RURAL ECONOMY

**Assessing the Consumer Acceptance and
Market Potential of Alternative Meats**

Bodo Steiner, Lorie Srivastava, and Fei Gao

Project Report # 07-01

Project Number: 2003A107R

Project Report

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Table of Contents   **page**

List of Tables   **page**

1. Introduction, project objectives and project background

This initiative to this project, including the original project proposal, goes back to Professor Kevin Chen (he is no longer with the Department of Rural Economy). The project was initially scheduled to begin on 2004/05/01. When I took over this project and started to work as Principal Investigator on January 1, 2005, the following objectives were to be fulfilled (taken from Professor Kevin Chen's initial proposal):

1) Documentation of consumer awareness, attitude, and choice regarding alternative meats
   - At what level and to what extent are consumers aware of alternative meats?
   - What is consumer interest level in alternative meats and their willingness to change consumption behavior (i.e. how much are they willing to pay for alternative meats)?
   - What kinds of alternative meats are consumers eating?
   - What kinds of alternative meats are consumers most likely to try in the future?
   - Where are consumers buying and eating alternative meats (meat specialty store, direct market, supermarket, restaurant, and others)?
   - What attributes do consumers find desirable in alternative meats (leanness, nutrition, adventure, taste, and others)?
   - What are the main barriers affecting purchase of alternative meats (price, awareness of availability, exotic nature, cooking instructions, nutrition labeling, and others)?

2) Compilation of a consumer profile related to purchase of alternative meats
   - How do various socioeconomic and demographic factors affect consumer awareness, attitude, and acceptance of alternative meats?
   - What are the distinct consumer market segments that Alberta's alternative livestock and meat producers might target?

3) Development of marketing strategies and implications for the Alberta alternative livestock industry
   - What are the implications of the findings in 1) and 2) for developing effective advertising and promotion strategies to support the further development of Alberta's alternative livestock industry?
   - What are the implications of the finding in 1) and 2) for producing alternative meat products that are consumer friendly?
   - What are the implications of the findings in 1) and 2) for selecting the main marketing and distribution channels for alternative meat products?

A decision was made together with the DLFOA to focus our research efforts on three species: bison, elk and lamb. The overall purpose of our research was to improve the understanding of consumer perceptions towards the consumption of alternative meats, notably the above three species. More specifically, the objectives were to:

1) Document the attitude and purchasing choices for three alternative meats which are strategically important to Alberta's alternative livestock industry.

2) Analyze the effects of socio-economic factors of Alberta consumers in purchasing the above alternative meats.

3) Explore possibilities for market segmentation and marketing implications, also for other alternative meats (other than bison, elk and lamb).

In order to achieve these objectives, this study has taken the following steps:

1) A preliminary survey was developed and received feedback from Professor Robert Hudson, University of Alberta.

2) This preliminary survey was revised by using four focus groups with Alberta consumers.

3) Three separate web-based surveys were constructed for bison, elk and lamb. In each of these surveys, a switching model was developed that employs revealed preference data in stated preference experiments. As consumers indicate their (un)willingness to switch away from beef, towards alternative meats, we addressed many issues; among them were: How important are which information sources in the purchasing decisions of alternative meats?

What role does farm origin traceability play in consumers' choice? To what extent do consumers care about Genetically Modified Organisms (GMO) in producing those meats?

2. Literature review

2.1. Literature review of alternative meats studies

The following review focuses on marketing studies for alternative red meats. Apart from a review of the literature on the alternative meats (which includes bison, venison, ostrich, deer, and wild boar etc.), this review includes also branded traditional meats, as well as fish and seafood, as they contain some valuable marketing insights in studying the consumer perceptions and preferences towards new meat products in general.

Earlier studies on alternative meats (McLean-Meyinsse et al., 1995; Schupp et al., 1998; Gillespie et al., 1998) mainly focus on identifying the influence of socioeconomic and demographic variables on consumer purchasing decisions. More recent studies (Hobbs et al., 2003; Nelson and Liu, 2005) start to explore the contribution of meat attributes which can explain consumers' purchasing behaviour and perceptions.

McLean-Meyinsse, Hui and J. Meyinsse (1995) examine the extent to which socioeconomic characteristics are significantly associated with consumers' decisions to purchase a new specialty meat product: quail, alligator, or deer meat. Chi-square contingency tests are used to show

3

whether there are significant differences in respondents' consumption patterns due to socioeconomic characteristics. The results from this consumer survey of households in Louisiana and Texas suggest that socio-economic factors influence consumption decisions on consuming quail, alligator, or deer meat. The consumption of, or interest in consuming new food products in general varied significantly with martial status, age, education, household size and income, ethnic background, religion, and occupation. The same socio-economic characteristics were found to be statistically significant in consumption decisions on quail and alligator meat, except for marital status and household size. Ethnic background and occupation were found to be statistically significant with the consumption of deer meat.

Torok, Tatsch, Bradley, Mittelstaedt, and May (1998) report the identification of American consumer characteristic dimensions and marketing strategies for restaurants selling bison meat. Bison taste tests and surveys were performed to collect demographic, psychographic, taste preference, intention to purchase, and product characteristic/attribute data. Based on nonparametric statistical approach, the authors identify that the four characteristic dimensions of customers are: variety meat eater, game meat eater, health conscious consumers and celebrators of special occasions.

The results from Torok et al. (1998) suggest also that those who prefer bison to beef and those who intend to purchase bison in the future have eaten a variety of other meats recently. This suggests that potential bison consumers seek out different types of meats, and that bison retailers

4

should position bison as a complementary meat product, rather than a competitive meat product. Therefore, the results also suggest that bison should be positioned on restaurant menus as a variety meat, not as a direct substitute for beef. However, other researchers have found conflicting evidence and suggest to position bison as a direct substitute (see below).

From Torok et al. (1998), it appears that there is a characteristic dimension of potential bison consumers to be game meat eaters, suggesting that some consumers would be attracted to bison because it represents a non-domesticated meat alternative, so that the untamed aspects should be stressed in any marketing strategy. The authors also conclude that since potential bison consumers eat healthier and leaner meats, the health benefits of bison should be stressed when positioning bison against other fattier meats. This is in line with the authors' conclusion that chicken, fish, and turkey are likely to be substitutes and competitors of bison meat. Their results also suggest that some consumers seem willing to consider bison as a special occasion food, especially in restaurant, which could offers an opportunity to market more expensive cuts of bison as special occasion meats. Further, the authors suggest that many potential consumers of bison products can be attracted by two or more of these dimensions. In order to have consumers to pay a price premium, bison products promotion should thus emphasize the above attributes jointly with the juiciness, taste and appearance of bison.

Torok et al. (1998) also point out to limitations of their study. These include the short time period, specific location, and small sample size that are common to the analysis of most survey data. Moreover, the small sample size and the use of nonparametric statistical techniques may not reveal the true characteristics of the population. However, the research results, which are based on primary data, provide important information related to the marketing of bison in restaurants in the United States.

Schupp, Gillespie and Reed (1998) investigate consumer choice among alternative red meats in Louisiana, U.S. A multinomial logit model is applied to analyze consumer choice between the best retail meat cut from four species of alternative livestock or "none of these" with equal retail prices. The data source is from a 1997 survey of Louisiana households, included bison, emu, ostrich, and venison. The important variables in the respondent's selection among species of alternative livestock are: gender, education and race of the respondent; previous consumption of meat from exotic animals; and respondent identification of venison as an exotic meat. The respondents also indicate some resistance to consuming meat from animals that they consider as exotic. These results suggest that producers and sellers of meat from exotic animals would have to overcome these perceptions to move their product beyond niche markets.

The authors also indicate that their sample is somewhat biased toward the white, higher-educated, or higher-income portions of the Louisiana population. This is typical of unstructured mail surveys.

6

In retrospect, Schupp et al. (1998) perceive that the analysis may have been strengthened had two additional items of information been obtained from the respondents. The more important of these two items is whether the household contains a recreational hunter. Households obtaining and consuming wild meat are likely to perceive meat from the four alternative species differently than those households that do not. A second useful item of information would be whether the respondent, or another member of the household, is a vegetarian. Households with one or more vegetarians are likely to have less experience with meats of all kinds, whether traditional or exotic. Therefore they conclude that future household research that involves exotic animals or meat should include these two variables to estimate their influence on the exotic issue. Both issues have been accommodated in our research efforts (see section 4.).

In a restaurant/retail study, Gillespie, Taylor, Schupp and Wirth (1998) test professional buyers' attitudes towards ostrich in the United States. The objectives of this study were to estimate current and past use and knowledge of ostrich meat by restaurants and retailers. The authors estimate buyer ratings of potential ostrich meat products from most to least preferred, as well as the relative importance of a selected group of attributes of ostrich meats. Mail surveys and a conjoint analysis are employed to fulfill these objectives. Two-limit Tobit models are used to estimate the most preferred ostrich meat products for the retail and restaurant sectors, as well as the relative importance of attributes considered in the decision to purchase ostrich meat. The

7

results suggest that buyers had very limited knowledge of ostrich meat, the preferred product in both the restaurant and retail markets is a branded, 6-oz. ostrich filet at the lowest price, and price is not the most important factor determining retail and restaurant managers' decisions on the product. The study further suggest that the expansion of ostrich meat (and also other alternative meats) into larger market rather than small niche markets would require lowering of price, increasing promotion at the handler level, higher levels of quality assurance, and more attention to meat cuts that consumers demand. Ostrich meat fits into the category of a low-fat, low-cholesterol, low-calorie red meat, and much like bison, venison, and rabbit, it is being sold primarily as a niche market product, therefore, the authors suggest that the overall findings of this study would, to a limited degree, also be beneficial to other alternative red meats.

In another ostrich study, Gillespie and Schupp (2002) analyzed the evolution of the United States ostrich industry from the mid-1980s to 2002. An econometric model is developed to examine ostrich pricing over the period 1993 – 1999, offering an overview of the U.S. ostrich industry. An OLS (Ordinary Least Squares) regression model is developed to examine ostrich pricing over the period 1993-1999. Results suggest that the prices decrease over the observation time. At the very early stage of this industry, prices of ostrich breeding stock were extremely high, but in 1995-1996 prices fell drastically and many firms ceased production. This scenario can be explained by the theory of the evolution of new industries, and is an example for other alternative agricultural industries. The authors argue that even though ostrich meat is expected in

demand from health-conscious upper-income segment as a beef substitute, insufficient effort is given to promoting ostrich meat, which is probably resulting from the "exotic" label; this situation placed it at a disadvantage compared with traditional meats and other alternative meats like bison, venison, and goat. They further suggest if the industry is to become viable in the long run, it must devote resources early on to developing a primary (consumer) demand for the product; leaders in new industries like the alternative livestock industry will need to promote the final product to consumers, while merely developing the demand for inputs (breeding stock in this case) will not sustain the growth in the long run.

Taylor, Andrews, Gillespie, Schupp and Prinyawiwatkul (1998) compare emu and ostrich meats with beef to identify and quantify their sensory attributes. A sensory panel is used to compare U.S. Department of Agriculture Choice top sirloin beef with emu and ostrich meat, both ground and intact meat. Comparisons of sensory quality and acceptability are made after zero, two, four and six months of frozen storage. Differences in flavor, juiciness and texture are detected between ratite meals and beef (the control). The differences are more pronounced for intact cuts than ground meat, with ratite meat usually being rated inferior to beef. Some differences in sensory acceptability across the six-month storage period were revealed.

McLean-Meyinesse (2003) investigated consumers' willingness to try a variety of goat meat products. Data come from a random sample of 1,421 telephone surveys in 13 states in the United States. This paper examines goat demand by assessing previous consumption and interest in

9

consuming goat meat, as well as other value-added goat meat products. Selected demographic, socioeconomic and geographic (DSG) factors are assessed to estimate their influence on previous consumption, willingness to consume goat meat, and interest in buying goat nuggets, patties, roasts, or marinated ready-to-cook and packaged goat meat. Binomial logit and ordered probit models are used to test the relationship between prior goat meat consumption and DSG characteristics. The most likely consumers of goat nuggets, patties, roasts, or marinated ready-to-cook and packaged goat meat are from households with three or more persons, or are Catholics, non-Caucasians, men, or Texas residents.

Nelson and Liu (2005) look into the empirical evidence of demand potential for goat meat in the US. A telephone survey was conducted in 2004, based on a random sampling procedure by interviewing 2751 households in eleven Southern states. The data permits the examination of goat meat demand by different ethnic populations, as well as the diversity among the states surveyed. The study uses five econometric models to examine the four-layers of goat meat demand: current demand, demand increase from per capita consumption, demand increase from new consumers, and demand changes related to season and occasions. The study identifies the major factors influencing goat meat purchasing in a large set of socioeconomic and demographic variables. The analysis differs from others in its large data base and the quantitative assessment of multiple layer demand. The authors suggest that there exists substantial demand for goat meat and a potential increase in the demand. Driven by the willingness to purchase more by existing

10

customers and the potential entry of new consumers into the market, the demand is projected to

expand. Multiple factors influence the current demand for goat meat and its potential of increase.

Ethnic background, age, real income, and the consumption of other meat products are a few of

such factors. Centered to those characterizations is ethnic population, the major driving force of

goat meat consumption. In the near future, the continuous growth of immigrants is likely to drive

the expansion of goat meat demand. The elder is another notable factor. As more

"baby-boomers" are retiring in the coming years, the demand potential for goat meat is expected

to be at record high. However, goat meat consumption is still seasonal and occasional. This may

not change in a short term. The authors suggest that in the long run, goat meat can have a

competitive share on the meat market only when convenient goat meat products, suitable for

daily consumption, are further developed.

Stefanson and Associates (1998) study the marketing of wild boar in western Canada. Initiated

by the Western Canadian Wild Boar Association, the goal of this project was to establish an

organized marketing tool for their industry, and to increase returns to producers through the

capture of higher margins generated in the processing and distribution of Wild Boar products.

The research aimed to identify problems within the distribution chain, barriers to the

development of the industry, and ways to improve the organizational structure in order to address

the concerns identified. After investigating potential markets and the activities that are currently

taking place, the study concludes that the distribution chain is currently working well, although

11

segments must be developed in order for the industry to grow in a sustainable manner. The findings suggest that the appropriate organizational structure for industry development is a new generation co-operative. It is suggested that this co-operative must increase its market power and potential through strategic alliances and co-operation with other players in the industry.

To identify the characteristics that consumers value in bison and to distinguish consumer segments with different preferences, Hobbs, Sanderson and Cunningham' s studies (2001, 2003) focus on the understanding of consumers' perception of quality. The authors explore which attributes influence the purchase and consumption decision, so product development and marketing strategies can be developed. Sanderson and Hobbs (2001) studied Canadian consumers' perceptions of bison meat. Consumer taste panels were conducted in Alberta, Canada, in order to identify consumers' evaluation for specific bison meat attributes through a Vickrey's second price auction. This allowed the authors to evaluate hypothetical bison striploin steaks (n=154). The pilot study reveals that three categories of attributes - palatability, health and economic attributes – are important to the consumer's red meat purchase and consumption decision. Price, tenderness, fat content and convenience to cook were four of the most important attributes for bison meat buyers. The authors suggest that consumers are willing to pay more for improved tenderness, lower preparation time and reduced fat content. The study concludes that the bison industry has large market opportunities by using product differentiation and product development strategies. In addition, the results suggest that consumers have inaccurate

12

perceptions about bison. Almost 40 percent of respondents did not disagree with the false statement that bison are an endangered species. Therefore, it is necessary for the bison industry to build on positive images and to correct misperceptions about bison through future promotional strategies.

Cunningham (2003) examined the impact of three different information treatments on consumers' willingness-to-pay for bison. The three treatments are a nutritional comparison chart of negatively-perceived nutrients, a bison taste testimonial from a restaurant chef, and a statement concerning the absence of growth hormones and antibiotics in processed bison. The hypothesis test is that nutritional information about bison would elicit the greatest increase in willingness-to-pay for the processed bison product. A random nth-price auction was conducted in December 2002 in Guelph, Ontario, with 57 participants to elicit willingness-to-pay values for the processed bison product. A regression model was used where socio-demographics served as independent variables, and the difference in bids as the dependent variable. The results suggest that nutritional information is insignificant. Therefore the hypothesis that nutritional information about bison would elicit the greatest increase in WTP for the processed bison product had to be rejected. Nevertheless, each information treatment was found to increase the group mean willingness-to-pay, so any information relevant to consumers about bison may be beneficial in increasing market share for bison products. The authors suggest that industry participants may

13

need to work together to simultaneously increase awareness, distribution and consumption of bison products to ensure the sustainability of the bison industry.

Hobbs et al. (2003) evaluate Canadian consumer attitudes towards bison; in particular, they assess consumer preferences and WTP for six value-added products: bison burger, kebab, stew, deli meat, bison garlic sausage and marinated bison strips.   Consumer panels were undertaken through 2002 and early 2003 in five Canadian locations in Saskatchewan, Alberta, British Columbia, Ontario and Québec. Consumers were shown to have limited knowledge about bison, hence almost any type of information would be beneficial in increasing awareness of bison products. The authors suggest that it is beneficial to increase awareness of bison being ranch-raised all over North America, and promoting the fact that bison are not an endangered species. The authors argue that bison is considered to be quite similar to beef in taste and appearance which are important attributes in the decision to purchase and consume a meat product and will therefore have a significant influence on the marketing of bison meat products. On the other hand, consumers' perceptions about the similarity of meat products change, as the specific attributes of price, healthiness and the eating occasion/location vary. This offers the industry an opportunity to target marketing towards those consumer segments expected to value the attributes that differentiate bison from beef and other traditional meat products. The results of the experimental auction in phase 1 suggests that there are specific groups of individuals who value bison for its lower fat content and natural production methods as well as the novel eating

14

experience it offered. The competitiveness analysis suggests that products may be perceived as similar by consumers based on cut. This is an important consideration when choosing products to develop and market to specific consumer segments. The authors suggest that it is important to ensure the image being promoted is consistent with the consumers' expectations or perceptions for that product.

The authors conduct a cluster analysis based on respondents' rating of the importance of price and a number of health, convenience and image attributes. Three of the five consumer segments were identified to prioritize specific health attributes when purchasing meat. One group emphasized the importance of looking for a unique/novel eating experience and the appeal of a meat product native to North America; another group valued convenience. The authors suggest that identifying target market segments interested in the unique qualities that bison has to offer is key to developing a successful marketing plan.

Hobbs et al. (2003) also use experimental auctions to gather more information about willingness-to-pay for bison products. An ordinary least squares (OLS) regression model is run using average bids for the last five rounds of a sandwich auction as the dependent variable. Only the last five rounds were used under the assumption that learning may occur in first few rounds of bidding; hence these later bids are therefore considered to be more stable in revealing willingness-to-pay (Dickinson and Bailey 2003). Independent (explanatory) variables included the

15

average market price of the first five rounds of bidding, respondent gender, age, education level, income level, the number of times the person had tried bison, and their overall rating of the deli meat product in the taste test. There was a wide distribution of bids among consumers, including a large number (27.6%) of zero bids for the sandwich with bison only. This indicates that many consumers were indifferent between bison and beef unless the bison meat offered them something extra. These results suggest the need to emphasize and develop the "extra" benefits of bison in order to command a premium in the marketplace.

Other factors that were significant in influencing people's bids included gender, whether they had previously tried bison, how much they liked the bison deli meat in the sensory evaluation. Consumers in BC bid significantly lower than those elsewhere. Overall, willingness-to-pay was statistically higher for two of the bison sandwiches – the sandwich labeled as produced without hormones and the sandwich labeled as 60% lower in fat and produced without the use of growth hormones.

2.2. Literature Review of other new food products

Marketing studies on other new food products are also included in this literature review, as they are also related to the changing pattern of consumer preferences for alternative meats. Such a review is also useful to document the advantages and disadvantages of a variety of methodological approaches used in related industry contexts.

16

The literature on branded and naturally raised traditional meats provides a valuable reference for marketing insights into alternative meats. Grannis and Thilmany (2002) examine the potential market for natural pork in the U.S. market. Their research identifies market segments for a natural, regionally produced line of pork products, to assist Colorado producers in developing a viable marketing plan. A contingent valuation mail survey was conducted. A two-stage probit model is employed to estimate target market segments. The results suggest that high-income pork consumers, frequent pork consumers, and those consumers who have purchased natural beef before, are most likely to purchase natural pork products. Two target markets were identified, based on consumer concerns about feed additives, and to a lesser degree, consumer concerns about the effects of pork production on the environment. The authors point to limitations in their study, since the study assumes the market segments are distinct and discontinuous, without testing for it. Therefore, the authors suggest that a follow-up study should estimate these markets using an ordered bivariate process such as an ordered probit or logit.

Unterschultz et al. (1998) conducted a study on South Korean attributes towards Canadian beef relative to competing beef from the United States and Australia, using a stated preference methodology. Executive chefs and purchasing managers from major 4-star and 5-star hotels were interviewed in 1995. Korean buyers strongly prefer beef from the US with quality similar to US prime. For a comparable high quality beef product from Canada or the US the estimated model predicts there is a 28% chance of the aggregate group choosing Canadian beef versus a 49% chance of this same group choosing US beef. The authors suggest that it would generally require

17

significant price cuts or other major marketing efforts to influence non-Korean chefs and Korean purchasing managers to purchasing Canadian beef versus US beef.

Quagrainie et al. (1998) use stated preference methods to ascertain consumer attributes, the identification of origin of fresh meat products, and bio-preservatives in meat packaging. A nested logit model is used to test data from the stated preference questionnaire. The possible presence of consumer market segments interested in high-quality beef, high-quality pork, and ground beef from Alberta are examined. Consumers appear to be loyal to meat products from Alberta and Canada as a whole, compared with fresh meat products from the United States, and products without any indication of origin. The results of a simulation suggest that the price of a beef cut identified to be labeled Canada origin must be reduced by 15% before western Canadian consumers will be indifferent between Canada origin and Alberta origin. These findings suggest that one possible marketing strategy for the Alberta beef industry is to use an Alberta logo or trade mark to distinguish Alberta beef in the western Canadian market.

Kuperis, Veeman and Adamowicz (1999) examine Edmonton consumers' choices of milk in a hypothetical market situation. This hypothetical market included milk that is identified as possibly being from cows treated with rBST (recombinant somatotrophin). The study was designed to examine the trade-offs that consumer appeared to be willing to make between the four milk attributes of fat content, price, freshness and rbst. The effect of socio-economic

18

variables on these trade-offs were also examined. A conditional logit model of consumer choice was developed to examine the choice between milks that vary in price, freshness and the use of rBST. The four fat contents of milk available (skim, 1%, 2%, and homo) are used as the choice alternatives or "brands" in the study. Welfare calculations for a representative household food purchaser were calculated based on the coefficients estimated by the conditional logit model.

Nauman, Gempesaw, Bacon, and Manalo (1995) study consumer choice for fresh fish. The objective of their study was to analyze the relationship between consumers' experiences, perceptions, preferences, and the ultimate choice to purchase selected finfish products. A consumer survey of the northeastern United States was conducted to gather market information regarding the decision to purchase fresh hybrid striped bass, trout and salmon. A modified "evoked set framework" along with logit models were used to model the experience, perceptions, preferences, and choices of consumers for seafood products based on a modified evoked set framework. The evoked set is the set of possible products or brands that consumers may be considering in the decision process. It is the set of choices that has been evoked and is salient as compared with the larger number of available possible choices. Choice, which is the end decision for the purchase of a particular product, is assumed to be explained by experience, perception, and preference along with the socioeconomic and demographic variables.

Özayan et al. (1998) analyzed buyers' preference for new food products (minced meat) derived from Louisiana's undersized crawfish. Results from focus groups indicate that a potential market for the crawfish mince meat is seafood restaurants, where the mince can be utilized as ingredients for various menu items. Conjoint analysis showed that the strongest attribute effects for both products are associated with the product's form, with the highest preferences being a fresh, never frozen product. On the other hand, the least preferred form is a dehydrated bouillon product. The authors also discuss the market's desire for base and stuffing products that are priced well below the price of crawfish tail meat.

3. Alternative meats focus groups

To insure the appropriateness of the alternative meats survey instrument used in this study, we conducted four focus groups between May and June, 2005 at a central facility at the University of Alberta in Edmonton. Each group consisted of seven to ten participants. The first two focus groups were comprised of students from the University of Alberta; they were recruited by the research team from a student's association mailing list. The survey instrument was then revised and scrutinized by the two following focus groups. The participants for these latter two groups were recruited out of the general Alberta population by a professional marketing company, using random digital dialing. Exclusion criteria for these last two focus groups were age (under 18) and vegetarianism. A major effort was made to recruit both urban and rural consumers in proportion

to the actual population split in Alberta.

The main objectives of these group discussions were (i) to identify the meat attributes relevant for consumers' choice decision; (ii) to obtain an understanding of the contentious issues around the consumption of alternative meats, especially bison, venison and lamb; and (iii) to test and modify the preliminary questionnaire.

The initial goal was to develop a survey format that could be used for all three species (bison, elk, lamb). Informal discussions and flipcharts were used first to identify the most relevant attributes and attribute levels, and related consumer perceptions. Moreover, we used selected questions from each of the three parts that make up the final survey: the first part asks several questions related to meat attributes and consumption habits; the second part consists of an actual choice experiment where consumers were asked under what conditions they would be willing to switch away from beef. The third part goes over more sensitive questions, such as demographic variables and past purchases.

Following these very informal discussions, we used, for example, a 5 point rating scale (or a different table format) to test the final question format (e.g. Table 1). We experimented with the same format for elk and lamb, to identify the most relevant attributes and attribute levels. As expected, consumers felt that lamb should be treated differently from bison and venison. Lamb

21

was clearly recognized as a less exotic meat and associated with more ethnic eating habits. The final survey format was adjusted correspondingly, so as to more accurately capture a range of consumer perceptions.

The following table is an example of the product features that were discussed. Only those features are reported below received significant attention by respondents. This information was instrumental in the design of the choice experiment format.

Table 1: Product features

Please evaluate the following features for **bison** meat, in terms of *how important* the features are to you personally when you buy this meat. If you have not bought or eaten bison meat before, please indicate what features *would be* important to you (please circle a number in each case):

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Product Feature	Not at all Important	Not Very Important	Somewhat Important	Very Important	Extremely Important	Don't know
Tenderness and flavour	1	2	3	4	5	6
Expiry date on package	1	2	3	4	5	6
Raised locally	1	2	3	4	5	6
No use of growth hormones, antibiotics, animal protein in raising the animals	1	2	3	4	5	6
Trace-back certification on packaging (origin)	1	2	3	4	5	6
Seasoned & Ready-to-Cook meat	1	2	3	4	5	6
Handling and cooking recommendations on packaging	1	2	3	4	5	6
Fresh rather than frozen	1	2	3	4	5	6
Variety of cuts	1	2	3	4	5	6
Price	1	2	3	4	5	6

22

Absence of genetic modification (non-GM)	1	2	3	4	5	6
Trying something different	1	2	3	4	5	6
Low Cholesterol and fat	1	2	3	4	5	6
Animals raised humanely	1	2	3	4	5	6
Meat colour	1	2	3	4	5	6

Tenderness and flavour

52.6% of the focus group participants indicated that it is a very important attribute for bison meat, and 42.1% claimed it is extremely important; in total, 94.7% of the respondents thought it is an important attribute.

Meat colour

21% of participants indicated that colour is somewhat important in bison ; 57.9% chose it as very important; 10.5% chose it as extremely important.

Freshness:

36.8% indicated that freshness is somewhat important, 36.8% said it is very important, and 10.5% said that price is extremely important respectively; 15.8% of participants believe it is not very important.

Price

For 26% of focus group participants, price was very important in their bison choice; 42.1% felt it is important; only 26.3% indicated that it is somewhat important.

Importance of variety of cuts

Out of all focus group participants, 52.6% feel that variety is very important; 15.8% said that it is extremely important, while 21.1% indicated that it is somewhat important.

Absence of growth hormones, antibiotics and animal protein in raising animals

Nearly 80% of participants were concerned with the use the growth hormones and antibiotics in meat production across all three species. The absence of growth hormones, antibiotics and animal protein in raising animals is somewhat important to 31.6%, very important to 10.5% and extremely important to 36.8% of participants considering their choice of bison meat.

Origin certification on packaging

For 26.3% of the focus group participants, this attribute is somewhat important, for another 26.3% it was very important, and for 15.8% of participants origin certification was extremely important.

Low Cholesterol and fat

47.4% of participants claimed that low cholesterol and fat is extremely important to them (respondents also felt that cholesterol and fat could be treated in one attribute category); to

15.8% of participants it is a very important attribute combination, and to 21.1% it is somewhat important.

Animals raised humanely [1]

Animal welfare is an emerging issue for consumers, which is reflected in the fact that 42.1% of focus group participants suggested that it is very important, and 31.6% indicated that it is extremely important in their choice of bison meat; however, consumers were also concerned with the credence nature of this attribute: how would a consumer know if the animal was raised humanely? Hence, the issue of labeling and certification was discussed jointly with this issue. We used this information as justification to include certification explicitly in the final survey design.

Information sources affecting consumer behaviour

The following table was used for discussions during the focus group sessions (the original wording was quite different) :

Table 2: information sources

If you have bought/ were to buy bison/lamb/venison, how important is/ would be each of the following *information sources* to you (1 = least important, 5 = most important):

	Not at all Important	Not Very Important	Somewhat Important	Very Important	Extremely Important	Don't know
Magazines, newspapers	1	2	3	4	5	6
TV, radio	1	2	3	4	5	6

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[1] In January 2006, the European Union legislation is preparing for an EU-wide labeling scheme of animal welfare.

Internet	1	2	3	4	5	6
Friends, family	1	2	3	4	5	6
Promotional flyers	1	2	3	4	5	6
Health professionals	1	2	3	4	5	6
In-store promotion	1	2	3	4	5	6
Label on package	1	2	3	4	5	6

It turned out that newspapers, magazines and internet sources do not significantly affect participants' decision of buying alternative meats: for both bison and elk meat, as over 50% of participants disagree that these information sources are important; TV and radio were considered to be somewhat more effective, as 50% of participants indicated that it is somewhat important. Nevertheless, friends, and family members' opinions were considered to be very important or extremely important (together 60%). Health professionals' advice was also considered to be a very important source for focus group participants, as 50% think it is very important, and 10% said it would be extremely important.

We also discussed how frequent and where consumers bought the above meats. Given the diverse channels through which alternative meats can be purchased, our focus group discussions tried to capture all relevant sources, including hunting and private distribution. For all focus group participants, almost 50% had never bought bison meat, 63% had never bought lamb, and 79% had never purchased elk meat before.

26

Interestingly, 58% never ate certified organic meats, 10.5% buy directly from a farm, and 21% got elk meat from a friend who hunts. As to be expected, respondents found it difficult to distinguish between venison, deer and elk. In order to improve the reliability of the final survey, we chose to focus on one species, elk, rather than to try and lump elk and deer into one group, as it would remain unknown whether consumers would be able to distinguish between these two meats. A similar issue relates to bison: over 30% of the focus group participants thought that bison and buffalo do not refer to the same species.

4. Results from web-based consumer surveys

The web-based surveys consisted of three parts. In the first part, consumers were asked to state their preferences with regards to their current or past purchasing pattern, as well as their attitudes towards certain product and process attributes. The second part of the survey consisted of an actual choice experiment, in which consumers faced four tables, from which they could choose one out of three options (your regular beef steak, a specified bison steak or non of both). This choice experiment was preceded by a question that asked consumers to specify their regular beef steak in terms of price category, fat level, farm origin traceability and use of GMO in animal feed. Once consumers had entered this information, it became their status quo in the following choice experiment. In this way, we were able to reveal what it takes – in terms of price, fat, traceability, and GMO – for consumers to switch away from beef towards bison steak. The third

27

part of the survey consisted of the collection of demographic information. This part was key, since we are interested in linking consumers' stated preferences from the first and second part of the survey with their personal information. In this manner, we are able to distinguish particular consumers segments and talk about target markets.

4.1. Results from the elk survey

The following sections will first document the descriptive statistics, before analyzing the model estimates.

Early on in the survey, consumers were asked for their perception of elk as a "wild", "alternative" or "exotic" meat. The following percentage of consumers agreed or strongly agreed with the following statements (n=299):

- 78.9%: "Elk is a wild meat"
- 66.9%: "Elk is an alternative meat"
- 38.5%: "Elk is an exotic meat"

It is thus to be recommended that marketing efforts emphasize and re-inforce consumers' perception of elk as a "wild" meat.

From a list of five factors that were singled out through the focus groups, we tried to infer why consumers had not purchased elk in the past. Consumers were therefore asked to rank five reasons for not purchasing elk meat (n=256).

- 38.7% indicated that "Lack of availability" was the first reason for not purchasing elk meat.
- 25.4% indicated that "Disease-related issues" were the second most important reason.

28

- 20.3% indicated that "Lack of cooking/preparation experience" was the third most important reason
- 12.1% indicated that "Lack of promotion and advertising" was only the fourth most important reason for not purchasing.
- 3.5% of the consumers indicated that unappealing in-store packaging was the least relevant reason for not purchasing elk.

Consumers were also asked how important several information sources are in their purchasing decision (n=253). Over 60% indicated that friends and/or family were very or extremely important sources of information in their purchasing decision. Clearly, this is expected, since elk is often purchased/sourced through family or friends. Interestingly enough, the package label and in-store promotions were considered to be the second and third most important source of information, as it impacts on consumers' purchasing decision. Marketing efforts should thus put more emphasis on informative and attractive labeling, and use in-store promotions more extensively.

How important are information sources for purchasing decisions? (n=253)

- Very or extremely important for elk purchase:
    - 15.4%: Magazines, newspapers
    - 13.8%: TV, radio
    - 12.3%: Internet
    - 60.1%: Friends, family
    - 19.0%: Promotional flyers
    - 37.2%: Health professionals
    - 42.7%: In-store promotion
    - 43.5%: Package label

Our focus groups also revealed that consumers who were unexperienced with alternative meats considered their first alternative meat experience in a restaurant as key experience (in terms of their willingness to experience more alternative meats in the future). Therefore, we asked respondents whether they first tried those meats in a sit-down restaurant. 33.3% of those

consumers who participated in the elk survey revealed that they had tried bison first in a sit-down restaurant. Thus, the initial consumption experience outside of a sit-down restaurant (including at home and in a fast-food restaurant) was predominant here. This was even more so for elk and lamb: 22.9% (11.9%) of respondents said that they had tried lamb (elk) first in a sit-down restaurant.

Percent of respondents who first tried meats in a sit-down restaurant (n=253)
- Bison in a sit-down restaurant: 38.3%
- Lamb in a sit-down restaurant: 22.9%
- Elk in a sit-down restaurant: 11.9%

These results are within expectation: (a) elk is most frequently traded and prepared through family, hence restaurant experience is rare; compared to lamb and bison, there appears to be a large scope to raise consumers' exposure to elk through restaurants and use this to stimulate in-store purchases; (b) compared to lamb, this survey revealed that bison has clearly the highest restaurant penetration rate; this may be partly explained due to the fact that respondents indicated that they are particularly unfamiliar with the preparation of bison at home; but it may also be a reflection that lamb is not as exciting to try in a restaurant as bison.

Respondents were also asked to what extent they think that a list of meat features is important in their purchasing decision (or would be important, if they had not purchased elk before). The following percent of respondents think that the following features are (or would be) very or extremely important when buying elk: (n=295)

- Tenderness and flavour – 89.2%
- No use of growth hormones, antibiotics, animal protein in raising the animals – 69.2%
- Absence of genetic modification (non-GM) – 60.3%
    - Considering the above three features, it is somewhat surprising that price is not ranked amongst the top three features; these results suggest that the elk industry's marketing (and labeling) efforts should address explicitly how the animals are being raised. From the above, consumers associate a "wild" experience with elk,

30

and this should be emphasized explicitly by emphasizing that these animals are raised without by-products, as applicable.

- Price – 58.0%
- Low cholesterol – 56.9%
  - The fact that low cholesterol is not amongst the top three seems to indicate that consumers are aware that cholesterol and fat are not negatively associated with elk.
- Trace-back certification on packaging (origin) – 51.9%
  - The fact that more than 50% of respondents think that it very or extremely important to know about trace-back on packaging suggests that the elk industry should address this issue explicitly in their marketing efforts.
- Handling and cooking recommendations on packaging – 49.2%
- Meat colour – 41.7%
- Raised locally – 32.2%
  - Clearly, this suggests that the elk industry will not gain from marketing the local origin to attract new consumers.
- Trying something different – 30.8%
  - It is somewhat disappointing to see that the novelty effect is not attractive to (potential) elk consumers. This only re-inforces our findings that consumers do not consider elk as "exotic", but rather as "wild".
- Seasoned & Ready-to-Cook meat – 19.0%

In order to explore the above findings in more depth, we conducted a special type of study called a *choice experiment* in which consumers were asked to imagine a that they are on a typical grocery shopping trip and have to decide what kind of steak to buy. As a first step, they were asked to describe their usual steak using four product features: price, amount of visible fat, information about tracing back the meat to the farm on which the animal was raised, and finally label certifying of that the animal was fed non-GM feed. These features are summarized in Table 3 below:

Table 3: Product Features of the Respondent's Usual Beef Steak

Features	Possible Product Feature Values			
Price per kg	$13.99/ kg	$15.99/ kg	$22.99/ kg	$28.99/ kg
Fat	trimmable	1-5% visible (not trimmable)	5-15% visible (not trimmable)	15-50% visible (not trimmable)
Guarantee of farm origin traceability		Yes		No
Guaranteed produced without genetically modified organisms (GMO)		Yes		No

Next, respondents were asked whether they were willing to switch from their usual beef steak to an elk steak in four different scenarios. In each of these scenarios, the product features of the elk steak were changed – for example, the amount of fat and/or the price, and/or the traceability, and/or the non-GM feed guarantee, etc. The combination of product features that were changed in the elk steak was varied in an objective, statistical manner.

The following table is a simplified example of such a scenario:

Table 4: Example of Meat Shopping Scenario

Product features	Choice A	Choice B	Choice C
	Your regular beef steak purchase (as in the previous question)	*Elk steak*	*Neither my regular steak nor the elk steak*
Fat:	*(as in the previous question)*	1-5% visible fat (not trimmable)	
Certified label gives guarantee of farm origin traceability:	*(as in the previous question)*	Yes	
Certified label states: "*Guaranteed produced without genetically modified organisms (GMO)***"**	*(as in the previous question)*	No such label	
Price:	*(as selected in Question 14)*	10% off your *regular* beef steak as selected in Question 14	
I would choose:	• Choice A	• Choice B	• Choice C

The following table shows the results of the statistical analysis in terms of the premium that the respondents are willing to pay for each of the product features:

Table 5: Premia for Elk Product Features

Product Feature	Premium for Product Feature ($ per kg)
Non-GM raised elk	$5.90
Traceability back to farm	$3.26
Low level of fat (1-5%)	$8.82
Medium level of fat (5-15%)	$4.90
High level of fat (15-50%)	$4.56

The analysis shows that the respondents most **highly value low levels of fat** in their elk steak. They are willing to pay $8.82/kg to have a low level of fat in the steak (1-5%). Interestingly, they will also pay a premium for 5-15%, and 15-50% levels of fat, but about half of the premium that they are willing to pay for the least amount of fat.

Also, respondents will pay $5.90/kg to ensure that the elk is **guaranteed to be raised without GM** feed, and $3.26/kg more for a certified label that gives a **guarantee of farm origin traceability**. Aside from these premia values, the analysis also showed that respondents prefer to buy some meat, whether their own regular beef steak or the elk alternative, they strongly prefer their regular beef steak to the elk steak. In 68 percent of the scenarios, respondents chose their usual beef steak, they chose elk 24 percent of the time, and 9 percent of the time they chose to buy neither meat options.

The fact that these premia are all positive seems to indicate that **consumers value some level of fat** (which also conforms with our previous finding that consumers rated flavour and tenderness as the prime factor in their choice). Thus, **consumers do not want to trade away taste that comes with fat**, especially as they are paying significantly more compared to their regular beef choice; however, they do not want too much fat on their elk meat. This result may be because those who are choosing elk over beef are doing so for its lower level of fat.

In a second step, we also analyzed the relationship between demographic variables and the meat attributes as well as the attribute levels from which consumers were able to choose from. The variables were defined as following:

Table 6: Description of variables used in the model estimation

Variables	Description
ALT1	alternative specific constant of beef (choice 1)
ALT2	alternative specific constant of bison (choice 2)
ALT3	alternative specific constant of neither beef nor bison (choice 3)
PRICE	Price (in Canadian Dollars)/kg of the meat steak
TR	label of traceability, 1 = yes, 0 = no
NOGMO	label of no Genetically Modified Organisms,1 = yes, 0 = no
FAT1	dummy-coded fat level 1, trimmable
FAT2	dummy-coded fat level 2, 1-5% visible (not trimmable)
FAT3	dummy-coded fat level 3, 5-15%visible (not trimmable)
FAT4	dummy-coded fat level 4, 15-50% or 15-20% (not trimmable)
FA1	dummy-coded beef fat level 1, trimmable
FA2	dummy-coded beef fat level 2, 1-5% visible (not trimmable)

FA3	dummy-coded beef fat level 3, 5-15% visible (not trimmable)
FA4	dummy-coded beef fat level 4, 15-50% visible (not trimmable)
FB1	dummy-coded bison fat level 1, trimmable
FB2	dummy-coded bison fat level 2, 1-5% visible (not trimmable)
FB3	dummy-coded bison fat level 3, 5-15% visible (not trimmable)
FB4	dummy-coded bison fat level 4, 15-20% (not trimmable)
EC1	effects-coded fat level 1, trimmable
EC2	effects-coded fat level 2, 1-5% visible (not trimmable)
EC3	effects-coded fat level 3, 5-15% visible (not trimmable)
EC4	effects-coded fat level 4, 15-50% or 15-20% (not trimmable)
EDU	education if university or grad school = 1, otherwise = 0
INCOME	mean points of the income categories
AGE	mean points of the age categories
EX	exercise regularly = 1 otherwise = 0
RED	consumers who prefer red meat than white meat = 1 otherwise=0
LOCALE	rural = 1, urban = 0
GENDER	male = 1, female = 0
MARRIED	married = 1, otherwise = 0
SMOKE	smoker = 1, non-smoker = 0
KID	have at least one child = 1, otherwise = 0
ORGANIC	organic food buyers = 1, otherwise = 0

Interaction terms:

EDGMO	**EDU × NOGMO**
EDTR	**EDU × TR**
KIDGMO	**KID × NOGMO**
KIDTR	**KID × TR**
KIDP	**KID × PRICE**
LOCGMO	**LOCALE × NOGMO**
LOCTR	**LOCALE × TR**
INCGMO	**INCOME × NOGMO**
INCTR	**INCOME × TR**
ORGANGMO	**ORGANIC × NOGMO**
ORGANTR	**ORGANIC × TR**
AGE1	**AGE × ALT1**
AGE1^2	**AGE^2 × ALT1**
AGE3	**AGE × ALT3**
AGE3^2	**AGE^2 × ALT3**
EX1	**EX × ALT1**

EX2	**EX × ALT2**
EX3	**EX × ALT3**

Table 7: Estimation results for elk

Variable	Coefficient	Standard Error	b/St.Er.|	P[|Z|>z]
FARM	1.373576911	.28477917	4.823	.0000
GMO	.7976259043	.15005200	5.316	.0000
FAT1	-.5769434733	.17108653	-3.372	.0007
FAT2	-.6778172130	.19264602	-3.518	.0004
FAT3	-1.944623957	.35753969	-5.439	.0000
PRICE	-.1970606835	.23432357E-01	-8.410	.0000
INCFAR	-.1523931350E-04	.38634374E-05	-3.944	.0001
INCPRIC	.1191807012E-05	.24123877E-06	-3.944	.0000
SCHFAT3	.4033503509	.96892010E-01	4.163	.0000
RURPRIC	-.4109031032E-01	.12355859E-01	-3.326	.0009
A_SQ	4.627641311	.29701533	15.580	.0000
A_ELK	3.352189037	.34773608	9.640	.0000

(Note: E+nn or E-nn means multiply by 10 to + or -nn power.)

Log likelihood at convergence	-733.4778

37

Pseudo-R^2	.10928
Number of observations	1068

The results suggest that only **higher income consumers** are willing to pay **a very small premium** for farm origin traceability (less than one penny per kg, see interaction term IncFar).

More interesting is the finding that higher income consumers gain utility from higher prices. Thus, high income consumers appear to consider **elk as a status meat**. Industry marketing efforts could thus opt for a price differentiation strategy: keep prices of medium to lower quality cuts at their current level (or even lower prices), and increase prices of the top qualities for the top end consumers. We can even paint a more differentiated picture, since the results suggest that rural consumers lose utility with higher prices (RurPric), irrespective of the income level. Thus, **urban consumers** should be particularly the targets of such a differentiated pricing strategy.

4.2. Results from the bison survey

We begin with a discussion of the descriptives.

The following percentage of consumers agreed or strongly agreed with the following statements (n=288):

- 75.3%: "bison is an alternative meat"
- 43.1%: "bison is a wild meat"
- 13.6%: "bison is an exotic meat"

This suggests that bison is quite differently from elk and lamb, in that it is the only meat which consumers consider being an "alternative meat".

From a list of five factors that were singled out through the focus groups, we tried to infer why consumers had not purchased bison in the past. Consumers were therefore asked to rank five reasons for not purchasing lamb meat (n=288).

- 65.1% indicated that "Lack of availability" was the first reason for not purchasing bison meat.
- 47.2% indicated that "Lack of cooking/preparation experience" was the second most important reason
- 46.5% indicated that "Lack of promotion and advertising" was the third most important reason for not purchasing.
- 41.3% indicated that "Disease-related issues" were the fourth most important reason.
  - It is striking that this issue is so important in the mind of the consumers, and even more important with regards to bison than with regards to elk
- 25.7% of the consumers indicated that unappealing in-store packaging was the least relevant reason for not purchasing elk.
  - The same ranking was also found for elk, hence it is somewhat encouraging that this aspect is addressed appropriately by the retailers.

We also asked consumers of the bison survey how frequently they had tried alternative meats before (n=253):
- 12.8% indicated that they had bison once or twice before
- 19.4% indicated that they had lamb once or twice before
- 4.5% indicated that they had elk once or twice before

Consumers were also faced with the following statement:

"I consider the lack of advertising for bison meat to be a negative signal for quality: I get the impression that the industry has something to hide."

25.4% of the consumers (n=288) agreed or strongly agreed with this statement. Considering this finding together with the above finding that the lack of promotion and advertising was the third most important reason for not purchasing bison suggests that the bison industry has

an important task in raising consumer awareness and sales by promoting bison more strongly and effectively.

Respondents were also asked to what extent they think that a list of meat features is important in their purchasing decision (or would be important, if they had not purchased lamb before). The following percent of respondents think that the following features are (or would be) very or extremely important when buying bison: (n=233)

- tenderness and flavour – 90.8%
- No use of growth hormones, antibiotics, animal protein in raising the animals – 68.4%
- Price – 67.3%
    - In contrast to lamb and elk, price is far more of an issue to bison consumers, which raises the question whether a price differentiation strategy would pay off for different consumer segments
- low cholesterol – 60.3%
    - in contrast to lamb and elk, cholesterol appears to be of greater concern to consumers of bison (and genetically modification appears to be less of an issues)
- Trace-back certification on packaging (origin) – 59.9%
- Absence of genetic modification (non-GM) – 57.4%
- Handling and cooking recommendations on packaging – 49.6%
- meat colour – 46.3%
- Trying something different – 43.4%
    - The novelty aspect appears to be a more important choice criteria for bison consumers as compared to elk and lamb
- raised locally – 40.4%
- Seasoned & Ready-to-Cook meat – 25.4%

This survey proceeded in the same manner as the elk survey, i.e. respondents described their usual beef steak that they bought, and were asked whether in a hypothetical grocery shopping trip, they would be willing to switch and buy a bison steak instead.

Please see Tables 1 and 2 for the steak product features and the scenario questions.

The following tables give a description of the variables used in the statistical analysis, and show the results of the statistical analysis in terms of the premium that the respondents are willing to pay for each of the product features:

Table 8: estimation results for bison

Variable	Coefficient	Standard error	b/St.Er.|
FARM	.7745985945E-01	.14765130	.525
GMO	.3938557192	.15259786	2.581
FAT1	.7706923680	.31007681	2.485
FAT2	1.008983449	.29669551	3.401
FAT3	.8597847082	.29446970	2.920
PRICE	-.7678415023E-01	.92686475E-02	-8.284
A_SQ	2.491990820	.34758841	7.169
A_BISON	1.705247971	.35348027	4.824

Number of observations	840
Log likelihood function	-555.0999
R-Squared	.08855
Chi-squared[6]	107.86259

Table 9: Premia for Bison Product Features

Product Feature	Premium for Product Feature ($ per kg)
Non-GM raised bison	$5.13
Traceability back to farm	$0.00
Low level of fat (1-5%)	$11.20
Medium level of fat (5-15%)	$13.14
High level of fat (15-50%)	$10.04

The analysis shows that the respondents do want fat in their bison steak, and will pay a significant premium for it. The amount they are willing to pay varies with different amounts of fat. **Respondents most highly value medium levels of fat in their bison steak** and are willing to pay $13.14/kg to have a medium level of fat in their steak (5-15%). Interestingly, they will also pay a premium for 1-5%, and 15-50% levels of fat. These findings appear to support anecdotal evidence that butchers tell their customers who buy bison to coat it with vegetable oil before cooking or barbequing it.

Also, respondents will pay $5.13/kg to ensure that the bison is **guaranteed to be raised without genetically modified organisms** (GMO), but they are **not willing to pay anything extra for a certified label that gives a guarantee of farm origin traceability** for the bison.

42

Aside from these premia values, the analysis also showed that respondents prefer to buy some meat, whether their own regular beef steak or the bison alternative, they strongly prefer their regular beef steak to the elk steak. In 75 percent of the scenarios, respondents chose their usual beef steak, they chose bison 17 percent of the time, and 8 percent of the time they chose to buy neither meat options.

4.2.1. A model to differentiate between bison and beef fat valuation by consumers

In this model we were interested to find out whether respondents had different preferences for beef fat versus bison fat (let fa1 to fa4 are 4 beef fat levels, and fb1 to fb4 are 4 bison fat levels).

Dependent Variable Y = **Choice**
Choice = ASC1 + ASC3 + *Price* + *NOGMO* + *Traceability* + *Fa1* + *Fat2* + *Fa3* + *Fb1* + *Fb2* + *Fb3*
(1.3)

Table 10: estimation results for bison vs. beef steaks

	Coeff.	Std.Err.	t-ratio	P-value
ALT1	1.62	0.51	3.14	0.00
ALT3	-1.69	0.35	-4.79	1.60E-06
PRICE	-0.08	0.01	-8.25	2.89E-15
TR	0.09	0.15	0.59	0.55
NOGMO	0.40	0.15	2.59	0.01
FA1	0.09	0.48	0.19	0.84
FA2	-0.05	0.48	-0.10	0.92
FA3	0.26	0.49	0.52	0.60
FB1	0.93	0.31	2.98	0.00
FB2	0.96	0.31	3.06	0.00
FB3	0.78	0.32	2.43	0.02

A joint Wald test was conducted to test whether the coefficients of fa1 versus fb1, fa2 versus fb2, and fa3 versus fb3 are significantly different. :

Table 11: Wald test for bison vs. beef fat

Variable	Coefficient	Standard Error	b/St.Er.	P[|Z|>z]
Fncn(1)	-.8392564420	.57100894	-1.470	.1416
Fncn(2)	-1.010353735	.56806970	-1.779	.0753
Fncn(3)	-.5188934941	.58056248	-.894	.3714

Number of observations   840
Log likelihood function   -554.6037
Chi-squared =   4.22, Sig. level =   .23867

Examining the probability value shown in the output, the value of 0.23867 is greater than the alpha of 0.05. Hence, we fail to reject the null hypothesis and conclude that **consumers do not appear to value bison fat different from beef fat**. As a result, we do not distinguish between bison and beef fat in the following models.

4.2.2. A model to differentiate further between consumers and their preferences for bison

The following two tables define the variables used:

Table 12: bison and beef steak attributes and attribute levels

Attributes	Levels
Beef Price	$13.99/kg, $15.99/kg, $22.99/kg, $28.99/kg
Bison Price	$12.99/kg, $22.99/kg, $32.99/kg, $42.99kg
Beef Fat	trimmable, 1-5% visible(not trimmable), 5-15%visible(not trimmable), 15-50%(not trimmable)
Bison Fat	trimmable, 1-5% visible (not trimmable), 5-15% visible (not trimmable), 15-20% visible (not trimmable)
Traceability	yes, no
Non-GMO	yes, no

44

Table 13: Description of variables and expected sign of the estimation results

Variables	Description	Expected Sign
ALT1	alternative specific constant of beef (choice 1)	?
ALT2	alternative specific constant of bison (choice 2)	?
ALT3	alternative specific constant of neither beef nor bison (choice 3)	?
PRICE	Price (in Canadian Dollars)/kg of the meat steak	-
TR	label of traceability, 1 = yes, 0 = no	+
NOGMO	label of no Genetically Modified Organisms,1 = yes, 0 = no	+
FAT1	dummy-coded fat level 1, trimmable	+
FAT2	dummy-coded fat level 2, 1-5% visible (not trimmable)	+
FAT3	dummy-coded fat level 3, 5-15%visible (not trimmable)	+?
FAT4	dummy-coded fat level 4, 15-50% or 15-20% (not trimmable)	-
FA1	dummy-coded beef fat level 1, trimmable	+
FA2	dummy-coded beef fat level 2, 1-5% visible (not trimmable)	+
FA3	dummy-coded beef fat level 3, 5-15%visible (not trimmable)	+?
FA4	dummy-coded beef fat level 4, 15-50% visible (not trimmable)	-
FB1	dummy-coded bison fat level 1, trimmable	+
FB2	dummy-coded bison fat level 2, 1-5% visible (not trimmable)	+
FB3	dummy-coded bison fat level 3, 5-15%visible (not trimmable)	+?
FB4	dummy-coded bison fat level 4, 15-20% (not trimmable)	-
EC1	effects-coded fat level 1, trimmable	+
EC2	effects-coded fat level 2, 1-5% visible (not trimmable)	+
EC3	effects-coded fat level 3, 5-15%visible (not trimmable)	+
EC4	effects-coded fat level 4, 15-50% or 15-20% (not trimmable)	-
EDU	education if university or grad school = 1, otherwise = 0	n.a.
INCOME	mean points of the income categories	n.a.
AGE	mean points of the age categories	n.a.
EX	exercise regularly = 1 otherwise = 0	n.a.
RED	consumers who prefer red meat than white meat = 1 otherwise=0	n.a.
LOCALE	rural = 1, urban = 0	n.a.
GENDER	male = 1, female = 0	n.a.
MARRIED	married = 1, otherwise = 0	n.a.
SMOKE	smoker = 1, non-smoker = 0	n.a.
KID	have at least one child = 1, otherwise = 0	n.a.
ORGANIC	organic food buyers = 1, otherwise = 0	n.a.

45

			Interaction terms:	
EDGMO	**EDU × NOGMO**			+
EDTR	**EDU × TR**			+
KIDGMO	**KID × NOGMO**			+
KIDTR	**KID × TR**			+
KIDP	**KID × PRICE**			-
LOCGMO	**LOCALE × NOGMO**			?
LOCTR	**LOCALE × TR**			?
INCGMO	**INCOME × NOGMO**			+
INCTR	**INCOME × TR**			-
ORGANGMO	**ORGANIC × NOGMO**			-
ORGANTR	**ORGANIC × TR**			+?
AGE1	**AGE × ALT1**			?
AGE1^2	**AGE^2 × ALT1**			?
AGE3	**AGE × ALT3**			?
AGE3^2	**AGE^2 × ALT3**			?
EX1	**EX × ALT1**			-
EX2	**EX × ALT2**			+
EX3	**EX × ALT3**			-

Table 14: Estimates for bison, including interaction terms

	Coefficient	Std.Err.	P-value
ALT1	3.53	1.07	0.00
ALT3	-1.48	1.54	0.34
PRICE	-0.07	0.01	0.00
TR	-1.33	0.58	0.02
NOGMO	1.83	0.63	0.00
EC1	0.32	0.12	0.01
EC2	0.13	0.12	0.27
EC3	0.18	0.14	0.20
EDGMO	-0.73	0.19	0.00
EDTR	0.30	0.17	0.07
KIDGMO	-0.14	0.33	0.67
KIDTR	0.93	0.32	0.00
KIDP	-0.03	0.01	0.06
RED1	0.38	0.25	0.13

RED3	-0.96	0.34	0.01
EX1	-0.48	0.22	0.03
EX3	-1.11	0.33	0.00
INCOME1	0.00	0.00	0.37
INCOME3	-0.00	0.00	0.06
AGE1	-0.13	0.05	0.01
AGE1^2	0.00	0.00	0.03
AGE3	0.03	0.07	0.71
AGE3^2	-0.00	0.00	0.93
ORGANIC1	-0.21	0.26	0.42
ORGANIC3	0.52	0.41	0.20
ORGANGMO	0.75	0.35	0.03
ORGANTR	0.21	0.33	0.52
INCGMO	0.00	0.00	0.05
INCTR	0.00	0.00	0.57

The following sections discuss the estimation results as in table 14.

Alternative Specific Constants (ASCs)

ASCs are included to estimate the impact of unobserved characteristics or source of the alternatives which are not described by attributes in the choice experiments. (Boxall et al. 2003)

The alternative specific constant (ASC), ALT1 is statistically significant different from zero at 1% level with positive sign, which includes all unobserved factors in the utility function of choosing beef. The ASC of 3rd choice, ALT3 has negative sign, but is not statistically significant from zero. The estimated parameters of ALT1 and ALT3 confirm the above results, in that beef is most preferred by respondents in the choice experiments, and the unobserved factors of beef in a consumer's utility function is significant higher than bison.

47

Price

The estimated parameter of price (PRICE) is statistically significant at 1% level and, as expected, has a negative sign, indicating when the price of an alternative increases, a respondent's utility will decrease. **Consumers who have at least one child are more sensitive to price increases than consumer households without children**, as the estimated coefficient of KIDP is negative and significant at 10% level.

Non-GMO

Non-GMO labeling (NOGMO) is statistically significant at 1% level with positive sign, which implies that the meat buyer is aware of the non-GMO labeling and will **prefer non-GMO certified meat steaks** (no differentiation here between high income, low income etc.). This finding is similar to that of Chern et al. (2002). However, the interaction term EDGMO is significant at 1% level with negative sign, which suggest that **higher educated consumers are less likely to choose steaks that are labeled as GMO-free**, since the attribute of Non-GMO labeling actually decreases their utility. **Respondents who have one or more children do not seem to care about GMO labeling**, as the coefficient of KIDGMO is negative, but not significantly different from zero. INCGMO is significant at 5% in Model 6, and the sign is positive, which indicates **higher income consumers think that GMO labeling is important,** their utility will be higher if they choose to buy meat steaks with Non-GMO labeling.

48

The estimated parameter of ORGANGMO is statistically significant at 5% level, and the sign is positive. Organic food buyers' utilities are higher when they buy meat cuts with non-GMO labels; the sign is expected, since organic food supporters are expected to be critical towards genetically modified or genetically engineered biotechnologies, and our results confirm that these **organic consumers (consumers that regularly purchase organic produce) have a strong preference for bison steaks produced without GMO's**.

Traceability

The estimated parameter of traceability (TR) is negative and statistically significant at 5% level as the estimation shows, indicating that consumers are less likely to choose a meat steak with the traceability labeling; negative sign indicates that this attribute will decrease a consumer's utility. However, **higher educated people care about traceability** label at 10% level, which indicates that they have higher concern with food safety issues. **Respondents who have at least one child are also more likely to buy bison steaks with traceability labeling**, as the coefficient of KIDTR is positively significant at 1% level. The estimated coefficient of INCTR is not statistically different from zero, suggesting **income differences are not a driver for consumers' willingness to pay for traceability**.

The sign of ORGANTR is positive, but the estimated coefficient is not significantly different from zero, which implies that **organic food buyers are indifferent with regards to traceability** labeling. The attribute of traceability for a meat steak will not increase a meat buyer's utility.

49

The findings of traceability suggest that consumers with diversified characteristics perceive the importance of traceability differently, which is consistent with the research of traceability for beef and pork (Hobbs et al. 2005). They conclude that age, gender, education, and income are not significant; they also argue that traceability assurance is limited to elicit consumers willingness to pay, however, bundling traceability with quality assurances will deliver more value to Canadian consumers.

Fat

Consumers **prefer to buy low or medium fat** meat cuts, or meat cuts with trimmable fat; to choose high fat meat cuts will decrease a consumer's utility. The results suggest that respondents strongly do not like high-fat meat steaks, however, respondents' preferences among trimmable fat meat cut, 1-5% fat meat cut and 5-15% fat meat cut are heterogeneous: the parameter of trimmable fat (EC1) is statistically significant and the sign is positive, suggesting that **trimmable fat on a bison steak is very attractive to consumers**; the signs of EC2 and EC3 are positive, but the difference among these low-fat (1-5% fat) and medium-fat levels (5-15% fat) are insignificant. Hobbs et al. (2006) find that low fat attribute of bison alone is insignificant to capture consumers' willingness to pay, which is comparable to the findings of fat attribute in this study

Socioeconomic and Demographic Variables interacted with ASCs

Respondents who prefer red meat are more likely to choose beef or bison, and less likely to choose "opt-out" as the coefficients of RED1 and RED3 indicate. **Respondents who exercise regularly are more attracted by bison meat**, suggesting that bison meat's health attribute is more likely to impact and capture health conscious consumers' demand. **Higher income consumers** are less likely to choose opt-out at 10% level, and they prefer beef or bison, however, they **do not significantly prefer beef to bison** according to the t statistics and p-values reported by NLOGIT 3.0. Younger and elder respondents are more likely to buy beef; **middle-aged consumers** are less likely to choose beef, but **more likely to choose bison**, as the quadratic function of age with respect to beef is U-shaped. The empirical results also suggest that organic food buyers' preference to bison is unknown, as the estimated parameters of ORGANIC1 and ORGANIC3 are not significantly different from zero.

The key findings could be summarized as following:

1. labeling bison steaks as **produced without GMOs** increases the bison steak values significantly; however, whether this negative labeling is to be recommended in practice, depends on the ability of the supply chain members to adhere to minimum legal thresholds for GM, i.e. on the ability of the supply chain members to ensure that only minimum traces of genetically engineered products are contained in the meat; however, despite the high price premium that we found, it is likely to be too expensive

(certification and testing) for individual producers/marketers to use negative labeling; this leads us to two recommendations:

a. individual producers/marketers of bison who are able to ensure minimum traces of genetically engineered products in their meats are likely to be better off to benefit from the underlying health benefits that consumers appear to associate with "produced without GMO's", by using labels that refer to "produced naturally" or "produced with natural ingredients"

b. producers who operate jointly through larger value chains or cooperatives are more likely to be able to share the financial burden of testing and certification for minimum traces of genetically engineered products, hence may in the future be able to benefit fully from the price premium that our study has revealed for labeling "produced without GMOs".[2]

2. labeling bison steaks as produced with guarantee of **farm origin traceability does not increase the value of bison steaks significantly**; since some certification and testing would be required to implement such a labeling scheme, it is highly unlikely that such a labeling schemes would pay off for industry participants

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[2] However, a more refined statement cannot be given at this stage, since the original project proposal did not focus on GMO's. It was only through the focus groups that the importance of GMO's was revealed. Further research is warranted in order to be able to make more conclusive and detailed recommendations for individual producers vs. producers being part of value chains.

3. **more educated** consumers and households with **more than one child** are **more likely** to choose bison steaks that give guarantee for **farm origin traceability**; this finding suggests that if a farm origin labeling scheme was put into practice, it should be marketed primarily to families with more than one child (it will be difficult in practice to differentiate marketing efforts between high and low educated consumers)

4. **Middle aged** consumers and those who **exercise regularly** are more likely to choose **bison** steaks; this finding suggests that bison meat could be marketed specifically towards middle-aged, health conscious consumers

4.3. Results from the lamb survey

We first document the descriptives of this survey.

The following percentage of consumers agreed or strongly agreed with the following statements (n=235):

- 53.6%: "lamb is an alternative meat"
- 13.6%: "lamb is an exotic meat"
- 3.4%: "lamb is a wild meat"

This shows that lamb is perceived quite differently from elk and bison.

From a list of five factors that were singled out through the focus groups, we tried to infer why consumers had not purchased elk in the past. Consumers were therefore asked to rank five reasons for not purchasing lamb meat (n=233).

- 62.6% indicated that "Lack of cooking/preparation experience" was the most important reason
  - Quite different from bison and lamb, this was rated number one in the case of elk, suggesting that there is more scope for the elk industry to provide educational information through labeling and in-store promotion (if the lack of availability is addressed at the same time, of course)
- 46.8% indicated that "Lack of availability" was the second reason for not purchasing elk meat.
- 36.5% indicated that "Disease-related issues" were the third most important reason.
- 32.5% indicated that "Lack of promotion and advertising" was only the fourth most important reason for not purchasing.
- 21.7% of the consumers indicated that unappealing in-store packaging was the least relevant reason for not purchasing elk.

Consumers were also asked whether various meats consist of the regular home meal or not:

- 16.6% indicated that they consider lamb to be a regular home meal
- 14.5% indicated that they consider bison to be a regular home meal
- 3.4% indicated that they consider elk to be a regular home meal

Lamb was considered to be most relevant for celebration purposes (e.g. Easter), with 12.8% of consumers indicating that they consume lamb for this purpose (followed by bison with 3.8% and elk with 1.3%).

Consumers indicated that bison was their favorite of the three meats in terms of using it for outdoor/BBQ opportunities (19.6%), followed by lamb (8.5%) and elk (3.4%).

We also asked consumers how frequently they had tried alternative meats before:
- 17.9% indicated that they had bison once or twice before
- 19.1% indicated that they had lamb once or twice before
- 6.4% indicated that they had elk once or twice before

Consumers were also asked how important several information sources are in their purchasing decision (n=235). Nearly 30% indicated that friends and/or family were very or extremely important sources of information in their purchasing decision. However, in-store promotion were considered to be the second most important source of information (21.3%), suggesting that the industry should focus more on this aspect of promotion.

How important are information sources for purchasing decisions? (n=235)

- Very or extremely important for elk purchase:
  - 6.8%: Magazines, newspapers
  - 8.1%: TV, radio
  - 3.0%: Internet
  - 29.8%: Friends, family
  - 8.9%: Promotional flyers
  - 14.5%: Health professionals
  - 21.3%: In-store promotion
  - 14.5%: Package label

Our focus groups also revealed that consumers who were inexperienced with alternative meats considered their first alternative meat experience in a restaurant as key experience (in terms of their willingness to experience more alternative meats in the future). Therefore, we asked respondents whether they first tried those meats in a sit-down restaurant. 24.7% of those consumers who participated in the lamb survey revealed that they had tried bison first in a sit-down restaurant. Thus, the initial consumption experience outside of a sit-down restaurant (including at home and in a fast-food restaurant) was predominant here.

Percent of respondents who first tried meats in a sit-down restaurant (n=235)
- Bison in a sit-down restaurant: 24.7%
- Lamb in a sit-down restaurant: 18.7%
- Elk in a sit-down restaurant: 7.7%

Respondents were also asked to what extent they think that a list of meat features is important in their purchasing decision (or would be important, if they had not purchased lamb before). The following percent of respondents think that the following features are (or would be) very or extremely important when buying lamb: (n=233)

- tenderness and flavour – 90.6%
- No use of growth hormones, antibiotics, animal protein in raising the animals – 63.5%
- Absence of genetic modification (non-GM) – 53.6%
  - As for the elk industry, these results suggest that the lamb industry's marketing (and labeling) efforts should address explicitly how the animals are being raised.
- Price – 55.8%
- low cholesterol – 51.9%
- Trace-back certification on packaging (origin) – 46.4%
  - The fact that less than 50% of respondents think that it very or extremely important to know about trace-back on packaging suggests that the lamb industry may be better off to focus on how the animals are being raised in their marketing efforts.
- Handling and cooking recommendations on packaging – 36.9%
- meat colour – 42.5%
- raised locally – 27.9%
  - This suggests that the lamb industry will not gain from marketing the local origin to attract new consumers.
- Trying something different – 24.9%
  - Novelty appears to be somewhat attractive to (potential) lamb consumers; at least more so for lamb than for elk.
- Seasoned & Ready-to-Cook meat – 12.9%

This survey proceeded in the same manner as the elk and bison surveys, i.e. respondents first described their usual beef steak that they bought, and were asked whether in a hypothetical grocery shopping trip, they would be willing to switch and buy lamb instead.

56

Table 15: estimation results for lamb steaks

Variable	Coefficient	Standard error	b/St.Er.|
FARM	-1.217221196	.53820694	-2.262
GMO	.1366770174	.19781879	.691
FAT1	-.4227037460E-01	.29046520	-.146
FAT2	-1.107970234	.49610592	-2.233
FAT3	.4670449390	.23542208	1.984
PRICE	-.5996282111E-01	.17467828E-01	-3.433
SCHFAR	.4294593047	.15205210	2.824
SCHFAT2	.4202823987	.14050831	2.991
CHLPRIC	.1660266102E-01	.84465662E-02	1.966
A_SQ	3.086693501	.37023104	8.337
A_LAMB	1.492973218	.42213609	3.537
Number of observations	591		
Iterations completed	5		
Log likelihood function	-370.9544		
R2	.04678		
Chi-squared[9]	36.41219		

The following table shows the results of the statistical analysis in terms of the premium that the respondents are willing to pay for each of the product features when it comes to buying lamb:

Table 16: Premia for lamb Product Features

Product Feature	Premium/Discount for Product Feature ($ per kg)
Non-GM raised lamb	$3.43
Traceability back to farm	$2.19
Low level of fat (1-5%)	$8.82
Medium level of fat (5-15%)	$5.47
High level of fat (15-50%)	($0.95)

The analysis shows that the respondents do want not necessarily want fat in their lamb, and in fact **will pay less if there is a lot of fat in the lamb**; they want to pay $0.95/kg if the lamb has 15-50% fat. But, for medium levels of fat (5-15%), they will pay a premium of $5.47/kg, and if the amount of fat is low (1-5%), they will pay $8.82/kg more. So, respondents **most highly value low levels of fat in lamb**.

Also, respondents will pay $3.43/kg to ensure that the lamb is **guaranteed to be raised with non-GM feed**, and are willing to pay **$2.19/kg extra** for a certified label that gives a guarantee of **farm origin traceability** for the lamb.[3]

Aside from these premia values, the analysis also showed that respondents prefer to buy some meat, whether their own regular beef steak or the lamb alternative; they strongly prefer their

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[3] Please consider also the discussion of marketing implications for bison on page 55-57.

regular beef steak to lamb. In 79 percent of the scenarios, respondents chose their usual beef steak, they chose lamb 15 percent of the time, and 6 percent of the time they chose to buy neither meat options.

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