Assessing Consumer Preferences for Organically Grown Fresh Fruit and Vegetables in Eastern New Brunswick

Morteza Haghiri[⊕a], Jill E. Hobbs[b] and Meaghan L. McNamara[c]

[a] *Associate Professor, Memorial University – Corner Brook, University Drive, Corner Brook, Newfoundland, A2H 6P9, Canada*

[b] *Professor, Department of Bioresource Policy, Business and Economics, University of Saskatchewan, 51 Campus Drive, Saskatoon, Saskatchewan, S7N 5A8, Canada*

[c] *Research Assistant, Department of Economics, Mount Allison University, 144 Main Street, Sackville, New Brunswick, E4L 1A7, Canada*

Abstract

Very little information is available about consumer preferences for organically grown fresh fruit and vegetables in the Maritimes region of Canada. This study was conducted across two locations in eastern New Brunswick to examine consumer willingness-to-pay a premium to purchase organic fresh fruit and vegetables with environmental and health attributes. Willingness-to-pay the premium was modeled as a function of a series of demographic, socio-economic and knowledge variables, plus degrees of awareness concerning the environment, and risk attitudes. Results suggest that when making food choices, although the environment may be regarded as important, ultimately consumers in eastern New Brunswick prioritize their health over the environment. Moreover, the more income households earn, and the more consumers perceive a potential negative impact on health from pesticides usage, the more likely they would be willing to pay a premium for fresh organic produce.

Keywords: consumer preferences, organic fresh produce, willingness-to-pay

⊕Corresponding author: Tel: +1 709.637.6200x 6145
                           Email: mhaghiri@mun.ca

Other contact information: J. Hobbs: jill.hobbs@usask.ca
                           M. McNamara: mlmcnmr@mta.ca

Introduction

Public perceptions regarding the environmental and health attributes of consuming fresh fruit and vegetables produced without the use of synthetic pesticides has fueled a growing demand for these types of products since the 1990s. Integrated-pest management (IPM) and organic production systems are examples of non-conventional agricultural methods that are perceived as environmentally friendly.

The market for organic produce has become one of the fastest growing agricultural markets in North America. It is estimated that in 2003 U.S. consumers spent almost US$12 billion on organic foods, with annual growth rates for the organic industry reportedly in the 20 per cent range (Batte et al 2004). In 2005, more than four million acres of U.S. farmland were organic, of which 42.5 per cent (1.7 million acres) were cropland and the rest was rangeland and pasture. In the same year, more than 220,000 acres of arable land in California were under certified organic fruit and vegetables production, making California the lead region in producing organic products in the U.S., followed by North Dakota, Montana, Minnesota, Wisconsin, Texas, and Idaho (USDA 2009). Similar trends have been observed in Canada. Macey (2004) reported that Canada was the sixth largest market for organic food and beverages in 2003, with retail sales estimated to be between 1.01 and 1.3 billion Canadian dollars. According to Holmes and Macey (2009) the total volume of organic sales in Canada was estimated to be near two billion Canadian dollars in 2008, having doubled in two years. In 2007, there were a total of 3,782 certified organic farms in Canada, of which 46 certified producers were in New Brunswick, compared to in 1992 where there was less than 15 (Holmes and Macey 2009). Fieldcrops, vegetables, livestock and maple syrup are the main organic products in Canada. According to the 2007 annual report of the Canadian Organic Growers (COG), the total arable land under organic produce was 556,273 hectares, with over 352,000 hectares in additional (wild) lands that will be transformed for farming (COG 2009).

The oldest non-governmental organization in Canada, which has been promoting the production and consumption of organic produce since its inauguration, is the Canadian Organic Growers (COG) Association. The COG is a membership-based education and networking institution that represents various stakeholders from farmers and gardeners to consumers. On July 1 2009, the official Canadian National Organic standard came into effect, prior to this date a system of voluntary organic standards had been in place since 1999, with different requirements across different regions, and different rules as to the use of the term 'certified organic.' The COG, along with other industry organizations, worked closely with the Federal government (Agriculture and Agri-Food Canada) to develop a national organic standard. These new organic regulations apply to all agricultural products marketed domestically and internationally for both human and livestock consumption, or those products which bear the logo "Organic Canada." For the time being, the Organic Products Regulations do not cover pet food, fertilizers, fibers, personal care products, and aquacultural products. It is worth noting that stakeholders within the Canadian aquaculture industry, the Federal government Department of Fisheries and Oceans and Agriculture and Agri-Food Canada have begun a collaborative initiative to establish a set of national organic standards for aquaculture products in Canada (COG 2009).

The distribution system for organically grown fresh fruit and vegetables has evolved as the

industry has matured, moving away from a reliance on farm-gate sales to sales through major supermarket chains. Often these stores feature a designated organic produce section where organic fruit and vegetables are sold at a premium relative to their conventional counterparts. Of relevance to the organic sector, and to the sustainability of the recent rates of growth experienced by the sector, is the extent to which consumers are willing to pay a premium for organic produce. Very little information is available on the consumer market for organic products in the Maritimes region of Canada[1].

The main objective of this paper is to identify and examine factors that affect consumers' willingness-to-pay (WTP) a premium to purchase organically grown fresh fruit and vegetables in eastern New Brunswick. In particular, the paper recognizes that there are often multiple reasons for purchasing organics, with two primary motivations being the perceived environmentally friendly nature of organic food production, together with the perceived healthiness of organic food. Thus, consumers may be motivated primarily by wider social goals (public benefits) related to environmental preservation or they may be motivated by direct private benefits related to perceived health benefits from consuming organic foods, or a combination of the two. A secondary objective of this paper is therefore to explore the relative importance of environmental versus health motivations in explaining WTP for organic food among consumers in the eastern New Brunswick region. The analysis is particularly relevant for the organic food industry in the region as it is relatively a young industry. Information from this analysis can assist regional stakeholders in developing marketing strategies and identifying target market segments for organic produce. The analysis focuses on the fruit and vegetables sector given the relative importance of this sector to the agricultural economy in New Brunswick[2] and the potential for concerns over health and environmental effects from the use of synthetic pesticides in conventional agriculture to affect this sector.

The willingness to pay for organic products is modeled as a function of independent and predetermined continuous and dummy variables including gender, age, education, employment status, income, knowledge of production practices, concerns over environmental and health issues, etc. The purpose of this study is to investigate the importance of these predictors on consumers' stated WTP for organically grown fresh fruit and vegetables in eastern New Brunswick. A binary response logit regression model is developed to quantify the impact of factors that affect individuals' WTP a price premium. By using a dichotomous logit model, we are able to segregate specific consumer characteristics and decompose the marginal effects of explanatory variables on the WTP a premium for organic produce.

The remainder of the paper is organized as follows: the next section presents a review of studies that examine consumer attitudes toward, and WTP for, organic produce. The third section briefly explains the methodology used in the empirical analysis and provides reasons for choosing the dependent and independent variables in the econometric model. The fourth section describes the data collection and presents the results of the study. The paper concludes by discussing the implications of the results and suggests some areas for further research.

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[1] The Maritimes region consists of three provinces: New Brunswick, Nova Scotia and Prince Edward Island.
[2] In 2003, vegetables, fruit and berries, greenhouse and floriculture combined accounted for 84 per cent of the value of farm cash receipts from crop production in New Brunswick, with potatoes the major component at 52 per cent (New Brunswick Department of Agriculture, Fisheries and Aquaculture, 2003).

Background

The study of consumer attitudes toward fresh produce grown under reduced pesticide production systems comprises several factors affecting the WTP for organic produce. In general, these factors can be classified into three main groups: demographic, socio-economic, and risk attitudes toward human health and the environment. A review of existing literature provides a useful starting point for our analysis, revealing some common threads but also some apparently contradictory evidence. In general, literature shows that, in most cases, gender and income are the two most important determinants of consumers' decisions to purchase organic food products (Govindasamy and Italia 1999; Govindasamy et al 2001). In contrast, other factors, such as concerns about cosmetic surface blemishes, and the retail price of organic fresh produce, have been found to be less important (Goldman and Clancy 1991).

Numerous studies in various countries have measured consumers' WTP a premium to purchase organic products. However, for the sake of brevity we confine our review to two types of studies. First, we consider studies whose methodologies are somewhat similar to ours and were applied to studies of organic fresh produce. Furthermore, we compare the result of our research to those in which a similar response variable is specified. Where discrepancies exist in the definition of dependent variables caution should be used in comparing results across these studies.

Most researchers concur that higher income groups are more likely to be willing to pay a premium for organic products. Loureiro and Hine (2001) estimate that American consumers (in the Colorado area) were willing to pay a premium of US 3.14 cents per pound for organic potatoes. Wealthy and well educated individuals (the upper-class variable) had an average WTP of US 3.65 cents per pound, while age had a negative impact on individuals' WTP. The researchers found that WTP decreases US 0.16 cents per pound as consumers aged one year.

To compare the preferences of organic and conventional fresh produce buyers in terms of their stated willingness to pay a price premium to purchase organically grown food products, Williams and Hammitt (2000) use a data set drawn from 700 food shoppers collected from ten major retail stores in the Boston area. Similar to this study, the authors specified a logit regression model to determine whether a consumer is willing to pay a premium to purchase organic fresh produce. The results showed significant differences between the two groups of buyers (organic and conventional) from various perspectives including lifestyle characteristics, food safety attitudes and beliefs, perceived food safety risks, and valuation of health risk reductions.

Boccaletti and Nardella (2000) assess the effects of socio-demographic and risk perception variables on individuals' WTP for pesticide-free fresh fruit and vegetables in Italy. The authors used an ordered logit model to measure the net benefits to Italian consumers of purchasing organic fresh produce, and concluded that 89 per cent of respondents were generally concerned about health risks from pesticides. As a result, consumers were willing to pay higher prices for pesticide-free fresh fruit and vegetables, but 70 per cent of them would not pay a premium higher than 10 per cent of conventional prices.

Studies evaluating WTP for environmentally friendly production methods, such as Integrated Pest Management (IPM) are also of relevance given our interest in the environmental

motivations that consumers may have for purchasing organic produce. Govindasamy et al (2001) measure the WTP a premium for IPM produce based on various socio-demographic and socio-economic factors using data collected from a consumer survey in New Jersey in 1997. The consumer survey was conducted and administered by Rutgers Cooperative Extension and five grocery retailers. The dependent variable was defined as whether or not the participants would be willing to pay 10 per cent more for IPM products than what they would normally pay for conventional food products. The result showed that females, the youngest age group and the high-earning income group of households were more willing to pay a 10 per cent premium for IPM produce than other consumers. Our study uses a similar definition for the dependent variable (willingness to pay a 10 per cent price premium for organic produce).

Focusing on the Canadian market, Cranfield and Magnusson (2003) conduct a contingent valuation study on a new classification of environmentally friendly food products, so-called "pesticide-free products." The pesticide-free production (PFP) system of farming lies between organic and IPM farming practices. Although pesticide use is prohibited at any time of the growing season under the PFP system, the use of certain fertilizers within the entire farming year, and specific pesticides before seeding, is allowed. In addition, no PFP crops can be grown if pesticides remain "commercially active" in the soil, which means that the PFP crops would be exposed to the pesticides. Cranfield and Magnusson (2003) found that 67 per cent of respondents have a modest WTP of a one to 10 per cent premium and five per cent are willing to pay a premium of 20 per cent over conventional prices. In a related study, Magnusson and Cranfield (2005) seek to assess the market potential for eight different food products produced under a pesticide-free production system. The authors concluded that the following factors have a positive, albeit small, effect on individuals' demand for pesticide-free products: concern over pesticide use and its effect on food and the environment, willingness to switch grocery stores to purchase pesticide-free products, being less than 36 years of age, having less than a graduate level of education, having high average household income and being willing to pay a premium for pesticide-free products.

Larue et al (2004) administer a stated-preference choice experiment survey to 1,008 consumers in Canada examining consumer preferences for functional foods produced from three alternative production systems: conventional, organic, and genetic manipulation. The authors focus on organic tomato sauce and organic chicken breasts to see if there is an opportunity to expand the organic niche food market by introducing foods that have a 'heart-healthy' functional property. Larue et al (2004) found that households tend to pay extra for functional food with clear health benefits, such as anti-cancer or heart-healthy properties. The authors conclude that those consumers who are already paying premiums for organic foods are health conscious consumers, and are willing to pay higher premiums for food to be 'exceptionally healthy.'

The literature reviewed provides a number of insights into the type of consumers that are expected to prefer organic produce, the factors influencing those preferences, and the size of the price premium that consumers may be willing to pay. This study draws on these insights to develop a methodology for assessing consumer preferences for organic food products in eastern New Brunswick, Canada. In particular, the influence of key demographic and socio-economic factors, the impact of media (television, radio and newspapers) attention to environmental and health issues surrounding food, and consumers' attitudes with respect to the impact of pesticide use on health and the environment are investigated in the region of the study.

Methodology

As the preceding discussion indicates, there exists a substantial body of literature dealing with consumer awareness and willingness-to-pay for organic products. Within this literature, contingent valuation (CV) is a popular methodological approach. Contingent valuation allows a direct estimation of WTP for a specific product and is the method employed in this study. The elicitation method chosen for this analysis was a simple dichotomous yes/no variable (i.e., are you willing to pay at least a 10 per cent premium to purchase organically grown fresh fruit and vegetables). Often used in the valuation of non-market goods, the limitations of CV analyses are well known. In particular, CV studies can suffer from hypothetical bias since respondents are faced with hypothetical purchasing situations and are either asked to state a WTP or given the option of a yes/no response to a specific price level; thus consumers may over or understate their true WTP. Incentive compatibility is also a challenge. An elicitation method is incentive compatible if the dominant strategy for an individual is to truthfully reveal his/her WTP. These problems can be particularly acute for non-market goods or new private goods in hypothetical settings. While acknowledging these potential limitations, in our case, the goods considered in this analysis are private, already marketed and therefore deliverable (unlike pure environmental goods for example); this may help attenuate (although does not eliminate) the hypothetical bias and incentive compatibility problems. Nonetheless, the results should be interpreted with these caveats in mind.

A logit model was used to estimate the effects of a variety of factors on WTP[3]. In this model, the dependent variable specifies the probability of observing a success, defined as an individual being willing to pay at least a 10 per cent price premium for organically grown fresh fruit and vegetables, as a function $\pi_i = \pi(X_i)$ in which X_i represents the vector of explanatory variables and   is the probability of observing the success. Our reasons for defining the dependent variable in this way are threefold. First, households reveal their consumption behavior in the organic produce markets through how much they would pay to obtain these types of products (Osterhuis 1997). Second, in organic produce markets we expect consumer behavior to be highly influenced by market prices and perceived food quality (Steenkamp and van Trijp 1996). Third, a 10 per cent price premium was chosen to reflect the WTP of the majority of our sample observation, which was deemed reasonable based on previous research (e.g. Boccaletti and Nardella 2000; Govindasamy et al 2001) and observed trends in the local marketplace at the time of survey.

The objective of this study is to explore factors influencing WTP for organic produce among consumers in eastern New Brunswick, including the relative importance of environmental benefits and perceived health benefits. For this reason, we are interested in the effect of consumers' knowledge and information about organic production methods on stated WTP. Also, of interest is the influence of risk perceptions and the extent to which socio-economic and demographic factors explain differences in preferences. Therefore, the explanatory variables for the model were chosen from five categories that captured these factors: (i) demographic

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[3] One advantage of using logit models is that their characteristics asymptotically guarantee the predicted probabilities to be in the range of zero to one. Since the data are collected at the individual and not at the aggregate level, the maximum likelihood (ML) method is used to estimate the parameters of the model. The ML estimates are consistent and asymptotically efficient (Peracchi 2001).

variables; (ii) socio-economic variables; (iii) behavioral variables (i.e. shopping behavior); (iv) risk perception variables; and (v) knowledge variables. The choice of variables was also informed by previous studies of consumer attitudes toward organic food produce (e.g. Govindasamy and Italia 1999; Govindasamy et al 2001; Hobbs et al 2005; and Yiridoe et al 2005).

Following previous studies, we control for a number of *demographic* factors including gender, age, marital status, and family size. In some cases, there are clear a *priori* expectation regarding the influence of these variables on WTP. For example, we expect that as consumers become older health perceptions will play a more important role in food consumption decisions, which may result in a stronger WTP for organic food products due to perceptions that these products have lower levels of pesticide residues, etc. In addition, a number of *socio-economic* factors may influence WTP for organic foods, such as income, education, and employment status. For instance, we expect that as households' incomes increase they are more likely to switch consumption from conventional foods to organically grown products, and therefore more likely to be WTP a price premium for organic produce. We hypothesize that as consumers become more educated the likelihood of consuming organic food products increases. What we did not know was the size of these effects on consumers' WTP for organic produce.

While socio-economic and demographic factors can be used to segment markets, *behavioral* traits are often a more useful way of identifying consumer segments. In this study we focused on a number of behaviors that were hypothesized to be relevant to identifying organic food consumers. For example, previous experience with purchasing organically grown fresh fruit and vegetables is expected to be a reasonably reliable predictor of future consumption intentions and of a positive stated WTP for organic produce. While organic produce is sold in most mainstream supermarkets, traditionally an important outlet for organic produce has been farmers' markets. Therefore, identifying consumers who frequent farmers markets is useful. Price sensitivity is a relevant behavioral characteristic in the region sector: a question capturing price sensitivity was included on the survey (namely, whether the consumer regularly visited many grocery stores to buy advertised products). Identifying those consumers who grow fruit and vegetables for self-consumption was also a potentially relevant behavioral characteristic for understanding consumer attitudes toward organic produce (Verhoef 2005).

We expect *risk perceptions* about health and the environment to have an impact on consumers' attitudes toward organic produce, and questions capturing these issues were included in the survey. Finally, consumers are often differentiated by their *knowledge,* including the extent of their knowledge of production methods, and the extent to which different information sources (including the media) shape their knowledge. In this case, knowledge of environmentally friendly production practices such as integrated pest management, and the influence of the media in shaping attitudes about foods safety (e.g. pesticide residues) and environmental impacts of agricultural production methods were anticipated to be relevant to understanding consumer attitudes toward organic produce.

To predict consumers' WTP at least a 10 per cent price premium to purchase organically grown fresh fruit and vegetables in eastern New Brunswick, the following regression model was developed[4]:

$$
\begin{aligned}
WTP_{ORGFOOD} = {} & \gamma_0 + \gamma_1\, gen + \gamma_2\, age1 + \gamma_3\, age2 + \gamma_4\, age3 + \gamma_5\, marit1 + \gamma_6\, marit2 + \\
& \gamma_7\, nch + \gamma_8\, nresid + \gamma_9\, edu1 + \gamma_{10}\, edu2 + \gamma_{11}\, edu3 + \gamma_{12}\, edu4 + \\
& \gamma_{13}\, emp1 + \gamma_{14}\, emp2 + \gamma_{15}\, inc1 + \gamma_{16}\, inc2 + \gamma_{17}\, inc3 + \gamma_{18}\, visg + \\
& \gamma_{19}\, visfm + \gamma_{20}\, purog + \gamma_{21}\, purdmu + \gamma_{22}\, grofv + \gamma_{23}\, trnew + \\
& \gamma_{24}\, pstht + \gamma_{25}\, pstenv + \gamma_{26}\, ipm + \gamma_{27}\, medtv + \gamma_{28}\, arti + \varepsilon,
\end{aligned}
$$

1)

Table 1 (See Appendix 1) describes the dependent and independent variables used in equation [1], and presents a priori expectations for the sign of each of the explanatory variables.

One category from each of the group-category independent dummy variables (i.e., marital status, age, education, employment status, and income) was eliminated to avoid perfect collinearity in the model. Thus, the following categories were considered as the base group: singles, a respondent whose age was less than 36 years, a participant with a high school degree, a retired respondent, and a respondent with more than Cdn$80,000 annual income. In addition, it is expected that females, individuals with high incomes, middle-age respondents and seniors, respondents with a high level of education, and those participants who care more about their health status and about the environment are more likely to be willing to pay a premium to purchase organically grown fresh fruit and vegetables in eastern New Brunswick.

Empirical Analysis

Data Description

A consumer survey, intended to collect primary data through a face-to-face interview with consumers, was conducted in two locations in eastern New Brunswick in May 2005: the Champlain Place Shopping Centre in Moncton and the Atlantic Canada SaveEasy Store in Sackville [5]. In both places, a demonstration-booth was allocated to our research team and as consumers approached the booth a two-page survey questionnaire was handed out. The participants were told that their contributions were completely voluntary and they could withdraw from the survey at any time. As indicated in the previous section, the questionnaire contains information related to the demographic variables (e.g., gender, age, marital status, household size, etc.), socio-economic characteristics (e.g., education, income level, employment status, etc.), behavioral characteristics, risk perceptions and knowledge of production methods [6]. The completed questionnaires were collected the same day they were distributed. The survey was conducted during both weekdays and weekend periods at various times of the day. To minimize bias in sampling, the survey was introduced to respondents as a "survey of consumers' attitudes

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[4] Details of the econometric model are available from the lead author upon request.
[5] To test the survey instrument, we carried out a pilot survey on a small scale prior to the main survey. The information collected in the present survey was not included in the final analysis.
[6] A copy of the questionnaire is available from the lead author upon request.

toward consuming fresh fruit and vegetables" without mentioning the term organic products prior to the distribution of the questionnaire 8[7].

In total, 310 individuals were approached and 141 questionnaires were completed, yielding a response rate of 45.5 per cent. Those individuals who did not participate in the survey provided various reasons, such as "have no time", "not interested", "not from here" for not participating. Table 2 presents summary statistics for the independent variables used in this study. Of the 141 respondents, 44 per cent were female, approximately 70 per cent of the participants were the primary food purchasers in their households, and 73.6 per cent did not grow fruit and vegetables. Collectively, nearly 73 per cent of the respondents were under the age of fifty, of which 43 per cent were less than 36 years of old. Of the 141 respondents, there were 12 participants who were divorced, 69 respondents were single, and the rest (49 per cent) were married at the time of survey. Only 16 per cent of the respondents had a post graduate degree, while 24 per cent of respondents declared they had an undergraduate degree. More than 28 per cent of the participants in the survey did not continue their education after graduating from high school, and 27 per cent took some courses in colleges. Table 2 also shows that more than 72 per cent of the respondents were employed at the time of survey, 70 per cent of the participants had annual household incomes of less than Cdn$50,000 ad only 11 per cent declared an annual household income of more than Cdn$80,000. In total, more than 86 per cent of the respondents believed that the use of pesticides poses a serious risk to human health, and almost 89 per cent of participants felt that the use of various synthetic pesticides has negative impacts on the environment.

The result of the survey revealed that respondents had little knowledge about IPM. Of the 141 participants in the survey, only 38 per cent were familiar with the IPM farming practice. Despite this, 66 per cent of the participants had heard and seen programs about organic food products in the last six months on radio and television. In addition, 57 per cent of the respondents declared that they have read media articles about organically grown products in newspapers within the past six months.

Finally, the survey found that 63 per cent of the participants were not likely to purchase organically grown fresh fruit and vegetables. In contrast, 67 per cent reported that they would switch grocery stores to purchase specially advertised fruit and vegetables, and approximately, 75 per cent had visited farmer's markets in the past five years. Overall, 60 per cent of the participants reported that they were not particularly enthusiastic to try newly introduced products, while 38 per cent were willing to pay at least a 10 per cent premium to purchase organically grown fresh fruit and vegetables. See Table 2 (Appendix 2).

Estimation Results

The empirical regression model, specified in equation [1], was estimated using the maximum likelihood (ML) approach in LIMDEP (version 7.0). The dependent variable (WTPORGFOOD) was coded as 1 indicating individuals who were willing to pay a 10 per cent premium for

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[7] The study recognizes the limitations of consumer surveys that are specific to a time period and geographic location, and the potential problems associated with accurate answers to hypothetical questions about how consumers would react to key demand variables. Nevertheless, the research reported here yields information that should be useful particularly on a regional level.

organically grown fresh fruit and vegetables and zero otherwise 9[8]. Table 3 displays the coefficient estimates influencing respondents' WTP for organic produce and their corresponding marginal effects (MEs). Marginal effects measure the impact of a unit change in each of the independent variables on the probability of a success (herein, respondents would pay at least a 10 per cent price premium). The following points are worth mentioning with respect to the findings from the study and the model specification. First, the results of this study should be interpreted with cautious as limited research funds prevented from a broader sampling of respondents across eastern New Brunswick. Nevertheless, the selected areas represent a fast-growing city (i.e., Moncton) and a unique town (i.e., Sackville) in the region. The town of Sackville, where Mount Allison University resides, was awarded as the "2008 Cultural Capital of Canada" along with the towns of Surrey and Nanaimo in the province of British Columbia, and the town of Morden in the province of Manitoba (Canadian Heritage 2009). Second, the likelihood ratio (LR) statistic test was used to examine the null hypothesis that all slope coefficients are zero. The calculated chi-square statistic (67.70) showed that at least one slope coefficient was significantly different from zero, and therefore the null hypothesis was rejected with 99 per cent confidence. This means that at least some of the explanatory variables are important in explaining consumers' stated WTP. Thirdly, the pseudo R-squared measure, also known as McFadden's coefficient of determination, was found to be 0.393; a reasonable figure for cross section models, although Wooldridge (2006, p. 590) states that "goodness-of-fit is usually less important than trying to obtain convincing estimates of the ceteris paribus effects of the explanatory variables."

Table 3 shows that the gender variable **(GEN)** was negative and statistically significant at the 0.01 level. The negative sign indicated that females, on average, were 31 per cent less likely to pay a 10 per cent premium for organically grown fresh fruit and vegetables in eastern New Brunswick. As mentioned earlier, the result of this research can only be compared to other studies if the dependent variable across the studies is the same. Nevertheless, our finding was consistent with some previous studies (e.g., Boccaletti and Nardella 2000), but differs from the result of Loureiro and Hine (2001) and Govindasamy and Italia (1999).

The sign of the explanatory variable **AGE2**, which refers to individuals with of 51 to 65 years of age, was positive and statistically significant at the 0.05 level. Generally, this implies that as consumers became older, their preferences changed in favor of consuming (paying a premium for) organic produce. Specifically, respondents who fell in this category were 32 per cent more likely to pay the premium for purchasing organic fresh fruit and vegetables than the youngest group-age, i.e., less than 36 years of age. Buzby et al (1995) report a similar pattern of behavior for consumers in the US, while Boccaletti and Nardella (2000) find the opposite for consumers in Italy. The estimated coefficient of the marital status variable, **MARIT1**, suggested that WTP was lower for those who were married. The coefficient was statistically different from zero with 95 per cent confidence holding other explanatory variables constant. The result showed that married people were 43 per cent less likely to pay a premium for organically grown fresh fruit and vegetables than singles in eastern New Brunswick.

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[8] The WTP question was asked as a dichotomous choice question in which respondents indicated "yes" or "no", whether they would be willing to pay a 10 per cent premium for organic produce.

Table 3. Estimated Coefficients [a]

Variable name	Estimate	Standard Error	Marginal Effect
Constant	2.4748	2.4164	----
GEN ***	-1.6182	0.6626	-0.3110
AGE1	0.8406	0.9820	0.1607
AGE2 **	2.2990	1.1964	0.3208
AGE3	1.2933	2.0045	0.1990
MARIT1**	-2.2138	0.9708	0.4391
MARIT2	-1.2783	1.3506	- 0.3006
NCH	0.1489	0.7995	0.0305
NRESID	-0.9605	0.2420	- 0.0198
EDU1	-0.0383	0.7231	- 0.0079
EDU2	0.5543	0.8214	0.1072
EDU3	-1.3685	0.9064	- 0.3166
EDU4	1.8276	1.7270	0.2374
EMP1	0.0624	1.4412	0.0129
EMP2	-0.6478	1.5580	- 0.1451
INC1	-1.0480	1.1323	- 0.2274
INC2	1.4416	0.9280	0.2694
INC3*	1.7921	1.0522	0.2730
VISG	-0.4503	0.6349	- 0.0898
VISFM**	-1.4997	0.7471	- 0.2592
PUROG***	2.5158	0.7436	0.4310
PURDUM**	-1.7197	0.8914	- 0.2901
GROFV	-0.3303	0.6309	- 0.0702
TRNEW	0.3611	0.6890	0.0734
PSTHT**	1.8613	0.8969	0.4311
PSTENV	0.4089	1.0870	- 0.0782
IPM	-0.3816	0.6613	- 0.0800
MEDTV	0.5285	0.6148	0.1121
ARTI	-0.4132	0.5946	- 0.0841
Number of observations	128		
McFadden R-squared	0.3933		
Likelihood ratio statistic	67.7045		
Degrees of freedom	28		
Prob [ChiSqd > value]	0.0000386		

[a] After deleting missing data, there were observations from 128 respondents.
* Significant at 0.10, ** Significant at 0.05, *** Significant at 0.01.

Previous literature has found the effect of education on consumers' purchasing decisions for organic produce to be ambiguous. For example, Govindasamy and Italia (1999) and Boccaletti and Nardella (2000) find that individuals with higher levels of education were less likely to be willing to pay a premium for organic produce. In contrast, Magnusson and Cranfield (2005) report a positive relationship between education and the WTP for organic food products, and also find that it varies from one organic product to another. None of the education variables in this study was found to be statistically significant, indicating that education levels did not help explain consumers' willingness to pay for organic produce. As such, the education variables are not discussed further.

We expect that the more income individuals make the higher the likelihood that they would be willing to pay a premium for organic produce. Nevertheless, the result showed that participants

whose annual income was between Cdn$50,000 to Cdn$79,999 **(INC3)** were 27.3 per cent more likely to pay a 10 per cent premium to purchase organically grown fresh fruit and vegetables when compared to those who earning more than Cdn$80,000 per year. The slope coefficient for **INC3** variable was statistically different from zero at the 0.10 level. The other income variables were not significant. Although one might expect, *a priori,* that the higher income group (which is the base group) would result in a higher WTP, our findings are nonetheless consistent with those of Underhill and Figueroa (1996), Govindasamy and Italia (1999), and Batte et al. (2004).

The dummy variable denoting whether respondents had visited farmer's markets **(VISFM)** was statistically significant at the 0.05 level. Surprisingly, respondents who visited farmers' markets were 26 per cent less likely to pay a premium to purchase organic produce than those who did not visit farmers' markets, ceteris paribus. As expected, the independent variable capturing those who regularly bought organically grown fresh fruit and vegetables **(PUROG)** was positive. The marginal effect for this variable was 0.431, implying that respondents who usually purchased organic fruit and vegetables were 43 per cent more likely to pay at least a 10 per cent price premium for organic produce compared with those who purchased primarily conventional fresh fruit and vegetables. The null hypothesis for the **PUROG** dummy variable was rejected with 99 per cent confidence. This finding is consistent with those of Goldman and Clancy (1991), and Govindasamy and Italia (1999). During the survey we noticed that those participants who reacted positively to the consumption of organic produce, to some extent, appeared less concerned about the price when they shopped for organic food products than were other respondents. This pattern of behavior was also reported by Batte et al. (2004, p. 14).

Table 3 shows that the WTP for organic produce declined with households whose primary food purchaser was someone other than the individual who participated in the survey. The dummy variable **(PURDMU)** was negative and significant at the 0.05 level. Those respondents who were not the primary food purchaser in their household were 29 per cent less likely to pay at least a 10 per cent premium than those respondents who made the final decision in purchasing food. The last explanatory variable whose slope coefficient was statistically different from zero with 95 per cent confidence was the dummy variable **(PSTHT)**, denoting whether the participants believed that the use of synthetic pesticides poses a very serious health risk. The results showed that respondents who perceived that health risks existed were 43 per cent more likely to pay a premium to purchase organic produce. Interestingly, the variable denoting whether participants believed the use of pesticides poses a risk to the environment **(PSTENV)** was not statistically significant. Thus, it appears that concerns over health risks are a stronger motivating factor for consumers in eastern New Brunswick to purchase organic produce than environmental concerns. Another possibility for the environmental concern variable being insignificant could have been the presence of an interaction between household income and the dummy variable representing individuals' concerns about the negative effect of pesticides usage on the environment. To examine this hypothesis, a new independent variable was generated from the product of these two variables. The result showed that the slope coefficient was not statistically significant, and thus it was dropped from the model.

The slope coefficients of other explanatory variables used in this study were not statistically significant. In particular, in addition to **PSTENV,** none of the null hypotheses associated with the following dummies could be rejected: growing fruit and vegetables at home **(GROFV),**

willingness to try newly introduced products **(TRNEW),** knowledge of integrated-pest management **(IPM)** production systems, awareness of organic produce from the television of radio **(MEDTV),** and from reading articles in newspapers **(ARTI).**

Finally, interaction effects between explanatory variables could potentially affect the likelihood of WTP for organic produce. Different models were run by generating new covariates obtained from the product of a series of independent variables to test whether the interaction effects between variables could have any impact on the regression estimates. In particular, different combinations of gender, age, education, and income were tested, but none of them led to significant results. In addition, the study did not find a significant correlation between the following independent variables: gender and primary household shopper, number of children under 17 years of age residing in the household and family size, and visiting farmers' markets and purchasing organic produce. Thus, any interaction dummies were dropped from the model in the final analysis.

Conclusions and Implications for Managers

The share of organic produce in North American markets has been steadily increasing since the 1990s, making this an interesting and dynamic market for analysis. Previous studies have assessed a number of factors determining consumer preferences toward organic food products often with contradictory results across different regions and different products. Region and product-specific analyses are therefore of great value to agri-food managers. Little is known about consumer attitudes toward organically grown fresh fruit and vegetables in eastern New Brunswick. Overall, the results of this study confirm that socio-economic and demographic variables (including gender, age, marital status and income) are important determinants of the willingness of respondents from this region to pay a premium for organic food products. As an implication for managers these findings indicate that there exist target consumer segments for the organic food sector in eastern New Brunswick, and this study is a first attempt at identifying some of these consumer segment characteristics. Further research could explore these characteristics in more depth.

A notable finding was that perceptions regarding negative health impacts of synthetic pesticide use were a far more compelling reason motivating a positive WTP for organic produce than concerns linking pesticide use to environmental degradation. It appears that the respondents from eastern New Brunswick who participated in the survey prioritized personal health concerns over broader environmental externalities. Understanding consumer preferences and the factors that motivate those preferences is important for the organic food industry in the region. Nevertheless, the prior expectation was that those respondents with environmental concerns regarding pesticide use would be more interested in organic produce. Moreover, the survey responses show that, in general, consumers in eastern New Brunswick had little knowledge of alternative new farming practices, such as integrated-pest management. This may in part explain why self-declared concerns over the effect of synthetic pesticide use on the environment did not translate into a WTP for higher priced organic produce.

Our results suggest that firms targeting the fresh produce organic sector in eastern New Brunswick are likely to see a stronger consumer response by focusing marketing strategies on the

positive health perceptions of organic produce, rather than the preservation of the environment. Clearly these insights are drawn from a relatively small sample, and further studies are recommended to decompose individuals' attitudes between the perceived health and environmental attributes when it comes to making decisions about organic produce.

A further marketing implication drawn from this study pertains to the potential importance of communication methods regarding alternative agricultural practices. Given the relatively low levels of awareness of agricultural production practices among respondents in this study, any attempts to introduce new agricultural methods in the region may need to be accompanied by plans to raise public awareness and understanding of these technologies in order to foster consumer acceptance. Both the organic industry and the extension division of the New Brunswick Department of Agriculture, Fisheries and Aquaculture and Agriculture and Agri-Food Canada may have a role to play in this regard. Finding an effective and credible means of communicating with consumers will be critical. The results of this study suggest that although many consumers had been exposed to media information about organic food products in recent months, ceteris paribus, this exposure did not appear to affect their willingness to purchase premium-priced organic food products. Nevertheless, understanding how consumers in eastern New Brunswick respond to media and other sources of information about agriculture, food and the environment are useful topics for future research.

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Appendix 1.

Table 1. Variable descriptions for regression analysis

Variable name	Description	Expected sign
WTP$_{ORGFOOD}$	1 if the participant was willing to pay at least a 10 per cent premium to purchase organically grown fresh fruit and vegetables and 0 otherwise;	
GEN	1 if the individual is female and 0 otherwise;	+
AGE1	1if the individual is between 36 to 50 years of age and 0 otherwise;	+
AGE2	1 if the individual is between 51 to 65 years of age and 0 otherwise;	+
AGE3	1 if the individual is over 65 years of age and 0 otherwise;	+
MARIT1	1 if the individual is married and 0 otherwise;	+?
MARIT2	1 if the individual is divorced and 0 otherwise;	+?
NCH	1 if one or more children under the age of 17 reside in the household and 0 otherwise;	+?
NRESID	Family size	-?
EDU1	1 if the completed level of education is some college and 0 otherwise;	+
EDU2	1 if the completed level of education is bachelors degree and 0 otherwise;	+
EDU3	1 if the completed level of education is post graduate and 0 otherwise;	+
EDU4	1 if the completed level of education is other and 0 otherwise;	+?
EMP1	1 if the individual is employed and 0 otherwise;	+?
EMP2	1 if the individual is unemployed and 0 otherwise;	-
INC1	1 if the household income was less than $29,999 and 0 otherwise;	+
INC2	1 if the household income was between $30,000 to $49,999 and 0 otherwise;	+
INC3	1 if the household income was between $50,000 to $79,999 and 0 otherwise;	+
VISG	1 if the individual visited many grocery stores in order to purchase advertised specials and 0 otherwise;	-
VISFM	1 if the individual visited farmer's markets within the past five years and 0 otherwise;	?
PUROG	1 if the individual usually (or always) purchase organically grown fresh fruit and vegetables and 0 otherwise;	+
PURDUM	1 if the participant was the primary food purchaser and 0 otherwise;	?

Table 1. Variable descriptions for regression analysis-Continued

Variable name	Description	Expected sign
GROFV	1 if the individual grew fruits and vegetables for self-consumption at his/her house and 0 otherwise;	?
TRNEW	1 if the individual classified himself/herself as among the very first to try newly introduced food products and 0 otherwise;	+
PSTHT	1 if the participant believed that the use of synthetic pesticide posed a very serious health risk and 0 otherwise;	+
PSTENV	1 if the participant believed that the use of pesticides has negative effects on the environment and 0 otherwise;	+
IPM	1 if the participant had knowledge of IPM prior to taking the survey and 0 otherwise;	+
MEDTV	1 if the participant seen/heard programs about organic food products in the last six months on TV/radio and 0 otherwise;	+
ARTI	1 if the participant read any articles/reports about organic food products in the last six months and 0 otherwise;	+

Appendix 2.

Table 2. Summary statistics for the explanatory variables [a]

Variable Name	Frequency	Mean	S.D.
Gender			
Female	62	0.439	0.4980
Male*	79	0.561	0.4980
Age			
AGE0 (less than 36 years of age)*	60	0.426	0.4962
AGE1 (36-50 years of age)	42	0.298	0.4589
AGE2 (51-65 years of age)	27	0.191	0.3949
AGE3 (over 65 years of age)	12	0.085	0.2692
Marital Status			
MARIT0 (singles)*	60	0.426	0.4962
MARIT1 (married)	69	0.489	0.5017
MARIT2 (divorce)	12	0.085	0.2692
Children under 17 years of age residing in the household			
Yes	51	0.362	0.4822
No*	90	0.638	0.4822
Family Size			
NRESID	141	2.773	1.4754
Education			
EDU0 (high school)*	40	0.284	0.4524
EDU1 (some college)	38	0.270	0.4453
EDU2 (bachelors)	34	0.241	0.4293
EDU3 (post-graduate)	22	0.156	0.3642
EDU4 (other)	7	0.049	0.1856
Employment Status			
EMP1 (employed)	102	0.723	0.4489
EMP2 (unemployed)	18	0.128	0.3183
EMP3 (retired)*	21	0.149	0.3573

Table 2. Summary statistics for the explanatory variables-Continued

Variable Name	Frequency	Mean	S.D.
Annual Household Income			
INC1 (less then $29,999)	47	0.334	0.4731
INC2 ($30,000 - $49,999)	52	0.367	0.4842
INC3 ($50,000 - $79,999)	26	0.184	0.3772
INC4 ($80,000 or more)*	16	0.115	0.3183
Visiting grocery stores to buy advertised specials			
Yes	94	0.667	0.4731
No*	47	0.333	0.4731
Visiting farmer's markets			
	105	0.745	0.4376
	36	0.255	0.4376
Purchasing organically grown fresh fruit and vegetables			
Yes	52	0.371	0.4849
No*	88	0.629	0.4849
Missing data	1	----	----
Primary food purchaser			
Yes	98	0.695	0.4620
No*	43	0.305	0.4620
Growing fruit and vegetables for self-consumption			
Yes	37	0.264	0.4425
No*	103	0.736	0.4425
Missing data	1	----	----
Try newly introduced food produce			
Yes	56	0.397	0.4911
No*	85	0.603	0.4911
Believed in negative impact of pesticides usage on health			
Yes	119	0.862	0.3104
No*	19	0.138	0.3104
Missing data	3	----	----
Knowledge of integrated-pest management			
Yes	53	0.379	0.4856
No*	87	0.621	0.4856
Missing data	1	----	----
Making use of TV and/or radio programs on food safety			
Yes	93	0.664	0.4731
No*	47	0.336	0.4731
Missing data	1	----	----
Reading articles/reports on organic produce			
Yes	74	0.565	0.4976
No*	57	0.435	0.4976
Missing data	10	----	----