U.S. Grass-Fed Beef: Marketing Health Benefits

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Grass-fed beef is a product with health benefits that may appeal to health-conscious consumers. This article analyzes the results of a choice experiment to explore the importance of health benefits in the marketing of grass-fed beef. Both price and fat and calories have a negative effect on the choice of the product, and higher levels of omega-3 fatty acids have a positive effect. Price is the most important attribute to respondents (39.5%), a low level of fat and calories is the second most important attribute (36.9%), and the level of omega-3 fatty acids is the least important of these factors (23.6%).

For more than 50 years, the U.S. beef industry has fed cattle high-energy, grain-based diets. The trend toward grain-fed beef began after World War II, when feedlots began using the post-war oversupply of grain. Cow-calf producers would raise their cattle to a weight of approximately 700 pounds and then sell them to a feedlot, where they would be fed grain until they reached a market weight of approximately 1000 pounds, a procedure commonly referred to as "finishing." Currently in the United States, the vast majority of beef is grain-fed in feedlots for at least 90 days.

Grass-fed beef refers to beef from cattle that have been fed only on grasses rather than finished in a feedlot. Grass-fed beef can often be classified as either organic or natural beef, depending on the production practices. In most cases, grass-fed beef has not been administered added hormones and antibiotics. From a consumer's point of view, three major potential benefit areas are associated with grass-fed beef: health and nutrition (Duckett et al. 1993), animal welfare (Morrow-Tesch 2000), and ecosystem friendly farming practices (Horrigan, Lawrence, and Walker 1999). This paper focuses only on health attributes.

The unhealthy types of fat have been a major health concern in recent years. Consumers have become increasingly conscious of the consequences of their food choices, as studies finding health risks associated with high levels of saturated and trans-fats consumption appear in the popular media, including in best-selling books such as *The Omega Diet*. Thus, Willet writes, "replacing saturated with unsaturated fats is a safe, proven and delicious way to cut the rates of heart disease," (2002, p.71). Saturated fat is abundant in grain-fed beef but much less so in grass-fed beef (Duckett et al. 1993). The overall fat content of grass-fed beef is similar to that of skinless chicken. Another important health benefit from grass-fed beef is the higher levels of omega-3 fatty acids, essential fats that "have been shown to have benefits in the prevention or treatment of heart disease and stroke and possibly autoimmune problems such as lupus, eczema, and rheumatoid arthritis; and a variety of other conditions," (Willet 2002, p. 75). High omega-3 acid levels are mostly found in seafood, certain nuts and seeds, and in animals raised on pasture. Grass-fed beef has two to six times more omega-3 fatty acids than does feed-lot beef, a significant difference (Duckett et al. 1993).

Grass-fed beef is a product with several health benefits that may appeal to health-conscious consumers. As consumer preferences evolve, it is important for the beef industry to understand consumer preferences for specialty products such as grass-fed beef. This paper examines consumers' preferences for grass-fed beef using an economic valuation-marketing, on-site survey. In contrast to other studies, we focus on U.S.-raised beef. We also explore the importance of both overall fat and calories and omega-3 fatty acids for consumer preferences for beef.

Previous Studies

Umberger et al. (2002) investigated U.S. consumer preferences and willingness to pay for domestic

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corn-fed beef versus Argentine grass-fed beef measured through experimental auctions. Consumers were classified based on taste-panel ranking and bid differentials between the two different steaks. Twenty-three percent of the participants preferred the Argentine grass-fed beef to the U.S. corn-fed beef and were willing to pay an average of $1.36 more per pound. In contrast, we hold country-of-origin constant across products in order to isolate the effect of grass-fed status.

Also relevant to this study, Lusk, Roosen, and Fox (2003) used a conjoint approach to analyze consumer preferences for beef from cattle administered growth hormones or fed genetically modified (GM) corn in France, Germany, the United Kingdom, and the United States. They found that consumer participants in France, Germany, and the United Kingdom place a higher value on steaks from cattle that have not been feed GM corn compared with their U.S. counterparts. Furthermore, only the French respondents placed a higher value on non-hormone-treated beef. Rosen (2003) discusses the opportunities to market safe foods through food labels.

The consumer response to bovine spongiform encephalopathy (BSE), commonly known as "mad-cow disease," is also relevant for marketing grass-fed beef, since BSE is contracted through meat-and-bone meal derived from diseased cattle that was included as an ingredient in cattle feed. Grass-fed beef are thus BSE-free. The BSE-outbreak and its effects on the livestock industry, beef demand, and consumers' food-safety perceptions have been studied. Loader and Hobbs (1996) analyzed the expected impact of the BSE-crisis on the beef industry. They argued that firms such as organic producers and firms that emphasize quality assurance may gain direct benefits due to increased demand for their products.

In the aftermath of the French BSE-outbreak, Latouche, Rainelli, and Vermersch (1998) conducted a survey in France eliciting consumers' consumption patterns and reasons for possible changes in those patterns, as well as consumers' attitudes about quality labels and sanitary norms. Consumers were asked how much of a premium they would be willing to pay for beef that would not transmit the human variant of BSE. The meat products were medium-quality, low-priced minced steak with little risk of BSE, and high-quality, higher-priced beef with no risk of BSE. The mean willingness to pay (WTP) premiums for the two meat products (including zero bids) were 22% of the original price and 13.7% of the original price, respectively.

The effect of providing nutrition information on consumer choice is also relevant to marketing grass-fed beef. Alston, Chalfant, and James (1999) evaluated a dairy industry-funded nutrition-education program to estimate the effects on consumption patterns of learning about nutrition. They found that the benefits to dairy producers from increased milk consumption outweigh the costs of the program.

Previous research has considered grass-fed beef only in combination with country of origin. Other work has focused on perceived dangers in feed such as GM corn or the risk of BSE. There has been relatively less analysis of the use of nutritional information as a marketing tool, which is the focus of this article.

Choice-Based Conjoint Analysis

We use choice-based conjoint analysis to isolate health attributes for grass-fed beef. Conjoint analysis is a stated preference technique that is used to isolate the effect of product attributes on consumer preferences. Compared to the traditional ratings- or rankings-based conjoint analysis, the choice-based conjoint approach has become an attractive alternative for measuring preference structures (see Elrod, Louviere, and Davey 1992; Huber et al. 1992; and Louviere and Gaeth 1988). Conjoint analysis allows consumers to make decisions about products based on several product attributes. The choice-based approach involves respondents making one choice from each of several sets of stimuli derived from an experimental design (Louviere 1991). Adamowicz et al. (1998) found that the choice-based conjoint analysis had several advantages over typical contingent-valuation methods. In particular, since this approach mimics what people do in the real world, its results are comparable to consumers' revealed preferences (Adamowicz, Louviere, and Williams 1994; Adamowicz et al. 1998). This mitigates the potential problem of "hypothetical bias" in which respondents say one thing but do something different.

In a microeconomic-econometric framework, the basic consumer-choice problem is modeled as the estimation of a utility function $U = f(X_1, \ldots, X_k)$, where U denotes utility for the good in question and $X_1, \ldots, X_k$ represent the k attributes of the good. One method of estimating $f(X_1, \ldots, X_k)$ is based on

experimental data on consumer preferences. The approach is to construct a number of hypothetical alternatives and let a sample of respondents make preference judgments.

Consider an individual faced with a set of alternatives from which to choose, each of which consists of a different combination of levels of a set of multiple attributes. Suppose individual *i* faces *J* alternatives, indexed $j=1,\ldots,J$ and described by vectors of attributes X_j. The individual *i* has a utility function that can be written in the linear form

$$(1)\quad U_{ij} = X\beta + \alpha_i + \varepsilon_{ij},$$

where X_j is the attribute vector of the *j*th alternative, β is the coefficient vector representing the weight of attribute in the valuation of alternative *j*, the variable α_i is an individual specific component, and ε_{ij} is stochastic and reflects the idiosyncracies of this individual in tastes for the alternative *j* (McFadden 1974). As respondents are randomly chosen, the unknown individual specific component can be interpreted as a random disturbance term.

The probability of an individual choosing the m^{th} alternative is

$$(2)\quad P(m|C,\beta) = P(X_m\beta + \varepsilon_{im} > X_j\beta + \varepsilon_{ij} \quad \forall j \in C \;\&\; j \neq m),$$

where *C* denotes the choice set. In the case of independently and identically distributed extreme value disturbances, the probability of an individual choosing the *m*th alternative can be expressed as

$$(3)\quad P(m|C,\beta) = \frac{exp(X_m\beta)}{\sum_{j\in C} exp(X_m\beta)}.$$

This equation was estimated from the consumer-choice data described below.

Data

This study uses survey data collected with in-person intercept surveys in Spokane, Washington in February of 2003. The surveys were conducted in four separate locations within Spokane, including three conventional grocery stores and one natural foods grocery store. Nearly half of the surveys (48.9%) were completed at the natural food store. At food stores there is an opportunity for respondents to make hypothetical decisions in the settings where they make their actual food-purchase decisions. This intercept-survey approach is used extensively in studies of food-purchase decisions because of this realistic decision setting. Increasing the realism of the decision setting helps reduce the "hypothetical bias" which can be a problem in studies that use "stated preferences" or intended behavior, rather than actual market choices, or "revealed preferences."

To guarantee a representative sample, one would survey food buyers at a random selection of all food-shopping sites in the community, weighted by proportions of the food budget. Such an ideal sample frame was beyond the resources of this survey. While precautions were made to make the sample as representative as possible within this framework—one of every three persons entering the area was approached in order to randomly select respondents—our sample is subject to possible selection bias. The potential for selection bias is not as great as a convenience sample (e.g., a shopping mall) at a site totally unrelated to the decision problem would have been, but care must still be taken in checking the representativeness of the sample and in extending the implications of the study to a general population from the more health-conscious consumers one presumably finds at the sample sites. As is common in current surveys, the respondents were offered an incentive to increase participation rates. The incentive was a food item worth between two and three dollars.[1] The turndown rate was approximately 50%.

Of the 603 respondents, 509 people ate beef. Demographic variables were included in the survey for purposes of assessing how representative the sample was in comparison to the general population and for use as statistical control variables in some of the modeling analysis. In this study we do not use these characteristics to divide the consumers into market segments. Of the 509 respondents, the majority were female (61.4%), full-time employed (55.2%), and above the age of 35 (69.2%). Since we were targeting food shoppers, we expected that the majority of respondents would be female. The respondents' average age was 42.6 years, which is slightly above the median age of residents in the State of Washington of 35.3 years. The greater

[1] Respondents had a choice of food items, which sell at the retail level for between $2.00 and $3.00, as an incentive to participate.

age was expected, since we only approached adult shoppers. Thirty-two percent of all respondents had children under the age of 18 living in their household, which is similar to the State of Washington average (35%). The average household size was 2.6 persons, compared with 2.5 persons per household on average in the State of Washington. Also, 79.4% of the respondents lived in either urban or suburban areas. The modal household income reported in the survey was in the $30,000–$50,000 income bracket[2] for the 2002 fiscal year. This bracket contains the mean income for the State of Washington of ($45,776). The modal education included some college (associate's degree), which is the same as for the State of Washington as a whole. Summary statistics for the demographic data are presented in Table 1.

The survey solicited information regarding respondents' attitudes about the environment and food safety, their knowledge about the benefits of grass-fed beef, and factors influencing their purchase decisions. In our survey, the majority of respondents eat beef at least once a week (55.8%), feel that beef is safe (76.3%), read nutritional labels (72.1%), and are aware of health benefits associated with grass-fed beef (55.4%). Summary statistics for consumer information and perception variables are presented in Table 2.

The survey asked consumers to choose from among beef cuts with different attributes in a choice experiment. The attributes considered in this study (price, fat and calories, and the presence of omega-3 fatty acids) were chosen because they are the most distinct characteristics of grass-fed beef. Recall that grass-fed beef is much lower in saturated fat and calories than is grain-fed beef. Although it is low in saturated fat, grass-fed beef is higher in omega-3 fatty acids, which are beneficial to health. Also, price was chosen as an attribute to provide a realistic comparison across steaks and for purposes of learning about potential price premiums. We offer two levels—high and low—for fat and calories and for omega-3 fatty acids. The price was randomly generated within the three ranges: high ($8–$12 per pound), medium ($5–$8 per pound), and low ($3–$6 per pound). The price ranges represented realistic limits of beef in the marketplace at the time of the survey. The total number of steak combinations from the various attributes and attribute levels was twelve. To simplify the experiment, a fractional factorial design was generated and the final design comprised six choice-set questions.

The following represents an example of a choice-experiment question containing three product profiles:

"If you were planning to buy beef steak today, and the following alternatives were available, circle your most preferred option."

Product Attributes	Option 1	Option 2	Option 3
Fat and calories	Low	Medium	High
Omega-3 fatty acids	Low	Low	High
Price/pound	$6	$8	$4

Because the respondents may not have been familiar with some of the terminology used in the survey, we included some information (such as definitions of grass-fed beef and omega-3 fatty acids). After receiving the above information, the respondents were presented with the choice set and asked to select one of the profiles in the set.

Estimation Results

The estimation results are presented in Table 3. All the estimated parameters are statistically significant at the 0.01 level. As expected, both price and fat and calories have a negative effect on choice and the presence of omega-3 fatty acids has a positive effect on choice. We calculated the relative importance of the three attributes. We moved each level of attribute from one extreme to another. The relative importance was calculated by the "range multiply weight" of this attribute divided by the sum of "range multiply weight" of these attributes. Figure 1 shows that price is the most important attribute to respondents (39.5%), a low level of fat and calories is the second most important attribute (36.9%), and omega-3 fatty acids is the least important attribute (23.6%).

Since we included price as one of the attributes, a change of one attribute from one level to another can be valued in terms of compensating variation. We therefore can measure the willingness to pay for each attribute. For fat and calories, two beef steaks were simulated: one with high fat and calories and

[2] To obtain a higher response rate, respondents were asked to place themselves in income brackets. This method was used because respondents are typically reluctant to divulge exact income information.

Table 1. Summary Statistics for Demographic Variables.

Variable	Description (coding)	Distribution of survey responses	
Site	0 if natural foods store	51.1%	
	1 if conventional grocery store	48.9%	
Age	0 if > 35 years	69.2%	Mean = 42.6
	1 if ≤ 35 years	29.5%	Std. dev. = 16.3
Gender	0 if male	37.8%	
	1 if female	61.4%	
Education	1 if Compulsory education	1.4%	Coding for estimation:
	2 if High school	20.4%	0 ≤2 years college
	3 if 2-year college	22.6%	
	4 if 4-year college or university	26.5%	1 > 2 years college
	5 if advanced/professional degree	25.9%	
	6 if refuse	1.6%	
Children	0 if children under 18 in household	32.4%	
	1 otherwise	63.9%	
Income	1 if <30,000 USD	25.1%	Coding for estimation:
	2 if 30,000–50,000 USD	23.6%	0 if <50,000 US$
	3 if 50,000–70,000 USD	20.4%	1 if >50,000 US$ annual
	4 if 70,000–100,000 USD	12.0%	income
	5 if >100,000 USD	11.0%	
	6 if refused	7.9%	
Employment status	1 if full-time employed	55.2%	Coding for estimation:
	2 if part-time employed	14.7%	0 if full-time employed
	3 if unemployed	4.9%	1 if otherwise
	4 if homemaker	8.1%	
	5 if retired	12.2%	
	6 if refused	1.8%	
	7 if student	0.6%	
Location of residence	1 if urban	41.5%	Coding for estimation:
	2 if suburban	37.9%	0 if urban, suburban
	3 if rural	19.6%	1 if rural
Family size	Number of people shopped for		Mean = 2.6
			Std. dev. = 1.4

one with low fat and calories; other attributes were held the same. The premium value is the estimate of the price premium for a low fat and calories beef steak that equates the probability of purchasing two beef steaks. We estimate that a low fat and calories steak could sell for $5.65 more per pound than could the high fat and calories steak. Similarly, we presented a choice between two hypothetical steaks, with one containing high levels of omega-3 fatty acids. The steak with high levels of omega-

Table 2. Summary Statistics for Consumer Information and Perception Variables.

Variable	Description & coding	Distribution of responses
Frequency	How often consumer eats beef roasts or steaks	
	1 if daily	6.3%
	2 if at least once a week	55.8%
	3 if at least once a month, but less than once a week	23.8%
	4 if less than once a month	12.0%
	5 if never	0.2%
Safety	Importance of food safety vs. food price	
	Scale from 1 to 10 where	Mean = 4.08
	1 food safety all important	Std. dev. =2.62
	10 food price all important	
Beef safety	Overall safety of beef	
	0 if very safe	29.7%
	0 if somewhat safe	46.6%
	1 if somewhat unsafe	16.1%
	1 if very unsafe	5.1%
	1 if don't know	2.6%
Labeling	Are nutrition labels read before a first time purchase	
	0 if always	37.9%
	0 if usually	34.2%
	1 if sometimes	19.6%
	1 if never	5.3%
Environment	Importance of economic growth vs. saving environment	
	Scale from 1 to 10 where	
	1 economic growth at all costs is all important	Mean = 6.5
	10 saving the environment at all costs is all important	Std. Dev = 2.18
Awareness	Awareness of health benefits associated with grass-fed and finished beef	
	1 if yes	55.4%
	2 if no	44.2%

Table 3. Estimation of Conditional Logit Model from Aggregate Consumer Choice.

Parameter	Estimate	Standard error
Price	-0.1996	0.0100
Fat & calories	-0.5634	0.0243
Ω3 fatty acids	0.3418	0.0326

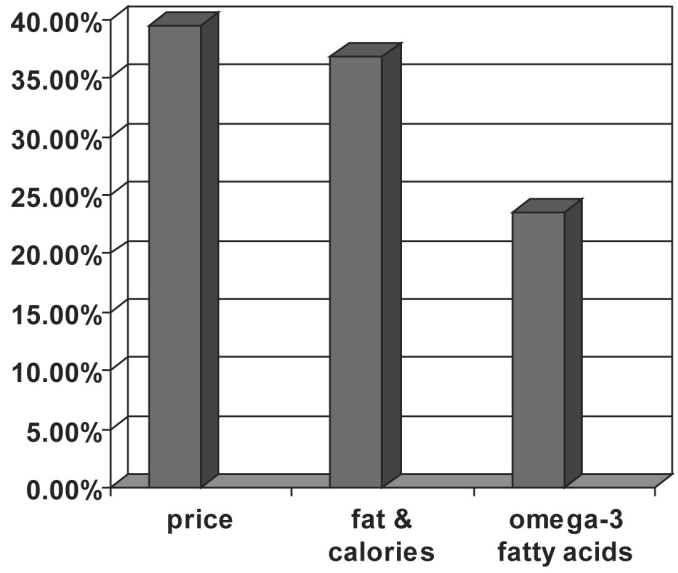

Figure 1. Relative Importance of Three Attributes.

3 fatty acids could sell for $3.42 more per pound under this scenario. Although these premiums may seem higher than expected, we must keep in mind that about half of the sampled consumers were natural food store shoppers, whom we expect to pay a greater premium than the general population. These levels of price premiums are not unusual in high-end natural foods stores.

Conclusions

Consumer data on preferences for U.S. grass-fed beef were collected in 2003 from both natural food and conventional grocery store shoppers in Spokane, Washington. The focus was on the consumer response to the health benefits associated with grass-fed beef. Respondents in our sample were quite favorably disposed to U.S. grass-fed beef and were willing to pay a significant premium in our scenarios. Marketing implications include that there is indeed a market for a niche beef product that focuses on health benefits, such as grass-fed beef, in the Spokane area. Since this study was held in only one city and did not examine a complete cross section of consumers, further study is needed to determine how robust this market is in terms of location and the size of the health-conscious niche relative to the total consumer market. Also, further study is needed to find the conditions under which the significant levels of premiums found in this study would hold. For example, it should be remembered that consumers were given information regarding the health benefits that grass-fed beef offers over grain-fed beef. Future studies might explore how sensitive the premium is to information both in the survey and current in the media.

While these and other details deserve further study, this study establishes that there is an opportunity for U.S. producers to market grass-fed beef, especially in natural food stores. Grass-fed beef has the potential to meet the consumer demand for a healthier beef product. From the analysis of this study, we find that the lower fat and calorie level of grass-fed beef is a very attractive attribute to aggregate consumers.

The grain-fed beef industry has long argued that beef has good flavor and is juicy and tender because of its fat content. The U.S. Department of Agriculture grading system categorizes steaks with abundant marbling (fat) as "Prime," the highest quality grade. The greater the quantity of intramuscular fat in the meat, the higher the grade. Since this system is based on saturated fat, it promotes the "unhealthy" fat, not the "healthy" fat. Consequently, what the industry has been selling may be inconsistent with what many consumers actually want in terms of health attributes. Note, however, that there is also a consumer segment that prefers the taste of meat

that is high in intramuscular fat, and this study did not specifically address either taste generally or the health-taste trade-off question. Nevertheless, meeting the needs and wants of the consumer is the key to successful marketing. Informing the consumer about attributes such as health benefits in the case of grass-fed is an important marketing tool for the future.

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Appendix

The following information was provided to survey participants:

Grass-fed beef refers to beef from cattle that have been fed only grasses. These cattle are not held in a feedlot and fed grain like conventional beef cattle. Grass-fed beef is known to have certain health benefits when consumed. Grass-fed beef is 1) lower in fat and calories than conventional beef, 2) has higher levels of omega-3 fatty acids, which have been shown to reduce the risk of certain cancers and brain disorders, and 3) is fed only grass, so there are no concerns about mad cow disease.