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Consumer Perceptions of Environmentally Friendly Products in New Foundland and Labrador

Morteza Haghiri

A stated-preference model was specified by a logit model to analyze consumers' willingness-to-pay a five-per cent premium to purchase environmentally friendly products in Newfoundland and Labrador. Although the industry suffers from insufficient number of certified producers in the region, the findings from the model reflect the existence of potential demands for environmentally friendly products. Results showed that survey respondents were willing to pay at least a five-per cent premium, as they believed pesticide residues would have negative impacts on their health conditions. In addition, being married, higher degree of education, knowledge about new methods of farming practices, such as integrated-pest management, and early adopters in trying newly introduced products were among the factors affecting consumer decisions in paying the premium.

Environmentally friendly products (EFPs) are produced without the use of pesticides, herbicides, chemical fertilizers, antibiotics, and artificial animal growth hormones in any stages of the production. In the case of EFPs sustainability and the ecological balance of natural resources in their production processes are assumed to be as important as the quantity of products. The main objective of producing EFPs is to optimize the overall productivity of scarce resources while considering the fitness of diverse communities within the agroecosystem including soil organisms, plants, livestock and people. To do this, policy makers and market analysts have been trying to define new strategies that lead to a development of new farms that are sustainable and harmonious with the environment (Agriculture and Agri-Food Canada, 2005). The idea of producing EFPs has been strengthened by the recent increase of public concerns and favors toward the production, consumption, and distribution of these groups of products. As a result, the market for EFPs has been dramatically increased in Canada since the beginning of 1990 and its growth is predicted to be increased steadily in the future. The environmentally friendly crop production is growing worldwide with an

annual turnover of more than \$US25 billion offering a range of market opportunities for these group of farmers. This has been a significant movement from the 1980s when the industry was recognized as a niche market.

Canada then is an appropriate country for producing EFPs because of its large land base and its mainly intemperate climate, which together tend to reduce various plant disease and pest problems. In 2004, more than 1.2 million acres of arable land in Canada were allocated to grow EFPs. It was also predicted that additional 141,000 acres were in transition to be cultivated under these groups of products (Macey, 2005). Evidence shows that the number of certified producers who commercially grew EFPs have been increasing significantly from 2002 to 2004 in the country. In 2002, there were a total of 3,120 certified farms producing EFPs while this figure was raised to 3,670 in 2004; an average increase of 8.1 per cent per year (Macey, 2004). Nevertheless, it only represents 1.5 per cent of total farms in Canada if the Census of Agriculture in 2001 is considered as the base year (Statistics Canada, 2001).

The Canada's crop map displays that EFPs are dispersedly grown in the country, given their bioregional characteristics. For example, environmentally friendly grains and oilseeds are mainly produced in the Prairies, whereas dairy products in Quebec and Ontario, fruits in British Columbia, and fresh vegetables and herbs, forages, permanent pastures, and green manure crops are grown in all provinces. Moreover, Atlantic Canada and Quebec are the center of berry

Morteza Haghiri is an Associate Professor of Economics at Memorial University-Corner Brook in Newfoundland, and Labrador, Canada.

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production including cranberries and wild harvested blueberries.

Macey (2005) reported that total value of EFPs in Canada was ranged between 250 to 350 million dollars. Most of the Canada's EFPs is exported to France, Germany, Italy, the United Kingdom, Japan, and the United States. Among them, grains and oilseeds have great share in Canada's total exported products. Of the \$65 million of Canada's total exported EFPs in 2005, wheat was in the first place with an estimated value of 14 million dollars (Agriculture and Agri-Food Canada, 2005). Since Canada cannot produce all types of EFPs (e.g., bananas and citrus fruits), more than 75 per cent of households' consumption of these types of products are provided from the foreign markets. It is predicted that the industry would increase its domestic retail market share to 10 per cent by 2010.

Despite the increase in the area under cultivation of EFPs, producers in Atlantic Canada have not yet responded appropriately to meet the ongoing increase in the demand for EFPs. In 2004, there were only 115 certified environmentally friendly producers in Atlantic Canada. Of these, only four producers (three farms active and one farm in transition) were operating in the province of Newfoundland and Labrador (Macey, 2005). Moreover, there were at least 79 acres of arable land were under the cultivation of environmentally friendly production (vegetables and blueberries) and 30 acres were in transitions in the same year (Macey, 2005). Although these figures demonstrate that the industry is underdeveloped in the province it does not necessarily mean that the demand for EFPs do not exist. There is not much information on the consumer market for EFPs in Newfoundland and Labrador. Studies like this research will help regional policy makers, market developers, investors, processors, handlers, traders, and environmentally friendly producers recognize the availability of demands for EFPs in the province.

The objectives of this paper are two-fold. First, to find the availability of the demand for EFPs in Newfoundland and Labrador we identify factors motivating consumers to purchase EFPs. The production cost of EFPs is usually higher than that of the conventional agricultural products (Govindasamy and Italia, 1999). This

difference, known as the premium, would therefore be passed onto the consumers. The amount of the premium depends on the EFPs prices and the demand drivers including consumers' income, tastes and preferences, and the prices of related products. The amount of the premium ranges from five to 25 per cent and varies regionally on a product basis. Second, we use the concept of willingness-to-pay (WTP) the premium as a way of maximizing consumer's satisfaction to examine the impact of factors affecting Newfoundlanders and Labradorians' decisions to purchase EFPs in the market. The WTP is modeled through a binary-choice logit framework as a function of a series of independent continuous and dummy variables including socio-demographic, socio-economic, media, and public perceptions toward EFPs.

The rest of the paper is organized as follows. Next section provides recent studies in Canada in which consumers' WTP are examined followed by a brief review on the binary-choice logit models. The sections following present a summary of data collected from the consumer survey, a justification for the selection of independent variables, and a discussion of the results. The final section concludes the paper, presents some policy implications, and introduces further research topics required advancing this analysis.

Recent Studies on EFPs in Canada

Few studies in Canada investigated consumer perceptions on EFPs in the recent decade. Here we review only those studies whose methodologies and dependent and independent variables are similar to those of this study to avoid biased outcomes in comparing findings.

Veeman and Adamowicz (2001) conducted a research to examine consumer perceptions of environmental risks and the demand for food safety in Alberta. They used the contingent value method to assess Albertans' purchasing behavior towards EFPs raised from a range of environmental risks, such as pesticide residues arisen in conventional agricultural foods and hormonal treatments derived from biotechnological farming practices. The result showed that consumers in Alberta were less susceptible to-

wards the use of hormones than the use of pesticide in the food production. In addition, being female and higher levels of education and income had positive effects on the WTP a premium, ranged from 13 to 25 per cent, to purchase EFPs. Veeman and Adamowicz (2001) also used a conditional logit model of consumer choice to examine Albertan's purchasing behavior towards the consumption of milk produced by using the recombinant bovine somatotrophin (rBST) in the production process. They considered other characteristics including fat content, price, and freshness as well as the use of rBST identified by labeling. Since the use of rBST in Canada is prohibited the objective of the research was to simulate market conditions and consumer responses towards a twofold scenarios: production milk with and without the use of rBST. The result showed that consumers were worse-off with the introduction of rBST. The losses were less for male than that of female households and for those consumers with higher levels of income and education. A small welfare gain was identified when households were offered a full range of rBST and non-rBST milk. The researchers concluded that consumers could abate their welfare losses if the produced milk labeled "rBST-free" milk.

Using the contingent valuation method Cranfield and Magnusson (2003) classified Canadian consumers based on the degree of their acceptance toward the consumption of pesticide-free products. The degree of acceptance of these groups of EFPs was measured by how much extra money consumers would like to spend on pesticide-free products than of what they normally pay for non-pesticide-free products. The result showed that 67 per cent of the sample observations were willing to pay the premium ranged from one to 10 per cent and only five per cent of the respondents tended to pay a premium of 20 per cent over conventional food prices.

Larue et al. (2004) collected data from a sample of 1,008 consumers to analyze their responses to buy various foods produced by different methods of production including conventional, organic, and genetically modified procedures. The researchers chose chicken breast, tomato sauce, and potato chips to assess an expansion of organic nich food markets for a combina-

tion of organic tomato sauce and organic chicken breasts. Larue et al. (2004) hypothesized that households would consume these products for their sanitary characteristics including anti-cancer for tomato sauce and heart-healthy for chicken breast. The researchers failed to reject their hypothesis implying that households would be willing to pay additional money to purchase organic tomato sauce and organic chicken breast as long as sanitary properties are attached to these products.

The assessment of market demand for a group of pesticide-free products including pasta, breakfast cereal, dry peas, sunflower seed, beer, multigrain bread, canola oil, and dry lentils was the main objective of a research conducted by Magnusson and Cranfield in 2005. Using a probit model, the researchers found that some socio-demographic, socio-economic, and market-oriented factors, such as switching grocery stores to purchase pesticide-free products, being less than 36 years of age, and high level of household income could have potentially impact on consumer decisions to purchase the pesticide-free products.

The review studies show that consumers are willing to pay a premium, which varies from one region to another, to purchase EFPs as long as they believe the use of pesticide and chemical materials would seriously affect their health condition and environment. This will certainly open a new era for environmental friendly producers to identify different market segments in each region. The production of EFPs has not yet been developed in Newfoundland and Labrador. Several reasons may justify the lack of farmers' interests in growing these types of products. These reasons are climatological conditions, lack of liquidity for farmers, resistance to adopt new technology, and finally the lack of information on the demand side in the province. This paper will draw on these insights to develop a methodology for assessing consumer preferences for EFPs in Newfoundland and Labrador.

Methodology

We used a binary-choice logit model whose parameters are estimated by the maximum-likelihood (ML) technique. Logit models are

widely used in the consumer survey studies because their asymptotic properties guarantee the predicted probabilities to be in the range of zero to one (Greene, 2008). In a likelihood function, a joint probability density function of dependent variables Y_1, Y_2, \dots, Y_n is constructed as independent variables that are randomly derived from a Bernoulli distribution with probability π_i , which varies from one observation to another. The expected value of the dependent random variable and its variance, respectively, is

$$E(Y_i) = \Pr[Y_i = 1] = \pi_i \text{ and } \text{Var}(Y_i) = \pi_i(1 - \pi_i).$$

We assume a positive outcome as a probability of observing a success derived from the behavior of a representative consumer who is willing to pay at least a five-percent premium to purchase EFPs. The probability of success is $\pi_i = \pi(\mathbf{X}_i)$ in which \mathbf{X}_i represents a vector of independent variables including demographic characteristics, socio-economic variables, media factors, and public awareness of hazardous on health condition and environment involved with the consumption of agricultural products that are produced from conventional farming practices. The five per cent premium is drawn from the information collected from the sample observations in the survey. Since the probability of success ranges from zero to one, the value of $\pi(\cdot)$ falls in the unit interval (0,1). Therefore, we can write the probability of success as

$$(1) \pi_i = \Lambda(\Omega_i) = \Lambda(\mathbf{X}_i' \boldsymbol{\gamma}) = \frac{\exp(\mathbf{X}_i' \boldsymbol{\gamma})}{1 + \exp(\mathbf{X}_i' \boldsymbol{\gamma})}$$

in which Ω_i represents the information set consisting of independent variables, $\mathbf{X}_i' \boldsymbol{\gamma}$ is the index function that maps a linear combination of independent variables from the covariate vector \mathbf{X}_i and the vector of unknown parameters $\boldsymbol{\gamma}$, and $\Lambda(\Omega_i)$ is the value of the logistic cumulative density function. In light of this, equation [2] specifies a logit model

$$(2) \Omega_i = \log\left(\frac{\pi_i}{1 - \pi_i}\right) = \mathbf{X}_i' \boldsymbol{\gamma} = \gamma_0 + \gamma_1 x_1 + \gamma_2 x_2 + \dots + \gamma_n x_n + \varepsilon, \\ i = 1, 2, \dots, n$$

that Ω_i represents the log odds of choice for the i^{th} observation, x_i indicates the i^{th} independent variable associated with each dependent variable, $\gamma_1, \dots, \gamma_n$ are the unknown parameters that must be estimated, and ε is the random error term. The signs of the estimated parameters in equation [2] will show the direct impact of a change in any of the explanatory variables on the probability of a success ($Y = 1$) quantified by the marginal effects (ME). Equation [3] measures the ME of the j^{th} independent variable on the probability of a success,

$$(3) \frac{\partial \pi(Y_i = 1 | x_i)}{\partial x_{ij}} = \text{scale} * \gamma_j \text{ where } \text{scale} = \frac{\exp(\mathbf{X}_i' \boldsymbol{\gamma})}{[1 + \exp(\mathbf{X}_i' \boldsymbol{\gamma})]^2}$$

In practice, the impact of MEs is evaluated at the sample mean for continuous independent variables, whereas equation [4] is used when the explanatory variables are either discrete variables or dummies.

$$(4) \pi(Y = 1 | x_j = 1, X_{\Theta}) - \pi(Y = 1 | x_j = 0, X_{\Theta})$$

In equation [4], X_{Θ} is defined by setting all dummy variables to their modal values and all continuous independent variables to their mean values. Equation [4] calculates the change in the probability of a success ($Y = 1$) yielding from a change in x_j between zero and one, holding all other variables at some fixed values X_{Θ} .

To predict a representative consumer's WTP at least a five per cent premium to purchase EFPs in the region of the study, we developed the following regression model:

$$(5) \quad WTP_{EFPs} = \gamma_0 + \gamma_1 gen + \gamma_2 age2 + \gamma_3 age3 + \gamma_4 age4 + \gamma_5 marit2 + \gamma_6 fsz + \gamma_7 edu2 + \gamma_8 edu3 + \gamma_9 edu4 + \gamma_{10} emp2 + \gamma_{11} emp3 + \gamma_{12} inc2 + \gamma_{13} inc3 + \gamma_{14} inc4 + \gamma_{15} visg + \gamma_{16} visfm + \gamma_{17} purog + \gamma_{18} trnew + \gamma_{19} psh + \gamma_{20} psen + \gamma_{21} ipm + \gamma_{22} med + \gamma_{23} arti + \gamma_{24} loc + \varepsilon,$$

Prior to estimate equation [5], we dropped one category from each of the group-category independent variables to avoid the perfect collinearity in the model (see Table 1). It is expected that consumers with higher levels of income or education are more likely to pay the premium. In addition, respondents who have serious concerns about the status of health and the environment will tend to purchase EFPs.

Empirical Analysis

Data Description

To analyze consumers' WTP to purchase EFPs, we elicited a consumer survey using a stated preference methodology during winter 2007 in the province of Newfoundland and Labrador. In particular, sample observations were randomly selected from St. John's, Mount Pearl and Grand-Falls Windsor in the east, and Deer Lake, Pasadena, Corner Brook, and Port aux Basque in the west of the province. The survey was conducted during weekday and weekend periods in various time of the day. We set up a table in shopping centers, handed in a two-page questionnaire to each one of the participants approaching the table, and collected the questionnaires in the same day. To minimize bias in sampling, participants were told the purpose of the survey was about their perceptions towards the consumption of various foods in general without mentioning the term EFPs. Prior to completing the survey, participants were given a one-page "consent and contact" letter that describes the objectives of the research and emphasizes that their contribution is completely voluntarily and they can quit the survey at any time.

We are aware of the limitations facing studies in which the stated preference methodology is selected as the focus of the research.

Consumer survey studies are usually time-and-location variant that might cause an inaccurate collection of information received from respondents. Nevertheless, such research as being done here still yields useful information and contributes to the body of literature. The questionnaire was designed based on what Govindasamy et al (2001) and Hobbs et al (2005) used in their studies with slight changes made to reflect the characteristics of the region. Due to the budget limitations the survey was not conducted in Labrador. In total, 447 individuals were approached and 222 completed questionnaires were collected, yielding a 49.6 per cent response rate. Of these, 108 questionnaires were completed in eastern Newfoundland and the rest (51.3 per cent) was completed in the west part of the province. Prior to the main survey, we tested the model in a small scale in Corner Brook and its suburbs, and excluded the results of the pilot survey from the final analysis.

Table 1 presents a descriptive analysis of the variables used in the study. Of the 222 total number of survey participants, 45 per cent were male and the rest were females, which, to some extent, conforms to the 2006 Census Provincial Population in which 49.5 per cent of the residents in NL was male and 50.5 per cent was females (Statistics Canada, 2007). The survey showed that 63.1 per cent of the participants were between 31 to 60 years of age and 33 per cent of them were singles. In addition, more than 70 per cent of the respondents declared that they had either a college or a university degree. The result also showed that near 42 per cent of the survey respondents earned an annual income between \$30,000 to less than \$50,000, whereas only seven per cent reported an annual household income of more than \$80,000. Table 1 displays that the annual household income of near 75.2 per cent of the survey participants was less than \$50,000. This implies that the information drawn from the sample observations conform to

the data released by Statistics Canada in 2006 indicating that the annual per capita income in the province of Newfoundland and Labrador was \$31, 234 (Statistics Canada, 2007).

Table 1 (See Appendix A) shows that 64 per cent of the survey respondents visited grocery stores to purchase advertised products and 63 per cent visited farmers' markets in the past five years. In total, more than 74 per cent of the participants believed that the use of pesticides poses a serious risk to human health, and 81.1 per cent thought that the use of various pesticides has negative impacts on the environment. Of the 222 sample observations, 22 per cent knew about the integrated-pest management as one of the new methods of farming practices prior to this survey. Finally, 49 per cent of the respondents expressed that they saw on television or heard from radio few programs aired about EFPs and 33 per cent declared that they had read articles about these types of products in magazines and newspapers, and on-line. Overall, 66.2 per cent of the survey participants stated that they were willing to pay at least a five-per cent premium to purchase EFPs. Since the majority of the survey respondents chose such a percentage, the five per cent premium was used to specify the dependent variable.

Estimation Results

Table 2 displays the estimation results of the logit model used to analyze consumers' choices by paying five per cent more than what they used to pay for conventional food to purchase EFPs in the province of Newfoundland and Labrador. The parameters of the regression model were estimated through the ML approach by using NLOGIT (Version 3.0). In the model, the dependent variable (WTP_{EFPs}) was coded as 1 indicating a representative consumer's WTP the five per cent premium for EFPs and zero otherwise. Overall, using the likelihood ratio (LR) statistic test, the calculated chi-square statistic was found to be 164.6, which rejects the null hypothesis that all slope coefficients were zero at the 0.01 level of significance. The Pseudo R-squared figure (0.5769) also represents a reasonable goodness-of-fit for the entire regression model although as Pindyck and Rubinfeld

(2000) expressed that binary choice models with cross sectional data are not expected to be estimated with high R-squared values.

Table 2 shows that married people (**MARIT2**) were 30 per cent more likely to pay a five-per cent premium to purchase EFPs than that of singles in the province. The **MARIT2** variable was positive and statistically significant at the 0.06 level. The result indicates that the level of education is positively related to the consumption of EFPs. Evidence shows that as respondents have higher level of education, they are more likely to pay the premium to purchase EFPs. Table 2 shows those respondents holding an undergraduate degree (**EDU3**) were 20 per cent more likely to pay the five-per cent premium than that of people with a high school degree to buy EFPs. The coefficient of **EDU3** was positive and statistically significant at the 0.05 level. In addition, respondents with a graduate degree (**EDU4**) were 17 per cent more likely to pay the premium when compared to those holding a high school diploma or those who did not finish high school. This is shown by the partial slope coefficient of **EDU4** that was positive and statistically significant with 99 per cent confidence. These results support those of Magnusson and Cranfield (2005), but in contrast with what Govindasamy and Italia (1999) and Boccaletti and Nardella (2000) reported. This comparison would not be feasible if the dependent and independent variables used in the studies were not similar to each other.

The dummy variable indicating that the respondents usually consider EFPs in their basket of foods (**PUREFPs**) was positive and statistically significant with 99 per cent confidence. The magnitude of the coefficient was 0.5077 implying that these group of consumers were approximately 51 per cent more likely to pay at least a five-per cent premium to purchase EFPs than those who did not tend to buy these types of products. Other studies also reported similar consumer behavior towards the consumption of EFPs (see, e.g., Govindasamy and Italia, 1999; and Batte et al., 2004). Batte et al. (2004, p.14) expressed that consumers who were willing to pay a premium to purchase EFPs were usually less concern about the prices of these products. We observed similar consumer behavior, but

Table 2. Estimation Results

Variable name	Estimate (<i>p</i> -value)	Change in Probability (<i>p</i> -value)
Constant ***	-3.9341 (0.0029)	-0.5091 (0.0167)
GEN	-0.0738 (0.9036)	-0.0095 (0.9035)
AGE2	-0.3753 (0.6556)	-0.0501 (0.6677)
AGE3	-1.1628 (0.3052)	-0.1827 (0.3850)
AGE4	-0.1001 (0.9446)	-0.0132 (0.9460)
MARIT2 *	1.8559 (0.0362)	0.2959 (0.0633)
FSZ	-0.3458 (0.1569)	-0.0447 (0.1581)
EDU2	0.4852 (0.4318)	0.0591 (0.4159)
EDU3 **	1.7143 (0.0317)	0.2000 (0.0303)
EDU4 ***	2.6338 (0.0738)	0.1682 (0.0033)
EMP2	0.4543 (0.5470)	0.0633 (0.5796)
EMP3	0.4558 (0.7212)	0.0523 (0.6885)
INC2	0.0995 (0.8697)	0.0128 (0.8692)
INC3	-0.1185 (0.9065)	-0.0157 (0.9089)
INC4	-0.3465 (0.8210)	-0.0496 (0.8383)
VISG	-0.8805 (0.1463)	-0.1053 (0.1147)
VISFM	0.1476 (0.8112)	0.0193 (0.8145)
PUREFPs***	3.4867 (0.0000)	0.5077 (0.0000)
TRNEW ***	1.6999 (0.0089)	0.2016 (0.0047)
PSH *	1.8381 (0.0217)	0.3142 (0.0623)
PSEN	-0.1561 (0.8351)	-0.0195 (0.8294)
IPM **	1.1017 (0.1055)	0.1159 (0.0459)
MED	0.7099 (0.2054)	0.0918 (0.2009)
ARTI	0.6344 (0.2760)	0.0765 (0.2679)
LOC	0.5138 (0.3625)	0.0669 (0.3857)
Number of observations	222	
McFadden R-squared (Pseudo R-squared)	0.57698	
Likelihood ratio statistic	164.6154	
Degrees of freedom	24	
Prob [ChiSq > value]	0.0000	

* Significant at 0.10, ** Significant at 0.05, *** Significant at 0.01.

with a mitigated reflection in the region of the study. The dummy variable denoting whether individuals classify themselves as among the very first to try newly introduced food products (**TRNEW**) was positive and statistically significant with a *p*-value of 0.0089. This implies that, everything else being equal, these groups of respondents were 20 per cent more likely to pay a five-per cent premium to buy EFPs than those who were not classified themselves as first-adopter consumers.

Table 2 shows that the independent dummy variable representing the participants' concerns

about the use of pesticide in farming practices and its effects on their health condition (**PSH**) was positive and significant at the 0.06 level. The magnitude of the estimate of the **PSH** variable was 0.3142 implying that environmentally friendly consumers, on average, were 31 per cent more likely to pay the premium than those of nonbelievers in the adverse effects of the conventional food products. This finding support those reported by Haghiri et al. (2006). The last explanatory variable that was statistically significant at the 0.05 level was the public knowledge about the new method of agricultural farming

practices, known as the integrated-pest management (**IPM**). This method of farming practice is an ecosystem-based method used to control pests and weeds through a series of different techniques, which are least injurious to the environment and most specific to the particular pest and weed. The IPM method includes biological control, habitat manipulation, modification of cultural practices, and the use of pest resistant plant varieties. The result shows that respondents having knowledge of **IPM** are 12 per cent more likely to pay the premium to purchase EFPs when compared to those who did not know anything about new method of farming practices.

Finally, we examined the effects of other variables on the WTP the premium to purchase EFPs in the model and found none of them was statistically significant. These variables were gender, age, family size, income levels, employment status, visiting grocery stores and farmers' markets, believed in the negative impact of synthetic pesticides use on environment, media, articles read about EFPs, and location.

Table 3 presents the frequencies of actual and predicted outcomes. Overall, the estimated regression model correctly identified 198 observations out of 222 total sample of observations (89.2 per cent). However, the correct percentage of predictions against the naive predictions (herein, all one) is 65.7 per cent of the total observations (146/222), suggesting a reasonable prediction.

Table 3. Frequencies of Actual and Predicted Outcomes^a

		Predicted		Correct
		0	1	
Actual	0	63	13	63/76
	1	11	135	135/146

a Total number of observations: 222. Total number of correct predictions: 198

Conclusion and Suggestions for Managers

The recent global appearance of a series of communicable diseases including Avian Flu, Bovine Spongiform Encephalopathy, and Polychlorinated Biphenyls in Atlantic farmed salmon have affected human lives especially infants, young children, and the elderly people worldwide. To date, the food incidence of salmonella

outbreak in Mexican tomatoes has not been solved and attentions have now been made toward Mexican cilantro and peppers. In addition, the existence of harmful microorganisms, agricultural chemicals, non-tested GM foods, and the misrepresentation of food origin placed a level of distrust in the food markets. As a result, households concern seriously about the quality of food they consume. The fear of being exposed by adverse effects of consuming conventional food on health and environment has brought substantial motivations for consumers to increase their demands for EFPs in the province of Newfoundland and Labrador.

The production of EFPs needs to be expanded in Newfoundland and Labrador. The lack of a developed sector of producing these groups of products can be imputed to several reasons; none of them stems from the demand side. The lower amount of the premium, which has lessened the motivations of producers and distributors of EFPs to increase their production scale, is one reason why the industry has not been developed.

Several points are drawn from the results of this study. First, different level of market segments for EFPs are available among consumers in Newfoundland and Labrador. Second, the marital status and high level of education have positive relationships with willingness-to-pay the premium strengthened by the public awareness of new farming methods including integrated-pest management. Third, consumers favor their health status against environment when making decisions to purchase EFPs. Fourth, a tendency toward the consumption of newly introduced products among consumers has been observed as the estimated parameter of the model was translated in paying the premium.

Due to the structure of the research we were unable to measure the sensitivity of consumers' decisions to pay the premium with respect to the changes in the levels of incomes and the EFPs prices. Thus, further studies are suggested to estimate the price and income elasticities of demands for EFPs. In addition, to encourage producers to grow EFPs, the provincial government should implement appropriate policies in support of the industry so that certified producers will have cost advantages in producing these types of products and as a result they will be become

more competitive in Canada. Meanwhile, public awareness of the advantages of consuming EFPs should be steadily raised. The aid of media (radio, television, and newspapers) in promoting the consumption of EFPs will help the industry grow consistently.

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Appendix

Table 1. Summary statistics for the independent variables^a

Variable name	Frequency	Mean	S.D.
<i>Gender</i>			
Male *	100	0.4505	0.4987
Female	122	0.5495	0.4987
<i>Age</i>			
AGE1 (less than 30 years of age) *	52	0.2342	0.4245
AGE2 (31-45 years of age)	85	0.3829	0.4872
AGE3 (46-60 years of age)	55	0.2478	0.4327
AGE4 (more than 60 years of age)	30	0.1351	0.3426
<i>Marital Status</i>			
MARIT1 (singles) *	73	0.3288	0.4708
MARIT2 (married)	149	0.6712	0.4708
<i>Family Size</i>			
FSZ	222	2.7703	1.0070
<i>Education</i>			
EDU1 (high school diploma and less) *	46	0.2072	0.4062
EDU2 (some college certificate)	71	0.3198	0.4675
EDU3 (undergraduate degree)	86	0.3874	0.4883
EDU4 (graduate degree)	19	0.0856	0.2804
<i>Employment Status</i>			
EMP1 (unemployed) *	32	0.1441	0.3520
EMP2 (employed)	164	0.7387	0.4403
EMP3 (retired)	26	0.1172	0.3327
<i>Annual Household Income</i>			
INC1 (less than \$30,000) *	74	0.3333	0.4725
INC2 (\$30,000 - \$49,999)	93	0.4189	0.4945
INC3 (\$50,000 - \$79,999)	39	0.1757	0.3814
INC4 (\$80,000 or more)	16	0.0721	0.2516
<i>Visiting grocery stores to purchase advertised specials (VISG)</i>			
Yes	142	0.6396	0.4812
No*	80	0.3604	0.4812
<i>Visiting farmers' markets (VISFM)</i>			
Yes	139	0.6261	0.4849
No*	83	0.3739	0.4849
<i>Purchasing environmentally friendly produce (PUREFPs)</i>			
Yes	120	0.5405	0.4995
No*	100	0.4595	0.4995
<i>Try newly introduced food produce (TRNEW)</i>			
Yes	89	0.4009	0.4912
No*	133	0.5991	0.4912
<i>Believed in negative impact of pesticides use on health (PSH)</i>			
Yes	166	0.7477	0.4353
No*	56	0.2523	0.4353
<i>Believed in negative impact of pesticides use on environment (PSEH)</i>			
Yes	180	0.8108	0.3925
No*	42	0.1892	0.3925

Table 1. Continued

<i>Knowledge of integrated-pest management (IPM)</i>			
Yes	49	0.2207	0.4157
No*	173	0.7793	0.4157
<i>Media (radio, Television) programs aired about environmentally friendly produce (MED)</i>			
Yes	109	0.4910	0.5010
No*	113	0.5090	0.5010
<i>Articles read about environmentally friendly produce (ARTI)</i>			
Yes	74	0.3333	0.4725
No*	148	0.6667	0.4725
<i>Location (LOC)</i>			
	108	0.4865	0.5009
	114	0.5135	0.5009