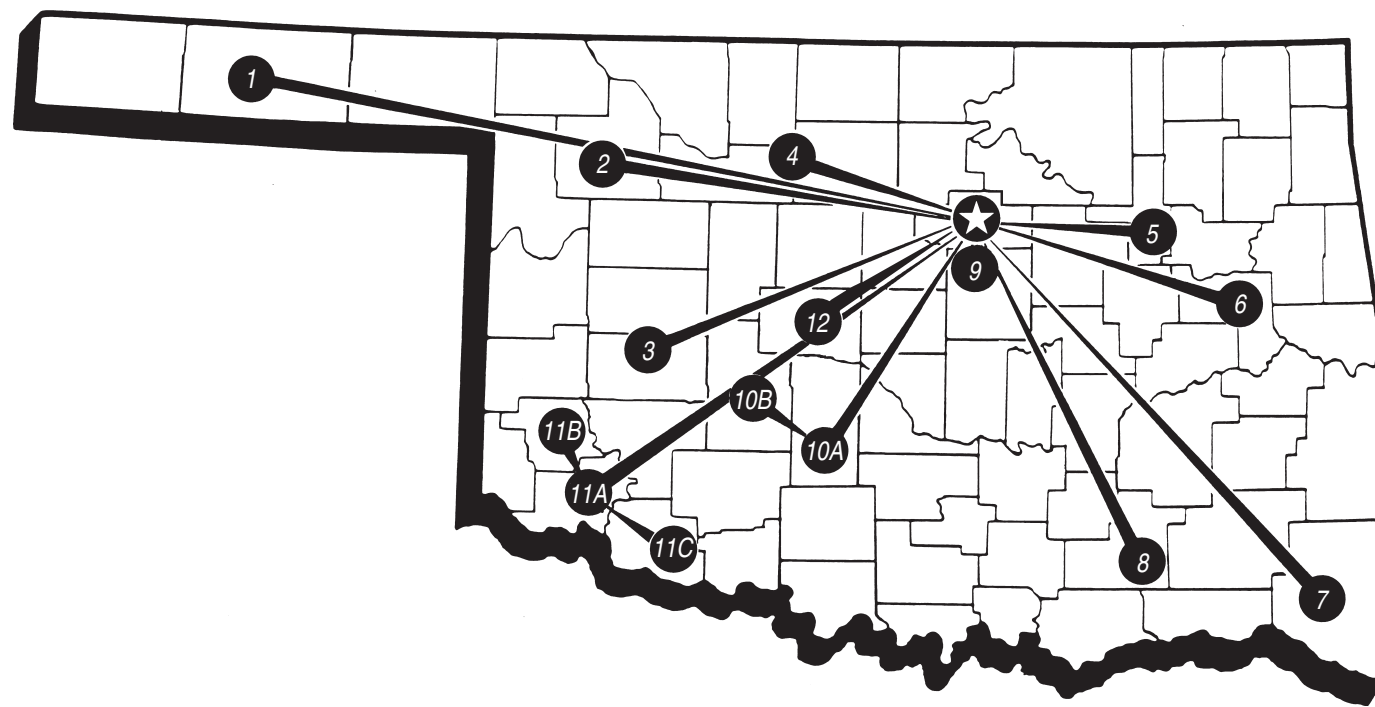


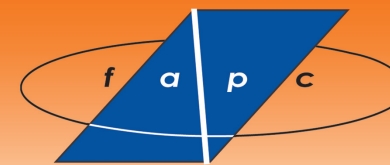
# THE OKLAHOMA AGRICULTURAL EXPERIMENT STATION SYSTEM COVERS THE STATE



- ★ **MAIN STATION**—Stillwater and adjoining areas
- 1. **Oklahoma Panhandle Research and Extension Center**—Goodwell
- 2. **Southern Plains Range Research Station**—Woodward
- 3. **Marvin Klemme Range Research Station**—Bessie
- 4. **North Central Research Station**—Lahoma
- 5. **Oklahoma Vegetable Research Station**—Bixby
- 6. **Eastern Research Station**—Haskell
- 7. **Kiamichi Forestry Research Station**—Idabel
- 8. **Wes Watkins Agricultural Research and Extension Center**—Lane
- 9. **A. Agronomy Research Station**—Perkins  
**B. Oklahoma Fruit and Pecan Research Station**—Perkins
- 10. **A. South Central Research Station**—Chickasha  
**B. Caddo Research Station**—Ft. Cobb
- 11. **A. Southwest Research and Extension Center**—Altus  
**B. Sandyland Research Station**—Mangum  
**C. Southwest Agronomy Research Station**—Tipton
- 12. **Grazingland Research Laboratory**—El Reno

Oklahoma State University, in compliance with Title VI and VII of the Civil Rights Act of 1964, Executive Order 11246 as amended, Title IX of the Education Amendments of 1972, Americans with Disabilities Act of 1990, and other federal laws and regulations, does not discriminate on the basis of race, color, national origin, sex, age, religion, disability, or status as a veteran in any of its policies, practices or procedures. This includes but is not limited to admissions, employment, financial aid, and educational services.

Issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Edwin L. Miller, Interim Director of Oklahoma Cooperative Extension Service, Oklahoma State University, Stillwater, Oklahoma. This publication is printed and issued by Oklahoma State University as authorized by the Dean of the Division of Agricultural Sciences and Natural Resources and has been prepared and distributed at a cost of \$5.40 per copy. MHG 1004.



WWW.FAPC.OKSTATE.EDU

OKLAHOMA AGRICULTURAL EXPERIMENT STATION • OKLAHOMA STATE UNIVERSITY

FOOD AND AGRICULTURAL PRODUCTS  
RESEARCH AND TECHNOLOGY CENTER

FOOD TECHNOLOGY  
RESEARCH REPORT

## Impacts of Consumer Characteristics and Perceptions on Willingness to Pay for Natural Beef in the Southern Plains

Jody Campiche, Rodney B. Holcomb, and Clement E. Ward\*

\*Authors are, respectively, former Research Assistant, Associate Professor, and Professor, Department of Agricultural Economics, Oklahoma State University.

### Introduction

The beef industry has experienced significant changes in marketing programs in recent years, largely due to a decline in beef demand. According to Purcell, beef demand declined each year from the mid-1970's to 1990. Per-capita beef consumption declined from 95 pounds in 1976 to approximately 65 pounds in 1990. The estimate for per-capita beef consumption in 2000 was approximately 69 pounds, a slight increase from 1990. Causes for the sharp decline in demand continue to be debated, but one potential cause is an apparent change in consumer tastes and preferences related to the image of beef.

Changes in demand have prompted some producers to develop programs for marketing "natural" (i.e. no growth hormones or antibiotics used in production) beef products. These marketing campaigns have risen from the considerable attention given to the use of growth promotants in livestock production in recent years, and some have been relatively successful on the East and West Coasts. Although the USDA has stated that residues from hormones administered in proper doses pose no threat to human health, some consumers are still not convinced (Kenney and Fallert). The recent success of niche markets for "natural" or "hormone-free" beef provides evidence that consumers are concerned about hormone use (Lusk and Fox). Skaggs et al. also reported that there is a consumer segment interested in branded, low-fat and natural beef products.

In the Southern Plains states of Kansas, Oklahoma, and Texas where considerable beef production occurs, natural beef marketing efforts have been relatively

limited. Little information exists related to tastes and preferences for natural beef among consumers in the Southern Plains. As producers in these states place greater emphasis on the possibilities of collectively marketing natural beef on a regional basis, such information may play an important role in venture assessment. At the request of a group of Oklahoma natural beef producers, a consumer survey and subsequent data analyses were undertaken to provide marketing recommendations to those interested in producing and promoting natural beef in the Southern Plains.

### Consumer Interest in Natural Beef

In order to understand the premium prices associated with natural beef products, one must consider the additional costs associated with producing natural beef. Currently about 95 percent of all cattle in the United States are implanted with growth hormones due to increased production efficiency and decreased production costs (Kenney and Fallert; Kuchler et al.; Lusk and Fox). The production of natural beef, therefore, results in increased production costs due to lower feed conversion efficiency, marketing costs (segregation, identity preservation), time investment, and potentially lower carcass yield. When antibiotics and growth hormones are not used in beef production, average daily gains decline (Boland, Boyle, and Lusk). As suggested in the Angus Journal by Mayer, it may cost 25 percent more to produce natural beef than to produce traditional beef. To maintain profitability, natural beef producers will need higher revenues to offset the increased costs of production (Boland, Boyle, and Lusk).

Menkhaus et al.. (1988) conducted a study to determine how a price premium on branded, low-fat, fresh beef impacted sales. The study showed that there exists a consumer segment willing to pay a higher price for a low-fat and natural product. However, information is needed regarding whether consumer segments in the Southern Plains (Oklahoma, Kansas, and Texas) are willing to pay premium prices to purchase natural beef products. Producers need to know how to effectively position their products to consumers. Grannis and Thilmany note that the target consumers must be able to recognize products that are hormone and antibiotic free or that are “environmentally friendly” according to a defined set of criteria. Therefore, producers must utilize marketing and packaging/labeling methods that will make their products stand out to consumers.

Givry found that although the organic produce market is expanding rapidly, the natural beef market suffers from limited product availability (i.e. few providers to the retail market and limited beef product offerings), consumer awareness of products, or a perception that the price is too high. Organic and natural products were only available at health food stores until the 1990’s (Boland, Boyle, and Lusk), but are now becoming more common in conventional food stores. It is, therefore, probable that as more consumers see and test natural/organic products in their traditional shopping places, the sales potential for natural beef should increase.

### Consumer Survey Procedures

Consumer purchasing behavior is assumed to be a function of several demographic factors, including age, gender, education, income, and household size. While demographic factors are often used as proxies for actual tastes and preferences in consumer studies, specific information on meat purchasing behavior and perceptions of natural beef may provide a more distinct indication of consumers’ willingness to pay for natural beef.

For this study, researchers surveyed consumers in supermarkets that offer natural foods, including a variety of meats, as part of an effort funded by USDA’s Sustainable Agriculture Research and Education (SARE) program. Following the guidelines of the SARE project, consultants began the surveys in November 2000 and finished in March 2001. Note

that this was not a random sample from the Southern Plains states because researchers specifically tried to get responses from consumers who buy natural products or shop in stores that carry natural foods.

One hypothesis of this study design was that consumers who purchase natural products represent the best potential market segment for natural beef. For purposes of the study, supermarkets chosen for consumer surveys were ones that maintain a section of their stores for natural foods. Eight stores from three geographic locations were chosen: two stores in the Oklahoma City (OKC) metropolitan area, three stores in the Dallas/Ft. Worth (DFW) metroplex, and three stores in the Kansas City (KC) metroplex (two in Kansas, one in Missouri). The surveys took place in stores that agreed to allow consumer sampling at their meat display counters. One hundred responses were received from each store, although some of these were incomplete and, thus, not useable in statistical evaluations.

Survey administrators asked customers, or more specifically those customers who were the primary shoppers for their households, to voluntarily participate in the survey, which usually took less than three minutes to complete. The questions addressed consumer meat purchasing behaviors, perceptions and preferences for natural beef, indicators of willingness-to-pay for natural beef cuts, and demographic characteristics of the household<sup>1</sup>.

To examine the impacts of consumer characteristics on willingness to pay for natural beef in the Southern Plains, the Dichotomous Choice Contingent Valuation Method (DC-CVM) was incorporated in the survey. The dichotomous choice method seems to approximate markets in which consumers have some experiences or familiarity (Calia and Strazzer). It also lowers the possibility of respondents exaggerating their expressed willingness to pay.

Survey respondents were given a hypothetical supermarket scenario and asked to make a choice: purchase “regular beef” sirloin steaks at \$4/pound or “natural beef” sirloin steaks at \$5.60/pound. If respondents chose to purchase the natural beef, they were given a second scenario in which the regular beef price remained the same but the natural beef price jumped to \$6.50/pound. Those who chose regular beef in the first scenario were also provided an additional scenario in which the natural beef price dropped to \$5/

Table 7. Likelihood Ratio Tests for Independent Variables Used in Model 2

Variable	Chi-Square	Pr > Chi-Square
Informed about Meat Processing	0.64	0.7275
Traceability of Meat	3.32	0.5060
Check Labels	10.3*	0.0357
Purchase Natural/Organic Food Products	10.4*	0.0343
Factor Affecting Beef Purchases	7.26	0.0641
Image of Natural Beef	5.78	0.1230
Interest in More Ingredient Information	2.50	0.6450
Beef Consumption	1.37	0.7116
Bone-in/Boneless	6.51*	0.0107
Beef Type	5.68*	0.0583
Preference for %Lean Ground Beef	0.03	0.9831
Factors Affecting Meat Purchases		
Healthy/Safe	1.73	0.6307
Convenient	3.10	0.5408
Appealing	8.91	0.0633
Price	32.79*	<.0001
Ratings of Beef Display Characteristics		
Cholesterol	16.12*	0.0029
Calories	4.59	0.3326
Sodium	11.52*	0.0213
Artificial Ingrid	5.63	0.2284
Ratings of Factors Affecting Beef Purchases		
Color	0.18	0.9960
Marbling	7.87	0.0963
External Fat	10.13*	0.0383
Tenderness	7.69	0.1035
Packaging	4.45	0.3479
Brand	14.79*	0.0052
Leanness	7.45	0.1140
Sodium	1.06	0.9001
Art Ingrid	5.95	0.2028
Knowledge of Natural Beef	4.02	0.1342
Frequency of Natural Beef Purchases	25.83*	<.0001
Attitude Before Reading Description	0.91	0.6344
Attitude After Reading Description	26.16*	<.0001

\*Chi-square analyses indicated significance at the 0.05 level.

<sup>1</sup> Detailed survey results and copies of the survey instrument are available upon request from the authors.

Table 6. Estimation Results: Significant\* Variables in Model 2

Variable	Estimate	Std Error	Odds Ratio**
<b>Check Labels</b>			
never	-2.9811	1.5506	0.0507
frequently	-1.3626	0.4783	0.2560
<b>Purchase Natural/Organic Food Products</b>			
rarely	-2.5865	1.1816	0.0753
Bone-in/Boneless	-1.1482	0.4571	0.3172
<b>Beef Type</b>			
Ground Beef	1.2537	0.6425	3.5033
<b>Factors Affecting Meat Purchases</b>			
<b>Appealing</b>			
somewhat important	1.5632	0.571	4.7741
<b>Price</b>			
not important	5.8955	1.3727	363.3985
somewhat important	2.855	0.9325	17.3744
important	1.8334	0.5106	6.2551
<b>Ratings of Beef Display Characteristics</b>			
<b>Cholesterol</b>			
very low	-3.5993	1.2461	0.0273
somewhat high	-1.3682	0.5731	0.2546
high	-1.8332	0.5792	0.1599
<b>Sodium</b>			
low	2.1512	0.8571	8.5952
<b>Ratings of Factors Affecting Beef Purchases</b>			
<b>Marbling</b>			
not important	-2.1116	1.0527	0.1210
<b>Ext Fat</b>			
somewhat important	1.2562	0.5767	3.5121
<b>Tenderness</b>			
somewhat important	1.4102	0.6874	4.0968
<b>Brand</b>			
not important	-2.8658	0.8346	0.0569
<b>Leanness</b>			
not important	3.0567	1.5468	21.2573
<b>Artificial Ingredients</b>			
somewhat important	-1.2138	0.5720	0.2971
<b>Frequency of Natural Beef Purchases</b>			
never	-4.9183	1.8583	0.0073
occasionally	-5.7038	1.8365	0.0033
frequently	-4.1676	1.8428	0.0155
<b>Attitude after Reading Description</b>			
positive	3.3362	0.7324	28.1121

\*Contact authors for all estimation results. \*\*Odds compared to either the highest/omitted level in a category (see Table 1).

pound while the regular beef price stayed at \$4/pound. Responses to these scenarios were placed into one of four identifiable categories:

- 1) NN - Respondents preferred natural beef to regular beef regardless of the price.
- 2) NR - Respondents would buy natural beef at \$5.60/pound but would switch to regular beef when the price of natural beef increased to \$6.50/pound.
- 3) RN - Respondents would buy regular beef when the price of natural beef was \$5.60/pound but would switch to natural beef when the price dropped to \$5/pound.
- 4) RR - Respondents preferred regular beef to natural beef regardless of the price.

### Methodology for Analyzing Survey Data

The multinomial logit procedure was used to assess the effect consumers' demographic characteristics had on their willingness to pay for natural beef. However, since demographic factors alone may not fully explain consumers' purchasing decisions, the effects of consumers' meat purchasing behavior and perceptions of natural beef on willingness to pay were also determined. The multinomial logit model is useful for analyzing the effects of independent variables on a finite number of choices and has been used extensively in recent consumer decision studies (Schupp, Gillespie, and Reed; Caffey and Kazmierczak; Luzar et al.; Moutou and Brester; Zepeda).

In the random utility model, a consumer's utility derived from a choice is specified as a linear function of the consumer's characteristics and the specific attributes of the choice, in addition to an error term. The probability that a consumer will select a certain choice is equal to the probability that the utility derived from that choice is greater than the utility derived from all other choices. The multinomial logit model results when the random utility error terms are assumed to be independently and identically distributed as a log Weibull distribution (Kennedy).

Following Greene (1993), the general multinomial logit model is:

$$(1) \text{Prob}(Y_i = j) = \frac{e^{\beta_j x_i}}{\sum_{k=1}^J e^{\beta_k x_i}} \quad \text{for } j = 1, 2, \dots, J.$$

where Y is the dependent variable corresponding to the choice made by the consumer with vector of characteristics x<sub>i</sub> faced with j choices. β is a vector of

unknown parameters corresponding to the consumer's characteristics and e is the natural base of logarithms.

The coefficients in this model do not allow for direct determination of the marginal effects. The marginal effects of the regressors on the probabilities are:

$$(2) \frac{\partial P_j}{\partial x_i} = P_j \left[ \beta_j - \sum_{k=1}^J P_k \beta_k \right]$$

Two multinomial logit models were estimated for this study. The first model estimated the effect consumers' demographic and socioeconomic characteristics had on their willingness to pay for natural beef. Several previous studies have found that consumers' willingness to pay was significantly affected by their demographic and socioeconomic characteristics (e.g., Thompson and Kidwell; Malone; Misra, Huang, and Ott; Byrne, Gempesaw, and Toensmeyer).

Consumers' demographic and socioeconomic characteristics, however, may not always be the best proxies for tastes and preferences, so a second model estimated the effect of consumers' meat purchasing behavior and perceptions of natural beef on their willingness to pay for natural beef. Purchasing behavior and perceptions of natural beef were determined by respondents' answers to several questions included in the survey that were designed to capture their beef tastes and preferences.

The first logit model was specified as:

$$(3) \text{Prob}(Y_i = j) = f(\text{Age}_i, \text{Gender}_i, \text{Education}_i, \text{Income}_i, \text{Children}_i, \text{Metropol}_i) \quad \text{for all } i=1 \dots n.$$

where,

Prob(Y<sub>i</sub> = j) = probability that respondent i fell into one of j categories (j = NN, NR, RN, or RR).

The names and definitions of the independent variables used in both Model 1 and Model 2 are presented in Table 1. All of the independent variables used in Model 1 were class variables. The frequency distributions for the demographic and socioeconomic variables used in Model 1 are shown in Table 2.

The second logit model was specified as:

$$(4) \text{Prob}(Y_i = j) = f(\text{Informed about Meat Processing}_i, \text{Traceability of Meat}_i, \text{Check Labels}_i, \text{Purchase Natural/Organic Food Products}_i, \text{Factor Affecting Beef Purchases}_i, \text{Image of Natural Beef}_i, \text{Interest in More Ingredient Information}_i, \text{Beef Consumption}_i, \text{Bone-in/Boneless}_i, \text{Beef Type}_i, \text{Preference for \%Lean Ground Beef}_i, \text{Healthy/Safe}_i, \text{Convenient}_i, \text{Appealing}_i, \text{Price}_i, \text{Cholesterol}_i, \text{Calories}_i, \text{Sodium Content}_i, \text{Artificial Ingredients Content}_i, \text{Color}_i, \text{Marbling}_i, \text{Ext Fat}_i, \text{Tenderness}_i, \text{Packaging}_i, \text{Brand}_i, \text{Leanness}_i, \text{Sodium}_i)$$

Knowledge of Natural Beef<sub>i</sub>, Frequency of Natural Beef Purchases<sub>i</sub>, Attitude before Reading Description<sub>i</sub>, Attitude after Reading Description<sub>i</sub>) for all  $i=1 \dots n$ , where once again,

Prob( $Y_i = j$ ) = probability that respondent  $i$  fell into category  $j$  ( $j = NN, NR, RN, \text{ or } RR$ ).

All of the independent variables used in Model 2 were class variables. The frequency distributions for the variables explaining consumers' meat purchasing behavior and perceptions of natural beef are shown in Table 3. Tests confirmed that there were no multicollinearity problems in either model.

## Results

### Model 1 Results

Consumers' demographic and socioeconomic characteristics were expected to influence their willingness to pay for natural beef. Surprisingly, results of Model 1 indicated that only two of the variables were significant in explaining consumers' willingness to pay for natural beef (Table 4). Odds ratios are presented along with parameter estimates for the purposes of comparing the likelihoods of respondents actually paying premiums for natural beef. For the purposes of explaining the results, use of the terms "purchasing natural beef" or "having a higher willingness to pay" for natural beef refer to the respondent being in the "NN" response category (i.e. would choose natural beef over "regular" beef at any price setting in the dichotomous choice scenario).

The odds (Table 4) of a respondent with an annual household income greater than \$100,000 purchasing natural beef were about 1.81 (1/0.5536) times the odds of a respondent with an annual household income between \$40,000 and \$69,999, not as great a difference as the authors had expected. Respondents from DFW were more willing to pay a higher price for natural beef than respondents from OKC. The odds of a respondent from DFW of purchasing natural beef were 5.65 times the odds for a respondent from OKC.

Consumers' gender, age, household size (i.e. having children living at home), and education level were expected to influence their willingness to pay for natural beef. However, none of these variables were found to be statistically significant in determining respondents' choices in the multinomial logit analysis. Likelihood ratio tests were computed for each variable to test the null hypothesis that all the coefficients in the set were equal to 0 (Table 5).

### Model 2 Results

The results of Model 2 show that consumers' meat purchasing behavior and perceptions of natural beef were much better indicators of their willingness to pay for natural beef than demographic and socioeconomic factors. The estimated coefficients, standard error, and odds ratios are shown in Table 6. Due to the large number of variables used in the model, only the significant variables are included in the table. Marginal probabilities were not calculated as a result of the large number of categorical variables included in the model, although odds ratios are provided for purposes of comparison. Likelihood ratio tests were computed for each class variable to test the null hypothesis that all the coefficients in the set were equal to 0 (Table 7).

Respondents who said they always check food labels were more likely to purchase natural beef than those who never check food labels (Table 6). The odds of a respondent who never checks labels purchasing natural beef were about 0.05 times the odds for a respondent who always checks labels. The odds of a respondent who frequently checks labels purchasing natural beef were only about 0.26 times the odds for a respondent who always checks labels.

Respondents who said they always purchase natural/organic food products were more likely to purchase natural beef than those who rarely purchase natural/organic food products. The odds of a respondent who rarely purchases natural/organic food products purchasing natural beef were 0.08 times the odds for a respondent who always purchases natural/organic food products. Oddly, respondents who preferred bone-in meat (e.g. T-bone steaks) were less likely to purchase natural beef than those who preferred boneless meat, possibly due to the fact that they don't want to pay the higher natural beef price for a product that includes an inedible bone. However, it would be interesting to recreate this study given the more recent BSE concerns and assess preferences for bone-in meat. The odds of a respondent who prefers bone-in meat purchasing natural beef were about 0.32 times the odds for a respondent who prefers boneless meat for this study.

A surprising finding was that respondents who said product appeal was "important" in their meat purchasing decisions were more inclined to purchase natural beef than those who said product appeal was "very important," indicating that at least some of the consumers felt that natural beef steaks were less visu-

Table 4. Estimation Results of Model 1

Variable	Estimate	Std Error	Odds Ratio**
Age			
1 <20	0.1507	0.8477	1.1626
2 20-40	0.3043	0.3814	1.3557
3 40-60	0.1504	0.3758	1.1623
Gender			
0 Male	0.2892	0.2074	1.3354
Education			
1 <12th grade education	0.1302	0.836	1.1391
2 Completed HS, tech school, some college	0.3245	0.2881	1.3833
3 Completed BS and/or some grad work	-0.0187	0.2677	0.9815
Income			
1 <\$39,999	-0.1208	0.3679	0.8862
2 \$40,000-\$69,999	-0.5913*	0.2832	0.5536
3 \$70,000-\$99,999	0.0289	0.3049	1.0293
Children			
0 no	0.005	0.0828	1.0050
Metroplex			
1 DFW	1.7313*	0.3213	5.6480
2 KC	0.3427	0.3157	1.4087

\*Chi-square analyses indicated significance at the 0.05 level.

\*\*Odds compared to highest/omitted category within a variable (see categories listed in Table 2).

Table 5. Likelihood Ratio Tests for Independent Variables Used in Model 1

Variable	Chi-Square	Pr > Chi-Square
Age	1.62	0.2037
Gender	0.79	0.8528
Education	0.03	0.8709
Income	2.47	0.4805
Children	5.46	0.1413
Metroplex	50.89*	<.0001

\*Chi-square analyses indicated significance at the 0.05 level.

Table 3 cont...

Marbling	
Not- somewhat important	8.17
Important	18.22
Very extremely important	73.59
External Fat	
Not-somewhat important	6.69
Important	13.59
Very-extremely important	79.72
Tenderness	
Not- Somewhat important	2.32
Important	8.10
Very- extremely important	89.58
Packaging	
Not-somewhat important	13.75
Important	29.14
Very extremely important	57.11
Brand	
Not- somewhat important	31.70
Important	27.27
Very-extremely important	41.03
Leanness	
Not-somewhat important	8.33
Important	15.05
Very- extremely important	76.62
Sodium	
Not-somewhat important	23.08
Important	32.87
Very-extremely important	44.06
Artificial Ingredients	
Not-somewhat important	11.55
Important	16.63
Very-extremely important	71.83
Knowledge of Natural Beef	
Never heard of	10.09
Had heard of	58.74
Knew a lot	31.16
Frequency of Natural Beef Purchases	
Never- Occasionally	56.39
Frequently- Always	43.61
Attitude before Reading Description	
Positive	73.02
Negative-Indifferent	26.98
Attitude after Reading Description	
Positive	85.29
Negative-indifferent	14.71

ally satisfying than “regular” steaks. Conversely, in an anticipated finding, respondents who said that price was “very important” were less likely to purchase natural beef than those who said that price was not as important.

Respondents who said that beef has relatively high cholesterol content were more likely to purchase natural beef than those who said beef has lower cholesterol content. The odds of purchasing natural beef for a respondent who perceived beef to have “very high” cholesterol content were about 36 times (1/0.273) the odds for a respondent who perceived beef to have “very low” cholesterol content. Respondents who felt that beef has “low” sodium content were 8.6 times more likely to purchase natural beef than those who believe beef has “very high” sodium content.

Respondents who indicated marbling and brand were “not important” had a lower willingness to pay for natural beef, compared with respondents who perceived marbling and brand as “very important.” Respondents who said that minimum external fat and tenderness were “somewhat important” when purchasing beef were more likely to purchase natural beef than those who said minimum external fat and tenderness were “very important.” This follows the common consumer perceptions of natural beef being so lean that flavor and texture are less desirable than that of “regular” beef. However, contrary to consumer perception, growth promoting compounds actually increase leanness in beef.

Respondents who perceived the lack of artificial ingredients in beef (i.e. chemical preservatives and tenderizing agents) as “very important” had higher probabilities of purchasing natural beef than those who perceive a lack of artificial ingredients as “important.” Respondents who said they always purchase natural beef were much more likely to purchase natural beef than those who said they purchase natural beef less frequently.

As shown in Table 3, providing a written description of natural beef increased the percentage of respondents having a positive attitude towards natural beef (compared to their attitudes before reading the description). Respondents who had a positive attitude toward natural beef after reading the description were more likely to purchase natural beef than those who were indifferent about natural beef after reading the description. The odds of a respondent purchasing natural beef when he/she had a positive attitude toward

natural beef were about 28.11 times the odds for a respondent who was indifferent about natural beef.

Results of the study indicate that consumer responses differed significantly by geographic location. However, geographic differences alone did not explain consumers’ decisions to purchase natural beef. With the exception of one income class and location, the demographic and socioeconomic variables were not significant in explaining respondents’ willingness to pay for natural beef. Instead, respondents’ previous meat purchasing behavior and perceptions of natural and traditional, or “regular,” beef were much better indicators of their willingness to pay for natural beef.

### Conclusions and Implications

Results of the multinomial logit analyses indicate that respondents’ previous meat purchasing behavior and perceptions of natural beef significantly affected their willingness to pay for natural beef. Respondents who check labels frequently were more likely to purchase natural beef than those that do not. Respondents who purchase other natural/organic food products more often were also more likely to purchase natural beef. Respondents who had a positive attitude toward natural beef after reading a description of natural beef were more likely to purchase natural beef than those with an indifferent attitude. Therefore, producers may be able to market natural beef to a larger group of consumers by providing more product information.

An interesting finding from the study was that respondents’ meat purchasing behavior was not significantly affected by brand. However, branded fresh beef products are a relatively new development, so consumers may have little experience in purchasing branded fresh beef products. The beef industry is just now trying to move toward a more consumer-oriented marketing approach instead of the traditional commodity-oriented marketing approach; therefore, brand could play a larger role in consumers’ meat purchasing decisions once more branded beef products (i.e. consumer-oriented) enter the market. Producers who are interested in promoting their own branded beef products in the Southern Plains region may want to consider further research into this issue.

The information provided from this study can be used as a starting point for producers’ natural beef marketing efforts. Results of the study corroborate previous research (Givry; Skaggs et al.), indicating that there is a consumer segment willing to purchase

natural beef. Producers may be able to develop a specific marketing strategy for each group of respondents to increase purchases of natural beef products. In addition, producers may be able to persuade more consumers to purchase natural beef by providing more product information via promotional activities.

Limitations of this research should be noted. The consumer survey could have been designed to provide more effective information, but due to the survey's small role in a much larger Sustainable Agriculture Research and Education (SARE) project a more comprehensive survey and analyses were not undertaken. The consumer survey may also have provided more meaningful results if only one supermarket chain was chosen for the survey, meaning that consumers in each of the three metropolitan areas might have experienced similar store conditions (i.e. layout, advertising, variety, etc.). However, none of the participating store chains was present in all three metropolitan areas. The effect of varied store conditions on consumers' meat purchasing decisions was captured only by the class variable indicating geographic location, so it is unknown whether or not store conditions affected consumer responses. This type of information may help to determine the characteristics that most directly distinguish consumers in each dichotomous category (NN, NR, RN, RR).

This study was also limited by a common problem of consumer willingness-to-pay studies. The use of actual prices and purchases of natural beef from a particular natural beef company or alliance would have provided a better assessment of consumer willingness to pay than the hypothetical market situation used in this study. However, this would require the participation by one or more natural beef providers.

In order to effectively market natural beef, producers also need information on competitors, alliance formation, and retail demand for natural beef in Oklahoma, Kansas, and Texas. Producers need to know how effective their competitors are in marketing natural beef products. It will probably be essential for small natural beef ranchers to join together in a cooperative or alliance in order to feasibly market natural beef products. However, there is little previous research on beef alliances since they are relatively new to the industry.

It is also important to know about the retail demand (i.e. aggregate product movement) for natural beef from supermarkets and natural foods stores in

Oklahoma, Kansas, and Texas. As the natural foods market continues to expand, supermarkets and natural foods stores will probably be looking for additional suppliers of natural beef. However, producers will need to establish a contract or some type of agreement with these stores to supply natural beef before they can make production decisions.

## References

- Boland, M., E. Boyle, and C. Lusk. "Economic Issues with Natural and Organic Beef." Kansas State University Agricultural Experiment Station and Cooperative Extension Service, MF-2432. Kansas State University, December 1999.
- Byrne, Patrick, C. Gempesaw, and U. Toensmeyer. "An Evaluation of Consumer Pesticide Residue Concerns and Risk Perceptions." *Southern Journal of Agricultural Economics*. 23 (December 1991): 167-174.
- Caffey, R.H. and R.F. Kazmierczak, Jr. "Factors Influencing Technology Adoption in a Louisiana Aquaculture System." *Journal of Agricultural and Applied Economics*. 26 (July 1994): 264-274.
- Calia, P. and E. Strazzera. "Bias and Efficiency of Single Versus Double Bound Models for Contingent Valuation Studies: A Monte Carlo Analysis." *Applied Economics*. 32 (August 2000): 1329-1336.
- Givry, S.R.M. "Consumers Preferences for Natural Beef Products." Masters Thesis. Department of Agricultural Economics, Kansas State University, Manhattan, Kansas. 1998.
- Greene, W.H. *Econometric Analysis*. New York: Macmillan Publishing, 1993.
- Grannis, J. and D. Thilmany. "Targetable Market Segments for Natural Pork Products." Paper Presented at the American Agricultural Economics Association Annual Meeting, Nashville, Tennessee. August 1999.
- Kennedy, P. *A Guide to Econometrics*. Cambridge MA: The MIT Press, 1998.

Table 3 cont...

<b>Preference for %Lean Ground Beef</b>	
70-80%lean	9.84
80-90%lean	36.38
>90%lean	53.78
<b>Factors Affecting Meat Purchases</b>	
<b>Healthy/Safe</b>	
Not-somewhat Important	.89
Important	6.43
Very-extremely important	92.69
<b>Convenient</b>	
Not-somewhat Important	15.07
Important	22.60
Very- extremely important	62.32
<b>Appealing</b>	
Not- somewhat Important	12.84
Important	19.22
Very-extremely important	67.97
<b>Price</b>	
Not-somewhat Important	11.28
Important	29.12
Very-extremely important	59.59
<b>Ratings of Beef Display Characteristics</b>	
<b>Cholesterol</b>	
Very low-low	7.99
Somewhat high	30.37
High-very high	61.64
<b>Calories</b>	
Very low-low	10.65
Somewhat high-High	70.84
Very high	18.52
<b>Sodium Content</b>	
Very low-Low	36.11
Somewhat high	39.43
High- Very high	24.47
<b>Artificial Ingredients Content</b>	
Very low-low	38.34
Somewhat high	27.38
High-Very high	34.28
<b>Ratings of Factor Affecting Beef Purchases</b>	
<b>Color</b>	
Not-somewhat important	3.24
Important	10.67
Very- extremely important	86.08

Table 3. Frequency Distribution for Independent Variables Used in Model 2

Variable	% of Respondents
Informed about Meat Processing	
Not informed	12.47
Somewhat informed	66.74
Very informed	20.79
Traceability of Meat	
Not-Somewhat important	21.80
Important	21.81
Very-extremely important	56.38
Check Labels	
Never-Rarely	7.87
Occasionally	24.94
Frequently-Always	73.96
Purchase Natural/Organic Food Products	
Never-Rarely	18.38
Occasionally	31.07
Frequently- Always	50.54
Factor Affecting Beef Purchases	
Label ingredients	29.31
Taste/tenderness	54.37
Brand name	5.91
Price	10.40
Image of Natural Beef	
Environment	7.41
No antibiotics/hormones	67.13
Taste/tenderness	18.16
Local family farms	7.41
Interest in More Ingredient Information	
Not-somewhat interested	17.92
Interested	28.76
Very-extremely interested	53.32
Beef Consumption	
Never- once/week	35.11
Twice-three/week	64.89
Bone-in/Boneless	
Bone-in	20.05
Boneless	79.96
Beef Type	
Ground Beef	40.84
Steak	47.33
Other	11.83

Kenney, J.M., and D. Fallert. "Livestock Hormones in the United States." *Food Review* 12,3 (July/Sept. 1989): 21-24.

Kuchler, F., J. McClelland, and S.E. Offutt. "Regulating Food Safety: The Case of Animal Growth Hormones." *Food Review* 12,3 (July/Sept. 1989): 25-30.

Lusk, J.L., and J.A. Fox. "Consumer Valuation of Beef Ribeye Steak Attributes." Paper presented at the American Agricultural Economics Association Annual Meeting, Tampa, Florida. August 2000.

Luzar, E.J., A. Diagne, C.E.C. Gan, and B.R. Henning. "Profiling the Nature-based Tourist: A Multinomial Logit Approach." *Journal of Travel Research*. 37 (August 1998): 48-55.

Malone, J.W. Jr. "Consumer Willingness to Purchase and to Pay More for Potential Benefits of Irradiated Fresh Food Products." *Agribusiness*. 6 (March/April 1990): 163-178.

Mayer, J. "Will Organic and Natural Beef Provide Growing Markets?" *Angus Journal* October 1999: 192-194.

Menkhaus, D.J, G.D. Whipple, R.A. Field, and S.W. Moore. "Impact of a Price Premium on Sales of Branded, Low Fat, Fresh Beef." *Agribusiness*. 4 (November/December 1988): 521-534.

Misra, S.K., C.L. Huang, and S.L. Ott. "Consumer Willingness to Pay for Pesticide-Free Fresh Produce." *Western Journal of Agricultural Economics*. 16 (December 1991): 218-227.

Moutou, C. and G.W. Brester. "Trends in U.S. Wheat-Based Food Consumption: Nutrition, Convenience, and Ethnic Foods." *Journal of Food Distribution Research*. 29 (July 1998): 1-14.

Purcell, W.D., "Measures of Changes in Demand for Beef, Pork, and Chicken, 1975-2000." *Research Bulletin 4-2000*, Research Institute on Livestock Pricing, Department of Agricultural and Applied Economics, Virginia Tech. December 2000.

Schupp, A., J. Gillespie, and D. Reed. "Consumer Choice Among Alternative Red Meats." *Journal of Food Distribution Research*. 29 (November 1998): 35-43.

Skaggs, D.J. Menkhaus, S.J. Torok, and R.A. Field. "Test Marketing of Branded, Low Fat, Fresh Beef." *Agribusiness: An International Journal*. 3 (1987): 257-272.

Thompson, G.D. and J. Kidwell. "Explaining the Choice of Organic Produce: Cosmetic Defects, Prices, and Consumer Preferences." *American Journal of Agricultural Economics*. 80 (May 1998): 277-287.

Zepeda, L. "Adoption of Capital Versus Management Intensive Technologies." *Canadian Journal of Agricultural Economics*. 38 (November 1990): 457-469.

Table 1. Description of Independent Variables Used in Models 1 and 2

Variable	Definition
Age	<20=1, 20-40=2, 40-60=3, >60=4
Gender	Female=1, Male=0
Education	<12 <sup>th</sup> grade education=1, Completed high school, technical or trade school, and/or some college=2, Completed bachelors degree and/or some graduate work=3, Completed masters and/or doctorate degree
Income	Annual household income <\$39,999=1, \$40,000-\$69,999=2, \$70,000-\$99,999=3, >\$100,000=4
Children	Children in household=1, 0 otherwise
Metroplex	Dallas/Ft. Worth=1, Kansas City=2, Oklahoma City=3
Informed About Meat Processing	Not Informed=1, Somewhat Informed=2, Very Informed=3
Traceability of Meat	Not Important=1, Somewhat Important=2, Important=3, Very Important=4, Extremely Important=5
Check Labels	Never=1, Rarely=2, Occasionally=3, Frequently=4, Always=5
Purchase Natural/Organic Food	Never=1, Rarely=2, Occasionally=3, Frequently=4, Always=5
Primary Factor Concerning Beef Purchases	Label Ingredients=1, Taste/Tenderness=2, Brand Name=3, Price=4
Image of Natural Beef	Better for the Environment=1, No Antibiotics/Hormones=2, Taste/Tenderness=3, Local Family Farms=4
Interest in More Ingredient Info for Processed Beef	Not Interested=1, Somewhat Interested=2, Interested=3, Very Interested=4, Extremely Interested=5
Beef Consumption	Never Eat=1, Once/week=2, Twice/week=3, Three or more=4
Preference for Meat Type	Boneless=1, Bone-in=0
Preference for Beef Type	Ground Beef=1, Steak=2, Other=3
Preference for %Lean Ground Beef	70-80%lean=1, 80-90%lean=2, >90%lean=3
Factors Affecting Meat Purchases ( <i>Healthy/Safe, Convenient, Appealing, Price</i> )	Not Important=1, Somewhat Important=2, Important=3, Very Important=4, Extremely Important=5
Ratings of Beef Product Characteristics ( <i>Cholesterol, Calories, Sodium Content, Artificial Ingredients Content</i> )	Very Low=1, Low=2, Somewhat High=3, High=4, Very High=5
Ratings of Factors Affecting Beef Purchases ( <i>Color, Marbling, External Fat, Tenderness, Packaging, Brand, Leanness, Sodium, Artificial Ingredients</i> )	Not Important=1, Somewhat Important=2, Important=3, Very Important=4, Extremely Important=5
Knowledge of Natural Beef Before Description	Never Heard Of=1, Had Heard Of=2, Knew A Lot=3
Frequency of Natural Beef Purchases	Never=1, Occasionally=2, Frequently=3, Always=4
Attitude of Natural Beef before Description	Positive=1, Negative=2, Indifferent=3
Attitude of Natural Beef after Description	Positive=1, Negative=2, Indifferent=3

Table 2. Frequency Distribution for Independent Variables Used in Model 1

Variable	%
Age	
<20	2.90
20-40	37.20
40-60	48.07
>60	11.84
Gender	
male	39.19
female	60.81
Education	
<12 <sup>th</sup> grade education	1.81
Completed high school, tech. school, or some college	39.96
Completed B.S. and/or some graduate work	39.23
Completed M.S, Ph.D., etc.	22.00
Income	
<\$39,999	23.02
\$40,000-\$69,999	23.76
\$70,000-\$99,999	16.09
>\$100,000	37.13
Children	
No	57.86
Yes	42.14
Metroplex	
Dallas/Ft. Worth (DFW)	46.39
Kansas City (KC)	30.63
Oklahoma City (OKC)	22.98