel, et al., 2016). However, in the US and other developed countries, it is often considered a specialty meat (Skapetas and Bampidis, 2016). Currently, most of the demand for goat meat in the US comes from the immigrant population. Due to immigration and large ethnic communities, coupled with a growing interest in new consumer groups, production of goat meat and even media coverage is expanding (McLean-Meyinsse, 2007). The US is one of the top importers of goat meat, ranking first in the world in the value of goat meat imports and second in tons imported (Food and Agriculture Organization of the United Nations, 2018). The demand fueled by immigrants is insatiable, while local production is not able to meet demand at such low prices; naturally making the comparatively cheaper goat imports favorable to US consumers (Sande and Houston, 2007). In 2019, consumption trends predicted the demand in the US to exceed domestic production by 160% (Fisher et al., 2009). In 2017, the US produced just over two million meat goats at $120 million. Even so, the US still had to import over 15,000 tons valued at $99 million (Food and Agriculture Organization of the United Nations, 2018). With demand outpacing domestic supply as demonstrated by the large number of imports compared to exports, there is a need to increase domestic production.

Goat meat consumption is relatively novel to the larger US population and may qualify as a niche market. As such, little research on goat meat consumption has been conducted for the US market to date. The following review examines meat goat production domestic and abroad, influence of overall consumer trends, overall meat preferences, the impact of demographics on

food choices, and attribute preferences specific to goat meat. It will also include aspects of goat production that make this agricultural industry an attractive alternative farming practice.

Meat Goat Production

The top five meat goat producing regions in the world are Asia (70.71%), Africa (24.03%), the Americas (2.53%), Europe (2.22%) and the European Union (1.65%). China itself accounts for 35.89% of world production of goats (Skapetas and Bampidis, 2016). Between 2012 and 2017 there was an increase in meat goat farms in the US from 100,910 to 101,578 and an increase in the value of sales from $121 million to $124 million. However, there was a decrease in the inventory of meat goats and kids from 2.05 million to 2 million (US Department of Agriculture, 2017).

In the US southern states, there was an increase of 59% in the number of meat goat farms and 75% in the number of meat goats from 1992 to 1997 (Nelson et al., 2004). The climate of the southern region allows goats to be able to graze suitable forage for more, minimizing the additional cost of supplemental feeds (Qushim et al., 2016). Along with the ideal foraging climate, Texas houses the largest meat-goat auctions in the US. The access to markets and large supply keeps prices less volatile across seasons as compared to the rest of the country (Gillespie et al., 2013). Regions of high goat meat production influence the demand of the product in those regions. A study by Liu et al. (2013) identifies the region of highest goat meat production and consumption in the US to be eleven southern states including: Alabama, Arkansas, Florida, Georgia, Mississippi, North Carolina, Oklahoma, Louisiana, South Carolina, Tennessee, and Texas.

There are several reasons meat goat farming is one of the fastest growing sectors in the US agriculture market (Gillespie et al., 2016). Farmers often take up goat farming for lifestyle reasons. Goats are small compared to cattle, and most are docile if raised around people. Goats can be raised on small farms with little acreage, can be used alongside other livestock for brush control, and provide a safe method of farming for people with limited finances or physical ability (Gillespie et al., 2016; Spencer, 2008). When used in a co-species grazing system, the inclusion of goats allow producers to increase stocking rates due to the lack of competition in forages between goats and other grazing species (Sahlu et al., 2009).

Meat goat farming also presents an environmentally friendly and safe way to produce meat. Consumers are becoming more aware of environmental issues related to agriculture, causing an increase in the demand for natural production systems. Goat production systems can fall into that category for the following reasons (Webb, 2014). Goats can survive on forages not suitable for other livestock and have a high tolerance for heat stress, making them ideal for raising in marginal areas in developing countries (Skapetas and Bampidis, 2016). With the ability to utilize water more efficiently than other livestock, goats can contribute to the sustainability of water supply (Mazhangara et al., 2019; Navarrete-Molina et al., 2020).

The US leads the world in value of goat meat imports and is second in tonnage imported, indicating that US production fails to meet domestic demand (Food and Agriculture Organization of the United Nations, 2018). There are several reasons that domestic supply is unable to meet the demand, causing the goat meat sector in the US to remain an infant industry. The US currently imports more goat meat than it produces because foreign prices for goat meat are low (US Department of Agriculture, 2017). Goat meat prices increase in the late winter and early spring demand is typically the highest. The seasonal breeding nature of goats causes a decrease

6

in supply during the winter and summer months, preventing producers from timing their supply of meat with demand (McMillin and Brock, 2005). Other challenges facing the industry as identified by producers, is the lack of a clear marketing system and insufficient government support (Gillespie et al., 2013). There is strong competition between products in large retail grocery stores, making it difficult for new products to establish themselves. The seasonal supply of goat meat makes it hard to compete with the products that are available all year long for shelf space. The processing and ingredients behind new products are essential to the success of that product (Azaneda et al., 2020).

Targeting niche markets within the goat meat industry may be important for gain traction in the US meat markets. For example, goats that were fed high concentrate diets had a higher fat content and a more gamey and intense flavor, presenting a good opportunity for a grass-fed goat niche market (McMillin and Brock, 2005) If goat meat consumption is to be encouraged, product country of origin may need to be addressed. Goat meat consumers trusted meat produced in the US more than they did imported meat (Puduri et al., 2009). The US producers who market their products in large retail grocery stores need to utilize country of origin labeling to target those consumers. Producers need to understand the current domestic demand for goat meat products. This study attempts to explore the consumer preferences for four variations of processed goat meat.

Meat Preferences

New product developers need to look at consumer trends and preferences. If the product becomes successful, the price of ingredients, in this case goat meat, will increase (Azaneda et al., 2020). Regarding goat meat, most consumers know little about the products, and therefore goat

meat will need to be marketed using the attributes it has in common with other, more familiar products. Attributes can be put into three categories: microbiological (safety aspect), nutritional (leanness, value-added), and sensory, identified as taste, texture, and appearance (Smith and Middleton, 2008). Several studies have ranked the order of importance in customer preferences toward certain attributes and will be discussed as follows separated into meat attributes and specifically goat meat attributes.

Consumer trends affect demand for meat of all kinds. Limited literature is available on the attributes of goat meat, but attribute preferences on meat in general can be used to create a product profile for goats. In general, meat preferences include taste, fat content, freshness, appearance, and US Department of Agriculture (USDA) inspection (McLean-Meyinnsse, 2007). One study found the order of importance to be freshness, food safety, US produced, tenderness, and reasonably priced (Smith and Middleton, 2008). Another study found the order of preference was flavor, tenderness, aroma, and juiciness (Guerrero et al., 2014). In yet another study, the most important intrinsic preference that drove purchasing decisions was the color of the meat, and the most important extrinsic preference was price, with a higher price indicating higher quality (Xazela et al., 2017).

The knowledge of a product's unique combination of attributes is critical for efficient marketing and influencing demand (Nelson et al., 2004). Consumers drive demand and for a consumer to purchase meat, their perceptions about it must be positive (Sirbu, 2014; Xazela et al., 2017). Visible attributes are the ones that drive demand and are the attributes that shoppers use to make their purchasing decisions at the grocery store. Once a purchase is made, consumers form preferences related experiencing the good. Liu et al. (2007) found that consumers are increasingly emphasizing the experience, or flavor, and health values of foods.

According to Hui et al. (1995) women are an important target of new meat products, especially if promotions are related to nutritional attributes. Women are most likely to watch their diet closely and are in the healthier third of the population. Another target mentioned was educated individuals. Those with a formal education, as well as smaller households and those with more adult women are more likely to be adventuresome, try new foods and purchase a variety (Senauer et al., 1991).

Additionally, consumers are looking for more diversity in their diets with 2/3 of US consumers purchasing at least three different types of meat each week (West et al, 2002). This trend toward diversity and adventure poses an important opportunity for expansion of the goat meat industry. To capitalize on this opportunity, goat producers must make sure their product's attributes are in line with the preferences of consumers and market them as so.

Attributes of Goat Meat

Few studies have been done on the attributes specific for goat meat. In a study by Ibrahim et al. (2018), 91.57% of respondents indicated that goat meat quality (taste and tenderness) was very important. Consumers who have not experienced the flavor of goat meat may not accept the product as easily (Borgogno et al., 2015). Literature also suggests it is possible to increase acceptance of goat meat through taste testing and promotional material.

For those who have tasted goat meat, there is a positive aspect to flavor. In an Oklahoma study by Jacques and Norwood (2017), 50% of respondents indicated that their preference for goat meat was equal to or better than pork, and 52% were equal to or better than beef. While goat meat had the lowest rankings of the three meats, it was comparable to both beef and pork in tenderness, flavor, and juiciness (Jacques and Norwood, 2017).

Lamb was preferred over goat meat in another study, mostly consumers were more accustomed to consuming lamb, but there was no statistically significant difference from the flavor of goat meat (Guerrero et al., 2014). In a 2009 study, Fisher et al. found that 53 million people in the US prefer goat meat. Rodrigues et al. (2009) indicated that quality of meats, specifically goat meat, is directly correlated to its tenderness, juiciness, taste, and odor (as cited by Paulos et al., 2015).

Health benefits are one of the most important attributes that drive demand for goat meat. Several studies concluded there is a shift toward consumption of healthier foods (Knight et al., 2009; Rimal, 2002; West et al., 2002), however many consumers still voice their intention of eating healthier without actually changing their food consumption choices. Almost half of adults try to decrease high-fat foods and cholesterol and 29% moderately try. Consumers in the US wanting to try to eat healthier presents a market potential for healthier versions of foods that have similar quality and sensory attributes.

Furthermore, a decline in meat consumption in the US for health reasons has been identified in the literature (Liu et al., 2013; West et al., 2002). In a 2015 survey of US households, two thirds of the respondents indicated they had reduced the consumption of red meat over the course of three years because of health concerns (Neff et al., 2017). Goat meat is one of the healthiest meats on the market (Spencer, 2008). According to the USDA Agriculture Research Service, when compared to chicken, beef, pork, and lamb, cooked or roasted goat meat has the lowest grams of calories, fat, saturated fat, and cholesterol. Cooked Goat meat is 1-2g of protein per 85g of meat lower in protein than beef but has the highest amount of iron (as cited in Mazhangara et al., 2019). As reviewed by Webb (2014), hind limb and dorsal trunk cuts of goat

meat have lower fat content and are associated with a higher retail value. Goat is also a source of linoleic acid which reduces cancer, heart disease and diabetes (Sande et al., 2005).

Households with children were more likely to be concerned with the nutritional value of the food they were consuming, but also preferred meat with their meals (Rimal, 2002). In a 2009 study, Sahlu et al. found that over 60% of respondents had a more positive perception of goat meat after being informed of the nutritional value. The USDA identified health concerns as the primary influencer of consumer demand for meat (as cited in Liu et al., 2013). Goat meat presents a good opportunity for consumers to add a healthy variety to meals without having to sacrifice meat. It is important to promote the health aspects of goat meat, and the versatility in cooking options it gives (Spencer, 2008).

Goat consumer respondents in Southern states indicated that meat safety, price, fat content and cholesterol content, respectively, were most important in making purchasing decisions (Liu et al., 2007). Producer and retailer's knowledge about consumer preferences allows the producer to more successfully market their product to cater to those needs. Only a small number of new products will succeed, specifically those with the bundle of attributes preferred by consumers.

Demographics

Consumer demographics is an important predictor of demand. In 2005, goat meat demand relied primarily on consumption by immigrants from the Middle East, Southeast Asia, and the Caribbean (Sande et al., 2005). This study also found the three major groups that contribute to the goat meat niche market are Muslims, Hispanics, and Africans. Additionally, these groups overall showed higher preference ratings for consuming goat meat than Caucasians (Gillespie et

al., 2016; Nelson et al., 2004). Goat meat is widely accepted across religions, leading to diverse demand markets (Mazhangara et al., 2019). Ten percent of households with families born outside of the US were multi-generational, indicating a range of ages and preferences within a household (Grieco et al., 2010).

Goat meat demand fluctuates throughout the year, dictated by special occasions (Spencer, 2008). In a study in the US state of Georgia, 50% of respondents were willing to buy goat meat on Christmas, Easter, and the 4th of July (Ibrahim et al., 2020). Seasonal characteristics of demand for goat meat are particularly sensitive to male consumers and those who favor lower cholesterol levels (Liu et al., 2013). The seasonal demand, along with the seasonality of production, leads to a volatility in prices. In the US, sales typically peak in the fall, followed by lower prices of goat meat. Meat prices peak in the spring months of February and March due to low supply and Easter which is a popular time for goat consumption (Singh-Knights and Knights, 2005). For prices to lower and remain steady, a more consistent demand is needed. Steadier demand can be accomplished by targeting ethnic groups with marketing. Ethnic diversity currently drives the goat meat market (Nyaupane et al., 2017; Qushim et al., 2016).

Other demographics factors are important to take into consideration are gender, age, and household size. McLean-Meyinsse (2007) found that the consumers from Georgia, Louisiana, Mississippi, Tennessee, and Texas that are more likely to buy goat meat are older, live in multiple-person households, and are non-Caucasians and men. Borgogno et al. (2015) found that males with a mean age of 44 were more familiar with goat meat products than females.

The US demand and supply of goat meat is comparatively lower than developing countries. Reasons to increase production in the US include environmental benefits of goat production to control weedy species and goats can be utilized on land not suitable to other

livestock or crops. On the demand side, goat meat can add a healthy meat variety to diets. Demand in the US is currently driven by immigrant populations. Efforts to increase demand could lead to easier access to goat meat products in grocery stores. The objective of this study is to identify the demographic profile of consumers willing to buy four potential goat meat products: sausage, jerky, burger, and patties. In addition, to identify the consumer preferences for goat meat and the effect those preferences have on willingness to buy these products.

METHODS

Consumer utility maximization theory was used to analyze willingness to buy meat goat products. Utility maximization models were found to be most appropriate due to the data used in this study and an evaluation of models such as logit, ordered probit and factor analysis used widely in previous similar studies (Gillespie et al., 2016; McLean-Meyinsse, 2007; Puduri et al., 2009; Rimal, 2002; Smith and Middleton, 2008). The framework can be viewed as one where a utility depends not only on the product attributes, but also on the personal characteristics of the consumer. Preferable in this study is the logit model, which predicts the likelihood that the independent variable would occur solely on the consumer's socio-economic characteristics and other product value attributes (Puduri et al., 2009). Logit models have been widely used to model consumer behavior in applied economics (Train, 2002).

Conceptual Framework

The relationship between consumer willingness to buy goat meat products and product's attributes and consumer characteristics is explored by modeling the indicator variable Z_i, for the ith consumer as a function of their economic, demographic and attributes associated with the meat product as follows:

$$Z_i = \beta X_i = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + K + \beta_k x_{ik} + v_i, \text{ i} = 1, 2, \text{K, n}(1)$$

where x_{ij} denotes the jth attribute of the ith respondent, $\beta = (\beta_0, \beta_1, \ldots, \beta_k)$ is the parameter vector to be estimated and v_i is the random error or disturbance term associated with the ith consumer. Under the logistical distributional assumption for the random term, the probability P_i

(that the ith consumer will be willing to buy goat meat products) can now be expressed as (Green, 2002):

$$P_i = F(Z_i) = F(\beta_0 + \sum_{j=1}^{k} \beta_j x_{ij}) = F(\boldsymbol{\beta X}_i) = \frac{1}{1 + \exp(-\boldsymbol{\beta X}_i)} \quad (2)$$

The estimated β-coefficients of the above equation do not directly represent the marginal effects of the independent variables on the probability P_i that the consumer will be willing to buy goat meat products. For binary explanatory variables, the marginal effect is determined as (source):

$$\partial P_i / \partial x_{ij} = P(x_{ij} = 1) - P(x_{ij} = 0) \quad (3)$$

The conceptual framework and empirical model are implemented using the data from a national survey on consumer preferences of goat meat as described in the following section.

Data

To analyze the willingness of goat meat consumers to buy goat meat products, data from a 2019 national consumer survey was conducted between October 30th and November 4th was used. An online consumer survey was sent to residents in all the 50 states in the US. Quotas were set to ensure balances in gender, ethnicity and certain regions perceived to be consuming higher levels of goat meat. The survey target sampling frame was the civilian population over eighteen years of age who had consumed goat meat at some point in their lifetime or were willing to try it. The target sample size was 1,200 (+/- 3% sampling error). The survey took 15 minutes on average to complete.

The survey instrument was developed by Fort Valley State University providing leadership with inputs from Missouri State University and University of Arkansas research

collaborators. The necessary International Review Board approvals were obtained by the Fort Valley project research team and can be found in Appendix A. The questionnaire was provided to Dynata (Shelton, CT) to program into their survey platform, which they utilized to provide useful insights on the research. To ensure all data collection is in accordance with the written questionnaire, Dynata initially conducted a pilot study with 120 respondents. Once confirmed that the survey platform aligned with the questionnaire provided, a full launch occurred to collect data for the remaining 1,080 respondents in the sample size. A total of 3,294 panelists accessed the survey, but only 1,200 completed all questions.

Questions on the survey asked respondents about the importance of goat meat product attributes including freshness, leanness, taste, quality, cholesterol level, and price on consumer preferences. Additionally, questions regarding whether participants considered grass-fed, genetically modified, or locally grown attributes in their willingness to buy a product were included. Questions on demographics, such as age of participant, education, gender, annual gross household income and household size as potential predictors of goat meat product preferences were also asked. The full survey can be found in Appendix B.

Empirical Model

The explanatory variables in this model include consumer preferences regarding goat meat attributes and demographics of the respondent. Variables were chosen based on past literature regarding goat meat consumption as well as consumption preferences of other meat products. Tables 1a and 1b show the variables included in the model as well as the descriptive statistics for each. Included below are the definitions of each variable and an explanation for their inclusion.

Gender. The dummy variable FEMALE is assigned a value of 1, and those who are male were assigned a 0. The sample of respondents was evenly distributed between males and females. Several studies indicate males are more willing to buy or are more familiar with goat meat (Borgogno et al., 2015; Ibrahim et al., 2017; McLean-Meyinsse, 2007). Therefore, males are expected to be more willing to purchase goat meat products.

Age. To examine willingness to buy goat meat products, respondents were organized into three categories. The groups were assigned as follows: (1) younger than 35 years old (YOUNG); (2) between 35 and 55 years of age (MIDAGE); (3) 55 years and older (MATURE). The distribution of ages was evenly split among the groups with 33% of respondents identifying with each category. Literature indicates older generations will be more willing to buy goat meat (McLean-Meyinsse, 2007). However, a more current study of Southern residents indicates those of a younger age will be more willing to purchase goat meat (Ibrahim et al., 2017). With consumer trends changing and younger generations being more willing to try new foods, the prior expectations for this variable is those under the age of 35 will be more willing to buy goat meat products.

Region. The variable region is included to identify regional consumption of goat meat products. The regions identified were (1) Northeast, (2) Midwest, (3) South and (4) West. The states included within each region can be found in Table 2. About 33% of respondents reside in the Northeast, while 23% reside in each of the other three regions. Prices are less volatile across seasons in the Southern Plains region because Texas is home to the largest goat-meat auctions in the US (Gillespie et al., 2013). The southern states are also known as the top goat meat production and consumption region in the US (Liu et al., 2013). With steadier prices and greater

17

access to markets comes the *a priori* expectation that individuals living in the Southern region will be more willing to buy goat meat.

Prefer Skinless. To examine goat meat preferences, respondents were asked whether they preferred skinless goat meat over singed or burned. The variable skinless was coded as a 1 if the respondent prefers skinless and 0 to explore the preference for skin-on. Of the respondents, 45% preferred skinless when selecting goat meat. There are no prior expectations for this variable.

Occasion. Goat meat is highly seasonal in demand (Liu et al., 2013; Spencer, 2008). Respondents were asked if they which for which special occasion they were more willing to buy goat meat. Special occasions included in the survey were Christmas, Easter, Ramadan, Eid-al-fitr, Eid-al-adha, wedding, July 4th and other. Of those surveyed, 69% were most willing to buy goat meat for Christmas. Based on the descriptive statistics and previous literature, we explored Christmas as a major occasion celebrated by assigning respondents who selected Christmas as 1, 0 being other special occasions. This will give producers an insight as to when demand for goat meat is likely to fluctuate. The demand for goat meat is highly dependent on special occasions (Spencer, 2008). Half of respondents were more willing to purchase goat meat on Christmas in a 2020 study (Ibrahim et al., 2020). In 2019, 90% of US consumers indicating that they planned to celebrate Christmas. Therefore, the *a priori* assumption is that respondents will be more willing to purchase goat meat products on Christmas than other special occasions (Statista Research Development, 2019).

Primary Shopper. To analyze whether the primary shopper would be willing to buy goat meat products, the variable of PRIM_SHOP was included in the model. The respondent was assigned a 1 if they were the primary shopper of their household, and a 0 otherwise. It is

expected the primary shopper will be more willing to buy goat meat products. They are typically more familiar with the food they purchase and more likely to take the time to compare attributes such as the price and health aspects of goat meat to other more conventional meat products. Therefore, it is expected the primary shopper will have a positive coefficient.

       Attribute Preferences. To examine the preference for goat meat, this study explored the importance of quality, price, freshness, leanness, and cholesterol. To identify which attributes consumers prefer when buying goat meat, respondents were asked to indicate how important their perception of each attribute was in making their buying choices. Respondents who identified each variable as important were assigned a 1 and 0 if they ranked the variable as not very or not important at all. Of the respondents, 77% indicated quality, identified as taste and tenderness, was important when making their purchasing decisions. In a 2018 study, over 90% of goat meat consumers indicated quality, taste, and tenderness were very important (Ibrahim et al., 2018) With flavor being one of the most important drivers of demand and an important aspect of quality (Paulos et al., 2015), it is expected those who value quality as important will be more willing to buy these products.

       A study by Xazela et al. (2017) found that price was the most important extrinsic motivator in meat purchasing decisions. In this study, 58% of respondents ranked price as an important attribute. Since higher prices can indicate higher quality (Xazela et al., 2017), the *a priori* expectations for this variable is those who value price as important will be more willing to purchase goat meat.

       Freshness is a product attribute explored in previous meat preference studies (McLean-Meyinnsse, 2007; Smith and Middleton, 2008). Of the respondents surveyed for this study, 60% indicated they valued freshness as important. The study by Smith and Middleton (2008)

identified freshness as the most important food attribute, leading to the assumption that those who value freshness will be more willing to buy goat meat products.

Leanness and cholesterol content preferences are explored to identify the value of health attributes when consumers are making their buying decisions. There is a correlation between goat meat products and the consumer preferences for more healthy food products (Liu et al., 2013). According to McLean-Meyinnsse (2007), fat content is one of the general attributes consumers look for when purchasing meat. In this study, 48% of respondents valued leanness as important when purchasing goat meat. Since goat meat is on average leaner than both beef and pork (Sande et al., 2005), it is expected those who value leanness as important will be more willing to buy goat meat. Of the respondents, 45% ranked cholesterol level of goat meat as important when making purchasing decisions. Goat meat is not only lower in total fat, but also saturated fat than beef and pork (Sande et al., 2005), making the cholesterol level lower than other meat options. Therefore, the *a priori* expectations are the more important cholesterol levels are to consumers, the more willing they will be to buy goat meat.

Household Size. To explore the effect of household size on consumer willingness to buy goat meat products, respondents were asked to identify how many people resided in their home. If they had greater than two people in the household, the respondent was assigned a 1 and 0 otherwise. Ethnic populations currently drive the demand for goat meat and ethnic populations in the US and typically have larger household sizes (Grieco et al., 2010). A study by Rimal (2002) indicated that households with children are more concerned with health choices, but still preferred to have meat with their meals. A study in 2007 found those who were more willing to buy goat meat live in multi-person households (McLean-Meyinnsse, 2007). Ibrahim et al. (2017) also found that individuals who lived in larger households were more willing to eat goat meat.

With the healthy attributes of goat meat and the large demand from ethnic populations, it would follow that larger household sizes lead to greater willingness to buy goat meat.

Education. To identify the relation between formal education level and willingness to buy goat meat products, respondents were asked what level of education they had completed. Responses were divided into three categories as follows: (1) less than high school education (LTHSCHOO); (2) has had some college education (SOME_COL); and (3) is a college graduate (COLLEGE). Of those surveyed, 47% were college graduates, 29% had some college education and 24% had less than a high school education. These numbers are comparable to the US national statistics in 2019 that 35% of Americans were college graduates, 26% had some college education and 38% had a high school diploma or less education (US Census, 2019). Consumers with a higher education tend to be more adventuresome in trying new foods (Senauer et al., 1991), therefore it is expected the higher the education, the more willing the respondent will be to buy goat meat.

Income. To identify if the variation in income levels of respondents was significant in determining their willingness to buy goat meat products, respondents were asked to identify their annual income and were then divided into four groups. The groups were as follows: 1) annual household income of less than $40,000 (INCOM_LT); (2) income between $40,000 and $80,000 (MIDINC41); (3) income between $80,000 and $120,000 (INC80_12); and (4) income greater than $120,000 (INC_AB12). About 33% of the respondents belong to INCOM_LT, 31% belong to MIDINC41, 21% belong to INC81-120 and the remaining 15% belong to Above INC_AB120 groups. It is expected an increase in income will lead to an increase in willingness to buy goat meat.

Marriage. To explore the effect of marital status on consumer willingness to buy goat meat products, respondents were assigned a 1 if they indicated they were married and a 0 otherwise. There was little previous literature regarding marriage and willingness to buy goat meat products. Several factors from other demographic findings in previous studies contribute to the assumption respondents who are married are more willing to buy goat meat. Therefore, there are no *a priori* expectations for this variable.

Race. To explore the role of ethnicity in willingness to buy goat meat products, respondents were assigned a 1 if they are white and a 0 otherwise. Of the respondents, 77% identified their race as white. Based on the literature, this variable is expected to have a negative relation to willingness to buy goat meat products. Demand for goat meat is driven by immigrant populations (Spencer, 2009). It has also been found non-Caucasian consumers are more willing to buy goat meat products (McLean-Meyinnsse, 2007). Therefore, it is expected respondents who are of European descent are less willing to buy goat meat.

The relationship between consumer willingness to buy goat meat products and the product's attributes and consumer characteristics was analyzed using the indicator variable Z_i for the ith consumer as a function of their socioeconomic and preference attributes as follows:

where:

Z_i = unobserved index level for the log odds of choice for the ith consumer;

x_{ij} = j^{th} attribute of the ith respondent;

$\beta = (\beta_0, \beta_1, \ldots, \beta_k)$ = the parameter vector to be estimated; and

v = random error or disturbance term.

The following empirical model was used to estimate the relation between the willingness of the consumer to buy the goat meat product and their socioeconomic, demographic and meat preference attributes:

$$WTP_i = \beta_0 + \beta_2 \text{ FEMALE} + \beta_3 \text{YOUNG} + \beta_4 \text{MIDAGE} + \beta_5 \text{NORTHEAST} + \beta_6 \text{SOUTH}$$
$$+ \beta_7 \text{WEST} + \beta_8 \text{SKINLESS} + \beta_9 \text{CHRISTMAS} + \beta_{10} \text{PRIM\_SHOP}$$
$$+ \beta_{11} \text{ATT\_QUAL} + \beta_{12} \text{ATT\_PRICE} + \beta_{13} \text{ATT\_FRESH} + \beta_{14} \text{ATT\_CHOL}$$
$$+ \beta_{16} \text{ATT\_LEAN} + \beta_{17} \text{LTHSCHOOL} + \beta_{18} \text{SOME\_COL} + \beta_{19} \text{INCLT40}$$
$$+ \beta_{20} \text{INCOM41\_80} + \beta_{21} \text{INCO80\_120} + \beta_{22} \text{MARRIED} + \beta_{23} \text{WHITE} + v$$

where:

$i = 1\text{-}4$

1 = SAUS = 1 if the respondent is willing to buy goat meat sausage, and 0 otherwise.

2 = JERKY = 1 if the respondent is willing to buy goat meat jerky, and 0 otherwise.

3 = PATT = 1 if the respondent is willing to buy goat meat patties, and 0 otherwise.

4 = BURG = 1 if the respondent is willing to buy goat meat burgers, and 0 otherwise.

Four different logistic models (for the specific goat meat products) were estimated to explain and predict consumer willingness to buy. The maximum likelihood (ML) estimation procedure was used to obtain the model parameters. The model summary statistics, β-coefficients (along with their t-ratios) and the marginal effects were obtained by using the software package NLOGIT (Econometric Software, Inc. 2008).

MODEL ESTIMATION AND EMPIRICAL RESULTS

The maximum likelihood estimates of the model coefficients and the associated t-ratios are reported in Tables 2-5. The tables also report the estimated values of the log-likelihood functions of the unrestricted and the restricted (i.e., all slope coefficients are zero) models. The estimated values of the McFadden's R^2 are measures of goodness of model fit. The marginal effects of the independent variables on the dependent variable (i.e., willingness to buy a goat meat product) are reported. Additionally, the tables provide information on model prediction success.

Willingness to Buy Goat Sausage

First, the consumer willingness to buy goat sausage is explored. Of the 928 respondents, 500 (53.9%) were willing to buy goat meat sausage (WTB_SAUS=1), while 428 (46.1%) were not willing to purchase this product. Table 3 reports model estimates for the consumer willingness to buy goat sausage. The demographic variables that are significant are gender, age and education. Gender and age, specifically those under the age of 35, are significant at the 1% level. Females had a negative coefficient, indicating they were less likely than males to purchase goat sausage, which aligns with the assumption that males would be more willing to buy than females.

The category of YOUNG (less than 35 years of age) are more willing to buy goat sausage than MATURE (over the age of 55) respondents, contradicting the literature that older generations are more likely to buy goat meat (McLean-Meyinsse, 2007), but agreeing with Ibrahim et al. (2017) that youth are more willing to buy. This may be explained by the

24

convenient nature of the products tested in this study. Older generations may prefer more traditional cuts of goat meat to sausage. The coefficient of SOME_COLL was significant at the 5% level with a positive coefficient, indicating those who had some college education are more willing to buy goat sausage. Similarly, Hui et al. (1995) found that consumers with higher education are more willing to try new varieties of foods.

The coefficient of PRIM_SHOP and the coefficient of ATT_QUAL were significant and positive. While females are less likely to buy goat sausage, the primary shopper was more willing to buy goat meat sausage. The data contradicts previous literature that the female is usually the primary shopper, were more likely to choose healthy options and were more adventuresome eaters (Hui et al., 1995; Senauer et al., 1991). As expected, those who value quality and low cholesterol as very important are more willing to buy goat sausage. The responses align well with findings by Spencer (2008) that goat meat is healthier than other major meats on the market.

The estimated marginal effects of the independent variables show that respondents' perceptions on product attributes and some demographic factors influenced their willingness to buy goat meat sausage. Respondents whose decisions to purchase goat meat products were dictated by the importance placed on cholesterol and quality attributes vis -a-vis those who did not were 11 and 26% more likely to buy goat meat sausage. In terms of demographics, respondents who were college educated and the primary shoppers were 10 and 18% more likely to buy goat sausage. Females were 11% less likely to purchase goat meat sausage. Young people, i.e. *YOUNG* (18-34 years compared to those age 55 years or older) were 15% more likely to purchase goat meat sausage.

The model summary statistics presented in Table 7 indicate it had significant explanatory power with a Chi square of 106.42, significant at less than 1%. The model has a McFadden's R^2 of 8%, typical of cross -section data. It has a predication success rate of 64%. The predicted values of this model are shown in Table 8.

Willingness to Buy Goat Jerky

Among the 941 respondents, 399 (42.4%) were willing to buy goat jerky, while 542 (57.6%) were not willing to buy this product. Table 4 reports the model estimates for the consumer willingness to buy goat jerky. The demographic variables that are significant are gender, age, region, and education. The coefficients YOUNG and MIDAGE were significant at the 1% level with positive coefficients. In this model, those between the age of 35 and 55 were most willing to buy goat jerky, with those under the age of 35 being more willing to buy than mature (older than 55). Findings agree with the *a priori* assumption that younger consumers would be more willing to purchase goat meat products.

Gender and the Northeast region are significant at the 5% level with negative coefficients. Respondents residing in the Northeast region are less likely to purchase goat jerky than those in the other surrounding regions, confirming the assumption that the South would be more willing than other regions to purchase goat meat.

Like sausage, females are less willing to buy goat jerky than males. The demographic variables of SOME_COL and WEST are significant at the 10% level. Consumers living in the western region were less willing to buy this product than those in other regions. This aligns with the literature that top goat meat consumers are in the southern and Midwest regions (McLean-

Meyinsse, 2007). Lastly and as expected, those who had some college education were more willing to buy goat jerky.

The coefficient PRIM_SHOP is significant at the 10% level with a positive coefficient, confirming *a priori* assumptions the primary shoppers would be more willing to purchase goat meat. The product attributes that are statistically significant are the importance of quality, price, freshness and leanness attributes. Quality and price are significant at the 1% level with positive coefficients, indicating that respondents who value quality and price as important are more willing to buy goat jerky. Freshness was significant at the 5% level and leanness at the 10% level, all with positive coefficients. These attribute coefficients were expected to have positive coefficients and this model confirms those assumptions.

The marginal effects show the influence of demographics and attribute preferences on the willingness to buy goat meat jerky. The demographics that influenced the decision to buy goat jerky were gender, age, education and region of the country. Women (7%) and those residing in the Northeast (11%) and West (9%) are less willing to buy goat jerky. The youth and those with some college education were 12 and 9% more willing to buy. Respondents who valued quality (8%), price (15%), freshness (9%), and leanness (9%) as important were more likely to buy goat jerky. The primary shopper was also 8% more willing to buy goat jerky.

The model summary statistics presented in Table 7 show it had significant explanatory power with a Chi Square of 100.06 significant at less than 1%. The model also has a McFadden's R^2 of 8%, typical of cross-sectional data. It has the highest prediction success rate of the four models at 66%. The predicted values of this model are shown in Table 8.

Willingness to Buy Goat Patties

There were 938 respondents in this study, of which 394 (42%) indicated they were willing to buy goat meat patties. Meanwhile, 544 (58%) responded they were not willing to buy this product. Table 5 reports the model estimates for the consumer willingness to buy goat meat patties. The demographic variables that are statistically significant in this model are age and gender. Gender is significant at the 1% level with a negative coefficient. Like the previous products discussed and aligning with previous expectations, female respondents were less willing to buy goat patties than the male respondents. Significant at the 5% level and like the previous models discussed, those under the age of 35 years are more willing to buy goat patties than mature consumers. This also aligns with the *a priori* expectations of this study.

The coefficient of primary shopper is significant at the 5% level. The product attributes that are statistically significant in this model are the attributes of quality, price, freshness, and cholesterol. Quality, price, and freshness are significant at the 1% level, while cholesterol is significant at the 5% level. As expected, all these attribute variables have positive coefficients, indicating those who are the primary shopper and value these attributes as important are more willing to purchase goat meat patties which were expected for this model.

The estimated marginal effects in this model are used to show the influence of attributes and demographics on consumer willingness to buy goat meat patties. The significant demographic variables were age and gender, with females being 11% less willing to buy and those under the age of 35 being 10% more willing to buy. The significant attribute variables were primary shopper and valuing quality, price, freshness, and cholesterol content as important. The primary shopper was 11% more willing to buy. Those who shop for quality (18%), price (12%), freshness (10%), and cholesterol (9%) are more willing to buy goat sausage.

28

The model summary statistics presented in Table 7 show this model has significant explanatory power with a Chi square of 103.77 significant at less than 1%. The model for goat patties also has a McFadden's R2 of 8%, typical of cross-sectional data, with a prediction success rate of 64.55%. The predicted values of this model are shown in Table 8.

Willingness to Buy Goat Burger

Among the 930 respondents in this survey, 453 (48.7%) were willing to buy goat meat burger, while 477 (51.3%) were not willing to buy this product. Table 6 presents the estimated model for consumer willingness to buy goat meat burger. The demographic variables that were statistically significant were age, gender, region and ethnicity. The variable YOUNG was significant at the 1% level with a positive coefficient indicating those who are under the age of 35 are more willing to buy goat burger. This is the same across all four dependent variables tested and was not expected.

Gender and ethnicity are significant at the 5% level. As with the other products, females had a negative coefficient and are less willing to buy goat burger than males. Contrary to previous literature, those who identified their race as white in this study were more willing to buy goat meat burger than those of different ethnicities. This could be explained by the nature of the product tested. The Western region is significant at the 1% level and the South at the 5% level with both regions being less willing to buy goat meat burger. This is surprising considering the recent increase in goat meat production in the Southern states (Nelson et al., 2004).

The shopper and product attribute variables significant in this model are primary shopper, special occasion and the importance of quality, price and leanness. Primary shopper, quality, price and leanness are all significant at the 1% level and have positive coefficients. This is as

expected because leanness is a quality of goat meat that improves both the health aspect and the taste (McMillin and Brock, 2005). The variables of PRIM_SHOP, ATT_QUAL, and ATT_PRICE were also expected to have positive coefficients. Willingness to purchase goat meat for a special occasion was positive and significant at the 10% level, with respondents being more willing to buy goat burger at Christmas than other special occasions. This is in line with *a priori* assumptions.

The estimated marginal effects in this model show how the demographics and personal preferences of the respondents effects their likelihood of purchasing goat meat burger. The significant demographic variables were age, gender, region, and ethnicity. Women (9%) and those residing in the West (14%) and South (11%) were less willing to buy goat burger. Those younger than 35 (15%) and those between 35 and 55 (8%) were more willing to buy goat meat burger. Surprisingly, respondents who are white were 9% more willing to buy this product.

The attributes that were significant included special occasion, primary shopper and the importance of quality, price, and leanness. Respondents were 7% more willing to buy goat burger for Christmas than any other special occasion. The primary shopper was 18% more willing to buy goat meat burger. Those who rank quality (15%), price (12%), and leanness (14%) as important were more willing to buy goat burger.

The model summary statistics of this model presented in Table 7 include a Chi square of 110.22, indicating a significant explanatory power of less than 1%. This model has the highest McFadden's R^2 at 9%, typical of cross-sectional data. This model also has a prediction success rate of 62%. The predicted values of this model are shown in Table 8.

DISCUSSION

This study attempts to predict willingness to buy goat meat products like the well-established beef or other highly consumed meat markets in the US. The research focused on sausage, jerky, patties and burger goat products. Goat meat consumption is a recent addition to the US meat market with most consumption in pockets of the East, West, and Southern US. In its infancy, it is mostly an unstructured market. Consumption of goat meat within unstructured markets has been found in urban centers, such as Minneapolis and Ohio, where large Somali communities are present (Worley et al., 2004).

In the past, there has been little research done regarding consumer attitudes towards goat meat attributes in the US. For that reason, this study uses literature regarding consumer preferences for conventional meat products and goat meat products. In a study by Senauer et al. (1991), quality was found to be one of the major attributes consumers look for when making food choices. It was no surprise this study found quality to be a highly significant ($p < 0.001$) and was a positive indicator for all four goat products. Consumers that value high quality meat when making their purchasing decisions are more willing to buy goat meat products which indicates that meat goat producers need to focus on producing high quality products while marketing needs to focus on information regarding that quality.

Another attribute noted for its importance in food choices in previous studies is price. Price is the most important extrinsic motivator for purchasing decisions (Xazela et al., 2017). Smith and Middelton (2008) found a reasonable price was very important to consumers. However, Xazela et al. (2017) indicate a higher price is perceived as a higher quality of product. As mentioned before, quality perception is critical to the success of a product. In this study, price

was highly significant with a positive coefficient for jerky, patties, and burger. Since goat meat products are relatively new to the market, they cannot price themselves out of the market. Consumers might not be as willing to try a new product if it is unreasonably priced. McMillin and Brock (2005) included a low price as one of the attributes of goat meat that is attractive to consumers. Goat meat products such as these need to maintain that reasonable price, while keeping their price high enough that consumers perceive the product is high quality. The importance of freshness to consumers appeared in two previous studies, which indicate there is a consumer trend toward healthier diets that are not processed or frozen (McLean-Meyinsse, 2007; Smith and Middleton, 2008). In this study, freshness was only significant for jerky and patties, with a positive coefficient.

One of the primary benefits of consuming goat meat is the healthy attributes it possesses. Goat meat has lower fat and cholesterol than other red meats, including beef and pork (Sande et al., 2005). Consumers tend to want health foods, without sacrificing variety and meats (Rimal, 2002; West et al., 2002). To analyze the correlation between consumer willingness to buy goat meat and their preference for leanness and low cholesterol meats, these variables were included in the survey. Viewing leanness as important when making the decision to buy goat meat was statistically significant for jerky and burgers. The importance of cholesterol levels in meat when making consumption choices was significant for sausage and patties. In this study, each product had a health attribute that was positive and significant. The results indicate that consumers do look at the health value of foods before making purchasing decisions. The goat meat market has a great opportunity to promote the nutrient values of goat meat compared to more conventional products.

The primary shopper is one of the most important targets for marketing. Primary shoppers are the ones that primarily go to the grocery store each week to make the purchasing decisions for their families. If the primary shopper is more willing to purchase goat meat than otherwise, there is a great opportunity for the goat meat market to gain traction. As expected, the variable of PRIM_SHOP was significant and positive for all products, indicating that the primary shopper in a household is more willing to buy. The primary shopper is more likely to be familiar with the attributes of products they are purchasing. If they are given information and samples of goat meat, they could be the key to increasing this market (Jacques and Norwood, 2017).

Previous literature regarding food products in general, indicates promotion of new products should target the female consumer (Hui et al., 1995). It was also found that the female consumers were healthier and more adventurous eaters (Senauer et al., 1991). However, for goat meat specifically, those found by McLean-Meyinnsse (2007) to be the most likely to try goat meat were men. This study confirms men are more willing to buy goat meat products than women. The female variable was significant and negative across all four models, indicating females are less willing to buy sausage, jerky, patties, and burgers than men.

A study by McLean-Meyinsse (2007) also indicates that those more willing to try goat meat are older. In contrast, his study confirmed that the youth (those under the age of 35) are more willing to purchase goat meat than the more mature consumers. The variable YOUNG was significant and positive in all four models. Those between 35 and 55 was significant and positive for jerky and burgers, indicating they could also be a target market for these two products.

Region, preference for skinless meat, special occasion and race were only significant for a couple of the products. The Northeast region was negative and significant for jerky, indicating those residing in the Northeast are less willing than other regions to purchase jerky. The Western

region was also significant and negative for jerky, as well as burgers. The South was significant and negative for willingness to buy burgers. These findings indicate that promotions should focus away from these areas.

Consumer preference for skinless meat was significant and positive for goat burgers only. Another variable only significant in one model was special occasion. Respondents indicated that they are more willing to buy goat burger for Christmas than other special occasions. In a study by Spencer (2008), it was found that the demand for goat meat is highly dictated by special occasions. It is surprising this variable was only significant in the model for burger in this study. This could be accounted for by the type of products included in the study. Of the four products included in this study, burger is the most versatile in preparation methods.

Lastly, the race of the respondent was only significant for burgers and it was positive. Research regarding goat meat indicates that a majority of the demand in the US comes from immigrant populations (McLean-Meyinsse, 2007, Sande and Houston, 2007). Race was only significant for one product, and whites were more willing to buy than other races. This could be accounted for by the nature of the products included. Respondents of other races and ethnicities could be less familiar with these products than they are will traditional cuts of goat meat. Burger is a staple in American diets and that might not be the case with other immigrant populations. For goat meat products to gain traction in the US market, it is critical that promotions focus on males, the younger generation and primary shoppers while promoting the quality of the products and keeping the price reasonable yet high enough to indicate good quality.

CONCLUSION AND IMPLICATIONS

This study suggests that the appeal of goat meat products is still uncommon in most Americans. It is also important to understand why people will buy goat meat products to expand the goat meat market in the US. The research suggests there may be attributes that consumers use to make food choices no matter what product they are buying, including goat meat. Data from a national consumer survey was analyzed to determine the impact of demographics as well as socioeconomic and product attributes on willingness to buy goat meat sausage, jerky, burgers, and patties. The data indicates that some attributes are significant across all four products, whereas other preferences and variables are unique to individual products. Overall, between 40 and 53% of respondents were willing to buy goat meat products.

The empirical results show the only variable that was significant at the 1% level across all four products is the attribute of quality. This indicates consumer's preferences for quality meat is critical to the purchasing decisions when buying goat meat. The survey identified the variable of quality as flavor and tenderness. If the consumer perceives the meat as having a higher quality, they are more willing to buy. This finding is important for all levels of goat meat production, from the farmer to the salesperson. Selling goat meat of the highest quality will enhance the positive perception of the product, allowing it to gain better access to and have a more competitive presence in the meat market.

Primary shopper, age and gender were also statistically significant across all products in varying degrees of significance. For goat meat to penetrate the market and continue to grow as an industry, they need to first target those consumers who are most willing to buy the product. This narrows the scope of promotion and marketing and allows incremental access to the market

with more efficient use of resources. Based on the empirical results from this study, those promotions should be focused on the primary shopper of the household, those under the age of 35 years of age and men.

Other product attributes included in this study and worth mentioning are price, freshness, leanness, and cholesterol, all of which were significant in at least two of the products examined. Those who valued price as important were more willing to buy goat jerky, patties, and burgers. This study identified price as a significant predictor of willingness to buy. However, consumer willingness to pay a premium for each product was not identified. Freshness was also significant for jerky and patties. The attributes of leanness and cholesterol were important for jerky and burgers, and sausage and patties, respectively which presents an opportunity for producers to heavily promote the healthy aspects of goat meat compared to its competitors. Consumers consider the health aspects, price, freshness, and quality when they are making their purchasing decisions for goat meat, so these are the areas that should be targeted with advertising and promotions.

The empirical results of these models show the region, skinless preference, special occasion, education, and ethnicity were only significant for one product each and not at the 1% level. These variables should be explored further before being used to guide promotions. The variables that were insignificant across all variables in these models were income and marriage status in this study. There was little previous literature on these variables, so it can be concluded that they are not significant in consumer willingness to buy goat meat products.

This study broadens our understanding of the factors driving willingness to buy goat meat products including factors that go beyond socioeconomics such as freshness and quality as important in a consumption decision. The findings of our study may also be important for

marketing conventional food products, as well as goat meat products. These findings can help goat meat producers aim their marketing to make it more efficient and productive in gaining greater access to US meat markets.

The goat meat industry is fast-growing but remains an infant industry in the US. It will take more education to continue to grow the consumption of goat meat. This study does not include US citizens who had not previously consumed goat meat. To gauge the willingness to try these unfamiliar products, future research should include those that have not tasted goat meat. This study also does not include the flavor of goat meat as compared to other meats, an important attribute for meat preferences according to this research. This is attribute is an important contributor to the fear of many in the US of trying goat meat products. Future studies should include flavor and taste testing in their research to compare to other meats and to give more comfort to those wary of trying new products.

This study is limited to gauging the willingness of consumers to try potential goat meat products. These products are more conventional in nature than traditional cuts of goat meat. As previous consumers of goat meat, respondents may be less willing to buy these products than the traditional cuts of goat meat they consumed before. Future research should also analyze preparation methods for goat meat. With new products, consumers often do not know how to best prepare the meat. If they prepare it wrong, this can lead to a poor perception of the flavor of goat meat. Value-added products, such as those tested in this study, can help bring comfort to those buying the product and require less preparation. However, more studies need to be done regarding preparation of goat meat and more information sent to consumers regarding the subject.

The literature regarding goat meat consumption in the US is scarce. Many more studies need to be conducting to analyze the market and find a niche for goat meat in the US. These studies will help consumers have a positive perception about goat meat and be more willing to buy these products in the future.

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    Consumers on the Aspects of Meat Quality and Health Implications Associated with
    Meat Consumption." *Sustainability* 9(5):1-11.

Table 1a. Descriptive Statistics of Explanatory Variables Used in the Analysis

Variable	Description of Variable	Mean	Std. Dev.
WTB_SAUS	1 = willing to buy sausage; 0 = otherwise	0.530	0.499
WTB_JERK	1 = willing to buy jerky; 0 = otherwise	0.417	0.493
WTB_PATT	1 = willing to buy patties; 0 = otherwise	0.407	0.492
WTB_BURG	1 = willing to buy burgers; 0 = otherwise	0.481	0.500
FEMALE	1 = respondent is female; 0 = otherwise	0.501	0.500
YOUNG	1 = age less than 35 years; 0 = otherwise	0.333	0.472
MIDAGE	1 = age is between 35 and 54 years; 0 = otherwise	0.333	0.472
MATURE*	1 = age 55 years or higher; 0 = otherwise	0.333	0.472
NORTHEAS	1 = resident of northeast region; 0 = otherwise	0.333	0.472
MIDWEST*	1 = resident of midwest region; 0 = otherwise	0.223	0.416
SOUTH	1 = resident of southern region; 0 = otherwise	0.222	0.416
WEST	1 = resident of western region; 0 = otherwise	0.223	0.416
SKINLESS	1 = prefer skinless; 0 = otherwise	0.446	0.497
CHRISTMAS	1 = consume goat meat for Christmas; 0 = otherwise	0.691	0.462

Notes: Asterisk implies that the variable was dropped during estimation to avoid dummy variable trap.

Table 1b. Descriptive Statistics of Explanatory Variables Used in the Analysis

Variable	Description of Variable	Mean	Std. Dev.
ATT_QUAL	1 = identifies quality as important; 0 = otherwise	0.766	0.423
ATT_PRIC	1 = identifies price as important; 0 = otherwise	0.580	0.494
ATT_FRES	1 = identifies freshness as important; 0 = otherwise	0.602	0.490
ATT_LEAN	1 = identifies leanness as important; 0 = otherwise	0.480	0.500
ATT_CHOL	1 = identifies cholesterol as important; 0 = otherwise	0.449	0.498
HSHOLD	1 = >2 residents in household; 0 = otherwise	2.630	1.431
LTHSCHOO	1 = Less than high school education; 0 = otherwise	0.239	0.427
SOME_COL	1 = Some college education; 0 = otherwise	0.287	0.452
COLLEGE*	1 = College graduate; 0 = otherwise	0.474	0.500
INCOM_LT	1 = (annual) income < than $40,000; 0 = otherwise	0.326	0.469
MIDINC41	1 = (annual) income between $40,000 and $80,000; 0 = otherwise	0.313	0.464
INC80_12	1 = (annual) income between $80,000 and $120,000; 0 = otherwise	0.210	0.408
INC_AB12*	1 = (annual) income > than $120,000; 0 = otherwise	0.150	0.358
MARRIED	1 = respondent is married; 0 = otherwise	0.498	0.500
WHITE	1 = respondent is white; 0 = otherwise	0.772	0.420

Notes: Asterisk implies that the variable was dropped during estimation to avoid dummy variable trap.

Table 2. Categorization of States into Region

Northeast	Midwest	South	West
Connecticut	Illinois	Alabama	Alaska
Maine	Indiana	Arkansas	Arizona
Massachusetts	Iowa	Delaware	California
New Hampshire	Kansas	Florida	Colorado
New Jersey	Michigan	Georgia	Idaho
New York	Minnesota	Kentucky	Montana
Pennsylvania	Missouri	Louisiana	Nevada
Rhode Island	Nebraska	Maryland	New Mexico
Vermont	North Dakota	Mississippi	Oregon
	Ohio	North Carolina	Utah
	South Dakota	Oklahoma	Washington
	Wisconsin	South Carolina	Wyoming
		Tennessee	
		Texas	
		Virginia	
		West Virginia	

Table 3. Maximum Likelihood Estimates of Model Coefficients and Marginal Effects of Independent Variables on Willingness to Buy: Goat Meat Sausage

Variable	Coefficient	t-ratio	P-value	ME
FEMALE	-0.4379	-2.987	0.003	-0.11
YOUNG	0.6082	3.328	0.001	0.15
MIDAGE	0.2422	1.354	0.176	0.06
NORTHEAS	-0.0542	-0.275	0.784	-0.01
WEST	-0.1387	-0.654	0.513	-0.03
SOUTH	0.0587	0.278	0.781	0.01
CHRISTMAS	0.2357	1.527	0.127	0.06
SKINLESS	0.1740	1.225	0.221	0.04
PRIM_SHO	0.7408	3.326	0.001	0.18
ATT_QUAL	1.0615	5.336	0.000	0.26
ATT_PRIC	0.1356	0.914	0.361	0.03
ATT_FRES	0.0973	0.607	0.544	0.02
ATT_LEAN	-0.0238	-0.135	0.892	-0.01
ATT_CHOL	0.4382	2.561	0.010	0.11
LTHSCHOO	0.2002	1.005	0.315	0.05
SOME_COL	0.4122	2.311	0.021	0.10
INCOM_LT	-0.0395	-0.152	0.879	-0.01
MIDINC41	-0.0587	-0.25	0.802	-0.01
INC80_12	0.1068	0.442	0.658	0.03
MARRIED	0.0562	0.361	0.718	0.01
WHITE	0.2064	1.2	0.230	0.05

Table 4. Maximum Likelihood Estimates of Model Coefficients and Marginal Effects of Independent Variables on Willingness to Buy: Goat Meat Jerky

Variable	Coefficient	t-ratio	P-value	ME
FEMALE	-0.2981	-2.03	0.04	-0.07
YOUNG	0.5015	2.73	0.01	0.12
MIDAGE	0.6966	3.82	0.00	0.17
NORTHEAS	-0.4557	-2.31	0.02	-0.11
WEST	-0.4006	-1.87	0.06	-0.09
SOUTH	-0.2384	-1.14	0.25	-0.06
CHRISTMAS	0.1687	1.09	0.28	0.04
SKINLESS	0.1256	0.89	0.38	0.03
PRIM_SHO	0.3625	1.60	0.11	0.08
ATT_QUAL	0.6754	3.32	0.00	0.15
ATT_PRIC	0.3775	2.54	0.01	0.09
ATT_FRES	0.3902	2.43	0.02	0.09
ATT_LEAN	0.2902	1.68	0.09	0.07
ATT_CHOL	0.1295	0.77	0.44	0.03
LTHSCHOO	0.3319	1.69	0.09	0.08
SOME_COL	0.2411	1.37	0.17	0.06
INCOM_LT	0.2321	0.88	0.38	0.06
MIDINC41	0.0521	0.22	0.83	0.01
INC80_12	0.1575	0.65	0.52	0.04
MARRIED	-0.1312	-0.84	0.40	-0.03
WHITE	0.2026	1.17	0.24	0.05

Table 5. Maximum Likelihood Estimates of Model Coefficients and Marginal Effects of Independent Variables on Willingness to Buy: Goat Meat Patties

Variable	Coefficient	t-ratio	P-value	ME
FEMALE	-0.4531	-3.06	0.002	-0.11
YOUNG	0.4196	2.31	0.021	0.10
MIDAGE	0.1862	1.03	0.305	0.04
NORTHEAS	-0.0224	-0.11	0.910	-0.01
WEST	-0.2205	-1.03	0.305	-0.05
SOUTH	-0.2777	-1.31	0.192	-0.07
CHRISTMAS	0.2282	1.46	0.144	0.05
SKINLESS	0.2037	1.43	0.152	0.05
PRIM_SHO	0.4721	2.05	0.041	0.11
ATT_QUAL	0.7942	3.77	0.000	0.18
ATT_PRIC	0.5075	3.36	0.001	0.12
ATT_FRES	0.4274	2.64	0.008	0.10
ATT_LEAN	0.0282	0.16	0.872	0.01
ATT_CHOL	0.3751	2.19	0.028	0.09
LTHSCHOO	0.2267	1.14	0.255	0.06
SOME_COL	0.1460	0.82	0.414	0.04
INCOM_LT	0.0956	0.36	0.716	0.02
MIDINC41	0.2749	1.15	0.252	0.07
INC80_12	0.2455	1.01	0.311	0.06
MARRIED	0.0532	0.34	0.733	0.01
WHITE	0.1525	0.88	0.377	0.04

Table 6. Maximum Likelihood Estimates of Model Coefficients and Marginal Effects of Independent Variables on Willingness to Buy: Goat Meat Burger

Variable	Coefficient	t-ratio	P-value	ME
FEMALE	-0.3496	-2.37	0.02	-0.09
YOUNG	0.6021	3.31	0.00	0.15
MIDAGE	0.3255	1.82	0.07	0.08
NORTHEAS	-0.2604	-1.31	0.19	-0.06
WEST	-0.5568	-2.60	0.01	-0.14
SOUTH	-0.4304	-2.03	0.04	-0.11
CHRISTMAS	0.2623	1.69	0.09	0.07
SKINLESS	0.1036	0.73	0.47	0.03
PRIM_SHO	0.7596	3.25	0.00	0.18
ATT_QUAL	0.6357	3.16	0.00	0.15
ATT_PRIC	0.4761	3.18	0.00	0.12
ATT_FRES	0.1574	0.98	0.33	0.04
ATT_LEAN	0.5824	3.34	0.00	0.14
ATT_CHOL	0.0054	0.03	0.97	0.00
LTHSCHOO	0.2822	1.42	0.16	0.07
SOME_COL	0.2399	1.36	0.17	0.06
INCOM_LT	-0.0179	-0.07	0.95	0.00
MIDINC41	0.1294	0.54	0.59	0.03
INC80_12	-0.0178	-0.07	0.94	0.00
MARRIED	-0.0681	-0.44	0.66	-0.02
WHITE	0.3646	2.10	0.04	0.09

Table 7. Estimated Model Results

	Sausage	Jerky	Patties	Burger
LL	-592.48	-594.51	-589.7	-593.2
Restricted LL	-645.69	-644.54	-641.58	-648.3
Chi-Square	106.42	100.06	103.77	110.22
DF	21.00	21.00	21.00	21.00
McFadden's R^2	0.08	0.08	0.08	0.09
Prediction Success	0.64	0.66	0.65	0.62

Table 8. Predicted Values of Model Results

	Predicted	0	1	Total
Sausage	0	226	208	434
	1	131	370	501
	Total	357	578	935
Jerky	0	441	110	551
	1	215	182	397
	Total	656	292	948
Patties	0	425	127	552
	1	208	185	393
	Total	633	312	945
Burger	0	301	182	483
	1	174	279	453
	Total	475	461	936

APPENDICES

Appendix A: Institutional Review Board Approval

Fort Valley State University
A State and Land-Grant University
University System of Georgia

Department of Veterinary Science & Public Health
1005 State University Drive - Fort Valley, Georgia 31030-4313

13 Oct 2019

Fort Valley State University IRB #1
US-OHRP (DHHS) #: IRB00006368
FWA #: 00018566

Dear Dr. Ibrahim:

Having made all necessary modifications and having clarified for the Human Subjects Committee all concerns, your proposal submission designated HSC-F-19-12.Ibrahim is complete. On behalf of the Human Subjects Committee, it is my pleasure to notify you that this proposal has received final acceptance from our IRB. An electronic copy, with required signatures, will be forwarded to your office for your records. If the project has not been completed by 20 Sep 2021, you must request renewed approval for continuation of this project. It has been a sincere pleasure for us to serve you. God's blessings on your study. If we may be of further assistance to you, please do not hesitate to ask.

Clarence E. Riley, Jr., PhD.
Chair, Human Subjects Committee
Fort Valley State University
825-6898

Appendix B: List of Survey Questions

S1: What is your gender?

S2: What is your age?

Q1: Have you ever tasted or eaten goat meat?

Q2: What are your reasons for not eating goat meat? Please provide all the reasons that contribute to your decision not to eat goat meat.

Q3: Suppose your area grocery store is giving out goat meat samples. Would you be willing to try it?

Q4: Have you ever purchased raw goat meat?

Q5: How often do you purchase goat meat? (Please select one response)

Q6: What's your preference in goat meat? (Please select one response)

Q7: Do you normally buy a whole (live) goat?

Q8: Where do you purchase your goats? (Please select all that apply)

Q9: What live weight do you prefer? (Please select one response)

Q10: Do you butcher your own goat meat?

Q11: Where do you purchase your goat meat products? (Please select all that apply)

Q12: The following are special occasions when you might purchase more goat meat. Please identify the **top three** occasions that you purchase more goat meat.

Q13: On average, how much did you spend on goat meat per purchase during the past month?

Q14: On average, how many pounds of goat meat did you purchase during the past month?

Q15: On average, how much did you pay for a pound of goat meat during the past month?

Q16.1: How important is it to you, that the goat meat you eat is processed in a conventional or regular manner?

Q16.2: How important is it to you, that the goat meat you eat is processed in a kosher or Jewish manner?

Q16.3: How important is it to you, that the goat meat you eat is processed in a Halal or Islamic-allowable manner?

Q16.4: How important is it to you, that the goat meat you eat is processed in some other manner?

Q17.1: Suppose your area grocery store carries goat meat that is certified as halal by a reputable Islamic organization or Imam. Would you be willing to purchase such meat?

Q17.2: Suppose that the price of uncertified halal goat meat is $4.00 per pound. What is the **maximum amount** of premium per pound that you would be willing to pay to purchase the certified halal goat meat?

Q18.1: Please indicate the extent of which you agree or disagree with each of the following statements.
      I purchase goat meat based on country of origin.
      Domestic Goat meat is safer than imported goat meat.

Q19: Are you willing to pay more for domestic produced goat meat than imported goat meat?

Q20: How much more, in percent, would you be willing to pay?

Q21: Are you the primary shopper in your household?

Q22: If made available to you, how much more willing (if at all) would you be to buy the following goat meat products?
      Sausage
      Jerky
      Patties
      Burgers

Q23: For comparison purposes, a package of beef jerky (1 ounce) is typically sold for between $1.29 and $2.00 in a grocery store. Would you be willing to buy goat jerky?

Q24: What is the maximum price you would be willing to pay for goat jerky?

Q25: Would you be more willing, indifferent to, or less willing to buy the following items if made available to you?
      Grass-fed goat meat
      Locally grown goat meat
      Organically grown goat meat
      Genetically modified goat meat

Q26: Do you read labels for fat and cholesterol content when shopping for meat and meat products?

Q27-31: Please indicate if each of the following is very important, somewhat important, or not important.
        Quality, including taste and tenderness
        Price
        Freshness (not frozen)
        Leanness (less fat)
        Less cholesterol

Q32: Including yourself, how many people live in your household?

Q33: How many people in your household are less than 18 years old?

Q34: Which of the following represents the highest level of education you have completed?

Q35: Which of the following categories best describe your total household income before taxes?

Q36: Are you single, married, separated, divorced, widowed, or something else?

Q37: Please indicate your race.

Q38: Please indicate your ethnicity.

Q39: Were you born in the United States?

Q40: Which of the following geographic areas are you from?

Q41: How old were you when you arrived in the United States?