EVALUATING CONSUMER PREFERENCES FOR
ORGANIC FOOD PRODUCTION STANDARDS

A Thesis

Presented to

The Faculty of Graduate Studies

of

The University of Guelph

by

SHREENIVAS G. SHELLIKERI

In partial fulfilment of requirements

for the degree of

Master of Science

April, 2007

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ISBN: 978-0-494-30618-5

Our file Notre référence

ISBN: 978-0-494-30618-5

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ABSTRACT

EVALUATING CONSUMER PREFERENCES FOR ORGANIC FOOD PRODUCTION STANDARDS

Shreenivas G. Shellikeri
University of Guelph, 2007

Co-Advisors:
Dr. Brady Deaton
Dr. John Cranfield

Growing demand for organic products has resulted in establishment of grades and standards for the production and processing of organic foods. However, the presence of multiple standards has created confusion in the market place, especially for consumers. The situation is not different in Canada. Therefore, the Government of Canada is implementing a regulated national organic standard. However, little is known about consumer preferences for the attributes of different organic standards. This study evaluates Canadian consumers' preferences for attributes of different organic standards. After comparing 18 organic certification standards, four important standards *viz.*, standards pertaining to pesticide-residue testing, product origin specifications, the standard setting agency, and standard monitoring agency are selected and evaluated for consumer preferences using a conjoint method. Respondents were recruited by a mall intercept method during October 2006 in the city of Guelph, Ontario. Results illustrate strengths and deficiencies of the proposed national organic standard in Canada.

To My Teachers

Brady Deaton
and
John Cranfield

ACKNOWLEDGEMENTS

I would like to take this opportunity to thank a number of individuals without their encouragement and support this thesis could not have been completed. First, I wish to acknowledge the great debt that I owe to my advisors, *Dr. Brady Deaton* and *Dr. John Cranfield*. Their guidance, support, constant encouragement, insightful comments, and infinite patience were invaluable. I would especially like to thank the members of my thesis committee, *Dr. Spencer Henson* and *Dr. Andreas Boecker*. The discussions I had with each of them and the written comments I received from them greatly improved the quality of this work. I would like thank *Dr. Wayne Pfeiffer* for chairing the final examination committee. Special gratitude is extended to *Dr. Getu Hailu* who was my internal examiner.

I want to specially thank the *Consumers Council of Canada* for awarding me the Ralph Lewis Scholarship towards this research. Special gratitude is extended to *Justine Richardson* for her constructive comments that substantially improved the survey instrument and the pre-testing. I would like to thank the helpful and supportive staff at the Department of Food, Agricultural and Resource Economics. Thanks *Kathryn, Debbie, Bertilla and Sally*.

To my colleagues and friends, *Ashwini Moharir, Gulraze Wakil, James Heumann, John Gordon, Rawlin Thangaraj, Rohit Sharma, Sunil Radhakrishnan, Vidya Sunil*, a big thank you for your invaluable support and encouragement throughout the period of my studies at the University of Guelph. And last, but not least, I want to thank my parents, *Govindrao G. Shellikeri* and *Krishnabai G. Shellikeri* and brother, *Girish G. Shellikeri* for their affection, care, encouragement and support.

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Chapter 1

Introduction

1.1 BACKGROUND

The last 20 years have seen a considerable increase in the popularity of organic agriculture and food. In 2006, the world market for organic products equalled approximately \$37 billion, with the United States market accounting for 49.7 percent of the global market value, while the European Union (EU) accounted for 39.8 percent (Datamonitor, 2006). Moreover, the US and EU markets are growing at an average rate of 20 percent per year. Canadian consumers are also keeping up with the trend in the global organic food market. Agriculture and Agri-Food Canada (AAFC, 2003) estimates that the Canadian organic food market is valued at around \$1.3 billion, while the sector's growing appeal to the Canadian consumers fuelled a 15 - 20 percent annual growth rate in recent years. This trend is expected to continue, and by 2010 it is estimated that the Canadian organic food market will capture ten percent of domestic retail sales (Organic Agriculture Centre of Canada, 2002).

There are a number of factors influencing the dramatic growth in the consumption of organic products. Many of these factors are illustrated by research studies¹ concerning consumer food preferences for and purchasing patterns of organic foods. The main reasons for the choice of organic foods are: health and nutrition issues; food safety concerns; positive environmental aspects of organic food production systems over conventional agricultural practices; ethical motives (particularly toward animals); overall

¹ These studies are discussed in the following chapter.

animal welfare; political considerations; local business support; altruistic values; and product related features such as freshness, appearance, and sensory characteristics like taste.

Factors influencing organic food purchase decisions can be classified into general and product-specific dimensions (Hansen, 2001). The notions of food safety and health related benefits, environmental effects, and farm animal welfare aspects are common to all organic foods and hence, are considered general in nature. While, freshness, visual appeal, nutritional value, taste and other such characteristics are unique to each product and, therefore, are grouped under product-specific characteristics.

Many organic product features (*e.g.* environmental friendliness, animal welfare, amount of chemical residues, sustainability of food production and handling methods *etc.*,) are governed by the way in which these products are produced or perceived to be produced. For example, the prohibition of synthetic fertilizers, chemicals, pesticides and herbicides under a production system can be one of the criteria for assessing the system's environmental friendliness.

Certain features of organic food products can be observed and/or experienced, while others cannot. For instance, freshness, appearance, and taste in organic apples are easily observable, whereas nutritional qualities and place of origin are not. Therefore, in practice, an individual may purchase an organic good by comparing a bundle of observable and unobservable features of the good. This notion of unobservable characteristics in a good leads to the perspective of credence goods developed Darby and Karni (1973). Credence goods are those for which individual consumers cannot verify the presence of certain product and process attributes either before or after consumption.

However, certification and labelling are means by which organic producers can transform the credence characteristics of organic foods into search characteristics, thereby signalling the character of their product to consumers. As the basis for certification and labelling, grades, standards and agreements regarding organic production and management practices needed to be developed.

1.2 ORGANIC STANDARDS AND CERTIFICATION

Although organic agriculture has been practised for thousands of years in all parts of the world, 'certified organic' finds its origin in Europe (FAO, 2003). Starting with the teachings of Rudolf Steiner in 1920s, organic agriculture has evolved and embraced different names, but appealed to a greater number of consumers over the years. The publication of Rachel Carson's book *Silent Spring* in 1962 had a considerable influence on the development of organic agriculture. This book explained the hazards of uncontrolled pesticide use, particularly DDT. *Silent Spring* added to the public's awareness of the negative implications of intensive agriculture methods and as a result, more people were drawn toward organic and other alternative food production methods.

As the organic sector developed, organic farmers' associations wrote their own standards. For the most part, these standards reflected farmers' knowledge, rather than a "code" of organic farming practices (FAO, 2003). However, factors such as increasing demand for organic products at different points of consumption, widening geographical distance between producers and consumers and heightened scope for fraudulent practices to capture the price premiums (associated with organic foods) hastened the process of codifying the parameters of organic agriculture.

Producer organizations were the first to be involved in setting organic certification standards. While these programs were primarily local, some were regional in scope (Lohr, 1998). As the organic market developed, organizations like the International Federation of Organic Agriculture Movement (IFOAM), *Codex Alimentarius*, various governments (*e.g.* USA, EU, Canada, Japan, Australia and elsewhere) and a number of private firms established norms and protocols regarding standardization, certification and labelling of organic products.

These varying organic standards outline production-related rules, such as restrictions on the use/non-use of inputs, open-space and feed requirements for livestock, antibiotic use and several other production practices to be followed in various organic enterprises. Principles concerning food processing and packaging are also included in many standards. In addition, producer and regional organic certification standards focus on philosophical perspectives and support notions such as rural community goals, small farms and social justice aspects, and are often more stringent than government and private certifications, which, typically emphasize production techniques (Lohr, 1998).

In general, organic standards are a set of rules regarding production, processing and packaging and the enterprises are required to implement these rules to a satisfactory level so that their products are classified as organic. Thus, certification of organic goods constitutes a process claim, not a product claim (Vindigni, Janssen and Jager, 2002). Such process claims require a mechanism that guarantees satisfactory implementation of organic standards and as a result, organic certification systems involving third-party monitoring agencies have emerged. These independent third-party agencies conduct conformity assessments, usually every year.

Organic certification systems help to signal product quality (*i.e.* reduce information asymmetry along the marketing channel), and facilitate market transactions. They also help guarantee that unscrupulous use of the term ‘organic’ does not diminish price premiums and the market share of organic produce (Lohr, 1998). On the other hand, certification systems describe organic production systems in many ways and production practices differ accordingly. Besides, the inherent agro-climatic variations and the diverse production practices also contribute to differences in the meaning of ‘organic’.

Differences also exist between farmer-based, private and government organic standards. For example, many national standards clearly define the norms that classify meat as organic, while other nations (*e.g.*, Japan) have no rules for organic meat (Organic FAQs, 2004). Under the US organic standard (popularly known as National Organic Program, NOP), usage of Chilean nitrate (a source of sodium nitrate) is allowed in organic production, whereas EU rules do not permit its use. Information on the use/non-use of certain inputs may lead to the differences in consumer acceptability of the resultant output. In addition, certification programs vary in terms of cost pattern, audit, labelling and inspection requirements and the implementation structure.

In some cases, there are greater differences between organic standards and the general expectations of organic consumers. For instance, organic consumers would typically like their products to be grown on a small family farm and supplied locally so as to avoid burning fossil fuels to transport them (Brady, 2006). However, most organic standards do not clearly address these concerns.

1.3 ECONOMIC PROBLEM

Variation in organic standards (both in meaning and scope) can cause higher transaction costs which, in turn, can be an impediment for market development. For example, depending on the requirements, producers choose to adopt one or more organic certification. Cost differences that exist in the implementation of different organic certification programs (Fetter and Caswell, 2002) can significantly vary the output prices. Multiple organic certifications also increase the search and information costs for consumers. Similarly, firms that are involved in fraudulent product/production differentiation further increase consumer costs of obtaining the desired quality information.

Multiple organic standards can also create confusion amongst consumers; the average organic consumer may be uncertain regarding the quality of 'organic' products and less likely to purchase organic food. In an attempt to address these problems, governments can establish a unified set of organic standards specifying the minimum requirements for products to be produced, processed and labelled as organic. In addition, governments can improve trade flows by implementing equivalence agreements between transnational organic certification systems (Lohr, 1998).

Establishing a single national standard or equivalency of standards is difficult because of the diverse characteristics of organic farmers and consumers. For instance, establishment of the national organic program in the United States had to deal with more than 300,000 public comments, many of which opposed the use of Genetically Modified Organisms (GMOs), sewage sludge (bio solids) and irradiation (ionizing radiation) under organic practices. Moreover, Californian consumers associated organic produce with

aspects of no pesticides, no artificial fertilizer, no growth regulators and residue-free products (Jolly *et al.*, 1989).

With nearly 20 organic certification programs in operation, Canadians are facing the same problem as that of Americans prior to the establishment of National Organic Program. Several sets of standards, logos and designations are being used to identify organic products in the Canadian market. The situation has resulted in a widespread confusion among Canadian consumers regarding what constitutes 'organic' (Option consommateurs, 2004). Also, in the absence of a national organic standard, Canada has limited access to trade and market opportunities within the European Union.

1.4 ECONOMIC RESEARCH PROBLEM

Development of a national standard is a critical issue for Canada and, accordingly, there have been years of painstaking efforts involving numerous industry stakeholders and government agencies (Standards Council of Canada, Canadian General Standards Board, Agriculture and Agri-Food Canada and Canadian Food Inspection Agency). As a result, on December 21, 2006 Government of Canada published the *Organic Products Regulations* in the Canada Gazette. Over the next two years, the new regulation will facilitate the implementation of national organic regime in Canada similar to that of National Organic Program in the United States.

The present Minister for Agriculture and Agri-Food in Canada Chuck Strahl believes (<http://www.inspection.gc.ca/english/corpaffr/newcom/2006/20061222be.shtml>) that with the formulation of national standards “not only will Canadians be protected against deceptive and misleading claims on organic products, but the organic industry’s capacity to respond to international and domestic market opportunities will be

strengthened”. Thus, the national organic standards are designed to protect Canadian consumers and support the growth of the organic products industry. However, unless consumers are certain that these standards reflect a majority of their beliefs, there is a potential threat that “Canada Organic” will merely remain a seal of approval and another label.

The Canadian organic industry could lose out if the national standards do not represent the quality that consumers are demanding. Costs to producers and processors would increase, as the operators will have to seek multiple certifications from the stricter domestic or foreign standards. Domestic production may be displaced by higher quality imports combined with low or zero demand for exports. Therefore, considering that end-user acceptability will have radical implications on the outcome of a Canada Organic standard, it is important that the national organic standard and the policy setting clearly resonate with consumer preferences. However, there is little research in this area.

The first step is to understand the salient features of various organic standards operational in Canada. The key elements from each standard highlighting various aspects defining ‘organic’ are then evaluated against popular beliefs regarding the characteristics of organic products. Such an exercise would yield a list of important characteristics that Canadians would like to see in their organic products. The next step is to understand the relative importance of these characteristics in consumers’ organic food purchase intentions. This is achieved by allowing consumers to rank different organic standards in a conjoint framework of analysis.

Results of this study will assist researchers to better explain the evolving consumer preferences and attitudes toward organic products. Knowledge on the

consumer side of the aspect is significantly relevant during the ongoing implementation of national organic standards in Canada and the results will benefit the Canadian government in strengthening the mandatory organic regime. The study explores an interesting aspect of economic research concerning how the underlying institutional mechanisms (in this case, organic production standards) could possibly provide an opportunity to direct the market outcome.

1.5 PURPOSE, OBJECTIVES AND METHODS

The purpose of this research is to explore the influence of organic food standards on consumers' purchase intentions. Specific objectives include:

1. *To examine Canadian consumer awareness regarding organic food production methods.*
2. *To estimate consumer preferences for different standards associated with an organic food product.*

In estimating consumer preferences for different organic food standards, it is hypothesized that *a set of non-price characteristics that define organic products are more important in determining consumer preferences for organic products than the price of the product.*

A survey instrument will be used to assess consumer awareness about organic food and organic food production methods. The survey instrument will also include a conjoint experiment which presents different product profiles related to standards and asks participants to rank these profiles. Respondents will rank the profiles consistent with their preferences for the organic standards and the associated price levels.

1.6 ORGANIZATION OF THE THESIS

The thesis is organized into four additional chapters. In the second chapter, the conceptual framework supporting this research is developed. Issues relating to consumer demand for organic food and organic food characteristics, market mechanisms that provide information on organic food characteristics, standards, and grades are discussed.

The third chapter provides details on the empirical methods and the data included in this study. An overview of the conjoint method and its application in the present study, particulars of the choice of attributes and good, questionnaire design, data collection and the model estimation are discussed in this chapter.

Results of the consumer survey and the estimated conjoint model are presented in chapter four. A detailed analysis of survey participants' awareness about organic food and organic food production methods, participants' socio-demographic characteristics and their likely influence on the preferences for organic food standards are discussed and summarized in this chapter.

In chapter five, the assessment of the objectives originally set for this research, as well as policy implications for the Canadian organic industry are presented and discussed. Also, the contributions and limitations of the research, and recommendations for further research are drawn.

Chapter 2

Previous Literature and Conceptual Framework

2.1 INTRODUCTION

Before empirically examining consumer preferences for organic food standards, it is essential to develop the context for the research. In this respect, it is important to understand dimensions of choice, preferences, and how the two interact to form/shape demand. This chapter develops such an understanding by reviewing the relevant conceptual frameworks used in the previous studies, but focusing on issues related to: individual preferences; demand for food in general and organic food in particular; market mechanisms that provide information on characteristics of organic goods; and standard grades that define organic in the Canadian market.

2.2 UNDERSTANDING CONSUMER PREFERENCES

2.2.1 Economic Consumer Theory

Economic theory helps in understanding individual preferences and provides a means for expressing preferences via consumer demand. The neo-classical utility maximization approach is the basis for most demand theory in economics. In this analysis, individuals are assumed to follow behavioural postulates and are able to order (rank) all possible collections of goods that could be obtained in non-negative quantities. This ordering is then presented in terms of a utility function. In making purchase decisions, individuals behave as if they are maximizing their utility function subject to a budget constraint. This approach leads to a demand function which relates the individual's demand for a good or service to income, the price of the good or service and prices of related goods or services.

Thus, optimal choices depend implicitly on individual tastes and preferences. In empirical analyses, demand functions often also reflect individual's socio-economic and demographic factors such as age, gender, educational achievements, marital status, income levels, household size *etc.*

Consumer demand for organic and similar other food products such as pesticide-free food, eco-labelled food *etc.* has been analyzed on the basis of neo-classical utility theory. Studies explore the roles of individual tastes and preferences, socio-economic-demographic characteristics, price and availability of desired products in determining the demand.

Following the fundamental tenet of neo-classical utility theory *i.e.* individuals behave as if they are maximizing their utility function, several studies have explained the consumption decisions in organic food markets. For example, individuals experienced higher utility while consuming an organic product and hence, they preferred organic product to conventional equivalent (Giannakas, 2002). Similarly, in a study that compared USDA's definition of 'organic' and consumer understanding of the term 'organic', Conner (2004) and Conner and Christy (2004) observed that consumers from Ithaca, New York preferred the organic products that contained no Genetically Modified Organisms (GMOs), not exposed to radiation treatment, and grown without the application of biosolids. Underhill and Figueroa (1996) evaluated consumer willingness to purchase organic; certified organic; certified pesticide-residue free; and grown with IPM practices. In the study, individuals achieved maximum utility by choosing to consume the labelled products and this decision was influenced by the perceived food and/or environmental safety attributes of the labelled products.

In the studies cited above, investigators have assumed that nature of individual utility functions is known with certainty and thus, have presented them in definite mathematical terms leading to empirical analyses. However, a deterministic representation of utility is a very strong assumption. Often it is difficult to account for all the factors that influence an individual's utility and in turn the purchase decisions. Therefore, it is prudent to make provisions for unobserved and unaccounted factors (referred to as random factors in theoretical constructs) affecting the choice decisions as attempted by Misra, Huang and Ott (1991), Thompson and Kidwell (1998), and Loureiro, McCluskey and Mittelhammer (2001). In these studies, consumers preferred utility maximizing product as determined by the individual socio-economic-demographic characteristics, price of the product, price of the substitute product, perceived benefits of certain product and process characteristics (*e.g.* appearance, pesticide-residue testing, labelling) and unobserved random components.

There are a number of other studies that highlight the effects of individual's socio-economic and demographic characteristics on organic food consumption. Thompson (1998) and Eves, Lumbers and Morgan (2004), have presented comprehensive reviews of the previous literature, while others such as Wier and Calverley; Wolf *et al.* (2002), Arvanitoyannis and Krystallis (2004), and Krystallis and Chryssohoidis (2005) have actually investigated the influence of such factors.

2.2.2 Weaknesses in the Traditional Utility Frameworks

The theoretical frameworks reviewed so far are structured on the premise of utility maximization. Organic products are treated as another class of goods capable of substituting for conventional goods. However, the role of organic food characteristics (or

attributes) is not explicitly considered in analyzing consumer demand. Failure to explicitly incorporate product attributes represents a significant weakness of neo-classical demand theory. However, Lancaster (1966) offers a means by which product attributes can be included in demand analysis.

Lancaster (1971, p.4-6) interprets traditional demand theory as having “swallowed” the characteristics of goods. Therefore, all individuals are seeking various aggregates of goods such as, “food,” “clothing,” that have taken into account the properties of goods. Thus, traditional theory is built on the ultimate proposition that “goods are what are thought of as goods” (Lancaster, 1966 p. 132). However, people see the same good in different ways. For example, an apple is distinguished on the basis of its variety, colour, shape, size *etc.*, though all individuals regard it as an edible fruit. Also, among many properties of a good, some are relevant to one individual, but not to another individual. An individual may not notice the properties that are least important to his or her decision-making. For instance, fat content in milk may be of no concern to some individuals, while for others, fat content in milk is important and therefore, grocery shelves offer milk with varying fat percentages.

It has also been contended that the traditional demand theory does not provide a robust explanation of the substitutability among goods. Under conventional demand theory, it is not clear (Lancaster, 1966 p.132), why butter and margarine are substitutes whereas butter and sugar are not. It appears that ‘taste’ determines if the goods are close substitutes. However, it is the dissimilar product characteristics that decide on the extent of substitution between goods.

Lancaster (1971, p.8) further argues that the traditional analysis is “completely incapable of handling the most important aspects of demand in an advanced consumer society”. The effects of product and quality variations, model changes, and new goods cannot be handled easily within the conventional set-up. Traditional analysis either treats the new variant the same as the old one or regards the new variant as a new good and advocates the entire analysis afresh. The former of these ignores the changes and predicts unchanged demand where demand conditions have certainly changed. The latter forces a researcher to discard the information concerning demand behaviour of the original variant and more over, calls for finding a new utility function and mapping consumer preferences right from scratch.

Revisiting the studies cited in the previous section, it is not hard to appreciate the merits of arguments put forth by Lancaster. For example, Loureiro, McCluskey and Mittelhammer (2001) considered that the intrinsic characteristics of organic, eco-labelled and regular apples were identical and given. Similarly, the studies of Underhill and Figueroa (1996) and Thompson and Kidwell (1998) treated the organic goods as perfect substitutes for the conventional equivalents. Hence, these studies have failed to assess consumer demand for the attributes unique to organic variants; rather, they have assessed the demand for the bundle of attributes that make up organic, without necessarily defining them. Under such circumstances, consumer behaviour may be guided by their subjective perceptions of what constitutes organic.

2.2.3 Lancaster's Characteristics Demand Model

Breaking away from the traditional notion of goods being the direct objects of utility, Lancaster (1966) supposed that goods are consumed for the characteristics they possess

and characteristics are the objects utility. In Lancaster's model, individuals are assumed to rank the collections of characteristics (attributes) that goods possess. It is also assumed that characteristics of a good or an aggregation of goods are the same for all consumers and therefore, consumers will have choice decisions between collections of characteristics and not in the allocation of characteristics. Thus, according Lancaster's model, performance of a given product is determined by a bundle of its characteristics (attributes). Individual's utility function is now a function of the total amount of product characteristics obtained from an array of products.

In essence, Lancaster's (1966, p.134) approach rests on:

1. *"The good, per se, does not give utility to the consumer; it possesses characteristic, and these characteristics give rise to utility."*
2. *"In general, a good will possess more than one characteristic, and many characteristics will be shared by more than one good."*
3. *"Goods in combination may possess characteristics different from those pertaining to the goods separately."*

There are numerous studies focusing on the characteristics of GMO, GMO-free, eco-labelled, pesticide-free, fair-trade and certified organic products. In one of the important studies, Baker and Crosbie (1993) outline a conceptual framework, later embraced by Baker (1999), which evaluates consumer preferences for food safety attributes. The authors in the above two publications argue that consumers purchase products because of the attributes they possess. Further, each product contains the same set of attributes but the levels vary with products. Combinations of these attributes provide "service" or "value" by satisfying consumer needs.

Following the classical Lancasterian characteristics model, Baker and Crosbie (1993) postulate that consumers purchase goods because of the consumption services

provided by each of their attributes. For example, attributes of an apple may include variety, colour, texture, size, and presence/absence of insect marks. However, consumers buy apples because of the consumption services provided by the attributes, such as taste, keeping quality, nutritional qualities, safety, and satisfaction of appetite. Consumers act as if to maximize the services provided by the bundle of attributes subject to budget constraint. In fact, Baker and Crosbie (1993) go further and show that an individual's utility depends upon the attributes of the product, its price, attributes and prices of all other products and the individual's level of income.

Lancaster's thesis that utility is a function of set of attributes and consumers purchase goods to obtain these attributes forms the theoretical basis of many studies. For example, Wang and Sun (2003) report consumer preferences for production method (organically grown or conventionally produced); location (produced in Vermont vs. produced in other places); price; and the certification programs (NOFA certified organic vs. USDA certified organic vs. organic but not certified) in organically grown apples and organic milk. Results indicate that consumers are primarily concerned about price, followed by production method in apples and production location in milk.

Holland and Wessells (1998) researched the importance of production characteristics such as inspections that guarantee product safety and quality, and production methods on consumers' choice of fresh salmon. Similarly, Wessells, Johnston and Donath (1999) studied the effects of price; species; physical characteristics of the seafood; knowledge and perceptions about the status of fish stocks; consumer demographics; and preferences for certifying agency while explaining consumer preferences for certified and uncertified seafood. Wessells, Johnston and Donath (1999)

also accounted for random components while describing individual behaviour. Likewise, Hearne and Volcan (2002) and Blend and van Ravenswaay (1999) report the studies suggesting consumers purchase products because of certain product characteristics.

2.3 ESTIMATING CONSUMER DEMAND FOR ORGANIC FOOD

In the previous sections, organic food consumption studies are examined to better understand their theoretical backgrounds. This section introduces the nature of estimation techniques used in the above-mentioned studies. This helps in choosing the estimation technique.

Given the characteristics, tastes, preferences, and attitudes, individual responses in most of the above studies are measured in terms of: (i) preference or choice decisions among the different goods and/ or characteristics of the goods; and/ or (ii) willingness to pay for the desired good or the attribute(s). Researchers have adopted several approaches to generate individual responses and attach a meaningful number to such responses. In order to gather information from the respondents, techniques like administering a questionnaire during personal interview, mail survey, web survey, focus group discussions, and auctioning have been widely used. Among others, the personal interview method has been employed most frequently.

For example, Misra, Huang and Ott (1991), Loureiro, McCluskey and Mittelhammer (2001), Conner (2004) and Conner and Christy (2004) designed surveys to capture contingent valuation (CV) for changes in quality attributes. By definition, the CV method uses survey techniques to gather information about dollar values that people place on nonmarket goods as if markets for these goods existed. In the above studies, CV is estimated in terms of willingness-to-pay (WTP) for the desired product characteristic.

Regression models are used to test whether socio-economic variables had significant influence in the decision-making.

Alternatively, Herane and Volcan (2002) and Durham and Andrade (2005) determined consumer preferences for the goods/product attributes in question using choice experiments. Ara (2003), on the other hand, experimented with a combination of CV and choice experiments to ascertain the preferences for organic rice attributes as well as the WTP for these attributes among consumers in Manila and Naga, Philippines. In the above studies, data gathered through surveys was analyzed with regression techniques involving ordinary least square or maximum likelihood estimation (in the case of probit and logit models) procedures.

Other studies like those of Baker and Crosbie (1993), Holland and Wessells (1998), and Baker (1999) have followed the techniques of conjoint analysis. In conjoint analysis, respondents are asked to evaluate alternative products that are comprised of several attributes (including price) on the premise that consumers value products based on the utility provided by each product attribute. Total utility from a product is assumed to be obtained by combining the separate amounts of utility provided by each attribute of the product. As with the CV method, conjoint analysis is typically used to evaluate hypothetical products. However, as is the case with Baker and Crosbie (1993), Holland and Wessells (1998), and Baker (1999), conjoint analysis can be used to examine how consumers value individual attributes and the tradeoffs consumers make between attributes.

Interestingly, CV and the choice experiments have been used both in traditional neo-classical and the Lancasterian characteristics demand frameworks. However, the use

of conjoint framework has greatly been influenced by the underlying Lancasterian attribute principles.

2.4 FOOD CHARACTERISTICS AND INFORMATION ISSUES

Product characteristics are the focal point consumer demand for any good or service. This is especially true in the case of food products. Technical advancements in food production, processing and distribution methods, new understanding about diet and healthy living, and consumers' increasing interest in the food related matters have driven the demand for high-quality as well as differentiated food products. Consequently, food product characteristics have evolved over a period of time.

Food businesses have responded to these changes and are focusing on supplying specific attributes in food products. Attributes such as nutritional and vitamin enhancements, healthy alternatives, safety features, adherence to animal welfare practices, overall welfare causes such as fair trade, environmental friendliness, responsiveness to biodiversity issues, ecological sustainability, and production methods have found places in shopping baskets.

Hooker and Caswell (1996) group the food quality attributes into five categories, which are reproduced in Table 2.1. Categories include food safety, nutritional, value, package and process attributes. Many of the characteristics in food products are not known to consumers and in some cases may not be known to producers. Consumers may have confusing perceptions about certain attributes. For example, people have differing safety and health risk perceptions associated with the consumption of genetically modified foods. Jolly *et al.* (1989) found that Californian consumers associated organic produce with notions such as no pesticides, no artificial fertilizer, no growth regulators,

Table 2.1 Quality Attributes of Food Products

1. Food Safety Attributes
Food borne pathogens
Heavy metals
Chemical residues
Food additives
Naturally occurring toxins
Veterinary residues
2. Nutrition Attributes
Fat
Calories
Fiber
Sodium
Vitamins
Minerals
3. Value Attributes
Purity
Compositional integrity
Size
Appearance
Taste
Convenience of Preparation
4. Package Attributes
Package materials
Labeling
Other information provided (recipes, etc.)
5. Process Attributes
Animal welfare
Biotechnology
Environmental impact
Chemical use
Worker safety

Source: Hooker and Caswell (1996)

and residue-free products. However, this may not be true. Therefore, quality differentiated food products create problems of imperfect information and result in inefficient market situations (McCluskey, 2000).

Economic theory provides an understanding of individual's ability to identify product quality attributes. Nelson (1970) distinguished between two types of products, "search" and "experience" goods. Applying this distinction to food product characteristics, as is done in Caswell and Mojduszka (1996), search attributes (or goods) are those wherein consumers can determine a product's quality before the purchase by examining or researching the product. Thus, there is nearly complete and easily accessible information about the quality before purchase. For example, in an apple, size, color and prices are search attributes.

For experience attributes, consumers cannot determine a product's characteristics until they buy and consume the product. Many food quality characteristics are experience attributes (Caswell and Mojduszka, 1996). For example, attributes such as taste can be easily assessed during use. Packaging attributes, convenience of preparation, and taste often form experience attributes. According to Caswell and Mojduszka (1996), the information problem in markets for experience goods may be mitigated by sequential or repeated consumption patterns and quality signalling (e.g. advertising, labelling warranties) by producers to consumers.

Darby and Karni (1973) expanded the classification of Nelson (1970) to include "credence" goods. Credence goods are more complex in that consumers cannot judge a product's quality even after they inspect, buy and use it. Also, consumers cannot rely on their experience. Credence attributes cannot be observed directly (or it is observed too

slowly or too late to matter or it is prohibitatively expensive to be observed) even after consumption (McCluskey, 2000). Besides, product testing may not be practicable for individual consumers. For example, an individual cannot reliably determine whether a food has been produced organically by inspecting or using the product. In general, the food safety, nutrition, and process attributes appearing in Table 2.1 are credence attributes (Caswell, 1998).

In credence goods, the presence of imperfect information as well as transaction costs in acquiring and using the information cause problems for producers as well as consumers. In such situations, governments could improve the information environment (transform credence attributes to search attributes) and in turn the functioning of markets by undertaking information provision programs. According to Caswell and Mojduszka (1996), such measures include: use of voluntary claims on particular attributes; requiring mandatory disclosure of information about the nature of a product or how it should be used; providing public information and education; subsidies for the provision of information; and quality signalling through labelling according to reputable certification standards. Moreover, in the case of organic goods, it is argued (Giannakas, 2002) that product labelling based on a third party certification is the only feasible method of allowing buyers to clearly assess product quality.

2.5 THE STANDARD GRADE

To achieve an optimum degree of order in a given situation, characteristics of various activities and their results need be agreed upon by the constituent parties and be validated. Standards are defined as the established criteria or specifications that serve as rules, guidelines, or definitions of characteristics to ensure consistency and compatibility

in inputs, processes, and products/services (Deaton and Hoehn, 2005). The set of guidelines may be targeted toward materials used in the production processes, product design, production processes, product characteristics, or meeting the needs of the end user (see, Bowbrick, 1992 p.2-10).

From a consumer's perspective, standards aim at providing objectively measurable and rankable product characteristics and the subjective attributes that individuals value. For instance, sugar content and acidity levels in grapes are measurable parameters, whereas freshness of the berries is subjective. It takes several standards working together to achieve the desired result. The group of standards is referred to as 'standard grade.'

Bowbrick (1992) defines a standard grade as the compilation of standards. A standard grade is a system of product grading (classification) that occurs when a central authority lays down a set of standards that are mandatory for products labelled with an official grade name. Further, Bowbrick (p. 34) notes that grades are specified by upper or lower level of the characteristics, or by the lower limit alone, or by the mean level, or by the tolerance limits. For example, a research journal may set an upper limit on the number of pages for an article to be accepted for publication or in a school students have to score minimum points to pass a course.

The Food and Agriculture Organization (FAO) broadly classifies standards into product and process standards. Product standards are specifications and criteria to evaluate the characteristics of products. For example, pesticide residue level in an apple ascertained through valid laboratory testing. Process standards, on the other hand, are sets of specifications and definitions that comply with a subset of acceptable production

practices (Deaton and Hoehn, 2005). For example, claims of pesticide-residue free apple quality not supported by testing and certification. However, both, product and process standards determine product grade.

2.6 ORGANIC STANDARDS AND CONSUMERS' DEMAND

An organic standard grade is the compilation of standards that set minimum requirements of production, processing, storage, handling, and distribution practices to be followed in the case of organic products. The individual standards include permitted and prohibited materials/inputs, production practices for various enterprises such as crops and livestock, processing and handling methods. Certification methods and agency procedures are set in the standards. Identity preservation of organic goods through the supply chain and communication with end consumers form an important aspect of the organic standard grade. Thus, “a distinguishing feature of organic certification is that it concerns primarily the complex process of production, rather than product itself” Fetter and Caswell (2002, p. 56). The use of organic labels indicates that food products have been produced and processed under certain standards.

Historically, organic certification standards are developed by farmer based groups and these standards were local and regional in scope (Lohr, 1998). As the sector developed, private firms and government agencies developed organic production standards. In such cases, government regulations and private standards coexist with the former restricted to a legally defined area and the latter operating in multiple jurisdictions. Later on, governments assumed the role of regulating the use of organic labels to protect consumers against deception and producers of organic products against

misrepresentation of other products as organic when they do not meet the recognized standards (Caswell, 1998).

Organic certification systems are established to overcome information asymmetry by transforming credence characteristics into search attributes. In addition, standard grades have defined organically grown food in many ways. The most common definitions of organic food emphasize the technology or production practices and principles used. Some definitions highlight the practices such as limited use of artificial chemicals, regular access to pasture in livestock production, while others emphasize dimensions such as 'biological', 'natural', or 'environmental friendliness'. Thus, in a way, production standards determine characteristics in organic goods.

Consumers on the other hand, have expressed differing perceptions and understanding of the term 'organic'. For example, Wolf (2002) found that the US consumers rated the attributes associated with organic lettuce as 'somewhat desirable' or 'very desirable', while the 'certified' organic label was rated as only 'slightly desirable' or 'somewhat desirable'. Hill and Lynchehaun (2002) tried to explain this situation by assuming that consumers are unaware of the nuances and complexities of organic farming practices and the associated product attributes. Considering that individuals decide in favour of a good after comparing a bundle of observable and unobservable characteristics and the fact that enough is not known regarding how the knowledge of organic production methods (standards) influence consumer purchase decisions, research efforts are to be focused in this area.

In most of the studies concerning consumer demand for organic food, production standards have not been modeled as determinants of demand function. For example,

many research studies discussed under the Section 2.2.1 do not segregate production process characteristics while defining organic. Moreover, the underpinning neo-classical economic theory in these studies treated organic products as another class of goods without referring to the characteristics of goods in either class. The preference/ choice and willingness-to-pay decisions are explained only on the bases of product type (organic or conventional), socio-economic, demographic, and risk-bearing characteristics of the respondents.

The studies discussed under the Section 2.2.3 have not explored the influence of production standards in the choice of organic goods. However, the theoretical basis of the Lancasterian characteristics demand model of these studies has allowed for a discussion of product attributes. In the context of the studies cited in Section 2.2.3, both observable and unobservable organic food characteristics such as size, appearance, insect marks, certification, food safety and environmental claims, production methods and location of production have been shown to influence the choice decisions. With the inclusion of product characteristics and the socio-economic-demographic parameters of the respondents, these studies are more comprehensive and hence, could better explain the choice decisions.

It is apparent that product and production attributes in organic goods along with the socio-economic and demographic characteristics of the individuals are essential to obtain a robust explanation of consumers' preference patterns and in turn, purchase decisions. A better understanding of the end point in the supply chain results in necessary improvements or adjustments at the production and policy frontiers.

2.7 CONCEPTUAL FRAMEWORK

According to the literature reviewed so far, consumer preferences for organic goods depended on price, appearance, various socio-economic-demographic characteristics of the individuals, respondent's perceived knowledge and awareness about organic goods, and more importantly, product characteristics. Among others, researchers have included environmental claims, geographical location of production, food safety levels, certification proofs, inspection seals, and the production methods while defining organic good characteristics. These characteristics are found to be important in determining consumer demand and willingness to pay premium prices for organic foods.

Factors that influence individual preferences for organic food products can be grouped into two sets: endogenous and exogenous. The endogenous set is made up of personal characteristics of a decision maker (age, education level, gender *etc.*). The personal characteristics interact with knowledge and awareness (actual and perceived) about organic food and influence individual preferences for organic products.

The exogenous set of factors include an organic product and production characteristics. The organic product related characteristics are those which can be observed and/ or experienced during purchase and consumption. Organic production characteristics, from a consumer's perspective, include the perceived direct and indirect benefits of producing and consuming organic goods. The production characteristics can also result in certain product attributes unique to organic goods and hence, are important in consumer decision-making process. For example, given the other factors, the claim that organic milk tastes better than conventional milk could positively stimulate individual preferences.

Figure 2.1 represents the factors influencing organic food preferences and purchase decisions. Individual characteristics in combination with organic product and production characteristics have direct and indirect effects on consumer preferences and attitudes, which in turn determine the ultimate purchase decisions. Thus, organic product and production characteristics are critical in the consumer purchase decision.

From among the models that explain consumer product purchases based on the characteristics of the products, this study is based on a Lancasterian demand model very much similar to those in Baker and Crosbie (1993) and Baker (1999). However, the difference reflects the production standard focus of this study, where as most previous efforts focused on product characteristics.

Consider, an organic good g_I , produced in compliance with a set of production methods (standards) is offered at price p_I . Also consider, there are N variants of the same organic good produced under different sets of production standards and are represented by vector $\mathbf{g} = (g_2, \dots, g_N)$. The corresponding price vector is $\mathbf{p} = (p_2, \dots, p_N)$. The product g_I reflects J production standards denoted by vector $\mathbf{s}_I = (s_{I1}, \dots, s_{IJ})$. Thus, products $\mathbf{g}$ contain a matrix of standard attributes, $\mathbf{s} = s_{ij}$ ($i = 2, \dots, N$ and $j = 1, \dots, J$).

Consumers choose organic foods produced in accordance with particular standards because of the production characteristics they value. Combinations of these standard attributes provide observable and unobservable benefits that consumers look for. For example, an organic good produced according to a standard that prohibits the use of pesticides might provide food safety benefits and better taste to the consumers. Such benefits are expressed as:

$$\mathbf{b} = b_k(g_I, s_I, \mathbf{g}, \mathbf{s}), \quad k = 1, \dots, K, \quad (2.1)$$

Figure 2.1 Schematic Representation of Factors that Influence Organic Food Purchase Decisions of an Individual

where $\mathbf{b}$ is a vector of K consumption benefits. In this scenario, each variant of the organic good is produced under the same set of production standards. However, the nature and stringency of the application of each standard varies with the organic good variant, and some standards may not be adhered to in certain variants.

The consumer's utility function can be represented as:

$$U = u(b_1, \dots, b_k), \quad (2.2)$$

and is subject to a budget constraint:

$$p_l g_l + \mathbf{p}'\mathbf{g} \leq m. \quad (2.3)$$

From equations 2.1, 2.2 and 2.3, consumer's choice problem can be rewritten as:

$$V = v(p_l, \mathbf{s}_l, \mathbf{p}, \mathbf{s}, m), \quad (2.4)$$

such that

$$p_l g_l + \mathbf{p}'\mathbf{g} = m. \quad (2.5)$$

V represents the maximum utility achievable by a consumer given organic production standards, prices and the level of income.

2.8 CONCLUSION

Neo-classical utility frameworks do not provide a robust solution to the consumer's choice problem in the presence of product attributes. Alternatively, a Lancasterian characteristics model is found to be suitable in the present study. Further, the Lancasterian demand model is restated to include the production characteristics that are important in determining the consumer's organic food purchase decision. Thus, this study incorporates the merits of understanding consumer preferences for organic production characteristics or attributes. By varying the selected production characteristics (standards) in a conjoint framework, the study also evaluates the relative importance of these standards from

consumers' perspective. Chapter 3 provides the rationale of selecting the standards that are being varied and the empirical model.

Chapter 3

Empirical Methods

3.1 INTRODUCTION

Organic food consumption, as mentioned earlier, is influenced by a variety of general and product specific characteristics. General and product specific characteristics, in turn, are determined by the production methods. For organic foods, such production methods correspond to management systems known as ‘organic production standards’. In the Canadian context, nearly 20 organic standards are guiding the production, processing and distribution of organic food. These multiple production standards create confusion and a problem of choice for producers as well as consumers. Therefore, a unified national organic standard is being proposed and will form the basis for organic trade regulation in Canada.

The purpose of the study is to understand consumer preferences for organic production standards. It is assumed that a consumer’s decision to buy an organic product is based on his/her knowledge and awareness of the production methods (standards) and the relative preference for the different production methods. This idea is explored amongst the Canadian consumers with organically grown apple as an example. Consumer awareness about organic production standards and the extent to which the different organic production standards influence the choice of apple is studied.

This chapter explains the empirical methods used to accomplish the above mentioned research objectives. A general understanding of the empirical method and its application in the context of the present study are presented in the following section.

Section three describes the reasons for selecting the specific organic production standards against which consumer purchase decisions are examined. Section four outlines the basic 'composition rule' with which the independent variables are related. The subsequent section lays out the survey method and the data collection procedures employed in this study. In the final section, the empirical methods used in this study are explained.

3.2 EMPIRICAL METHOD

This study uses conjoint analysis to evaluate consumer preferences over selected production characteristics for organic apples. The empirical method, originally introduced in mathematical psychology², has grown in popularity with academicians and practitioners in measuring consumer valuation of product attributes. As a tool for developing effective product design, conjoint analysis is extensively used in marketing research. Conjoint methods have also successfully provided an understanding of the structure of consumer preferences (Green and Srinivasan (1978), Baker and Crosbie (1993) and Wang and Sun (2003)). Based on these considerations, conjoint analysis can best facilitate accomplishment of the current research objectives. An overview of the method and its application in the present study are discussed below.

3.2.1 Conjoint Analysis - An Overview

Conjoint analysis is a statistical technique used to determine how individuals value different characteristics or attributes that make up a product or service. The underlying premise here is that individuals value a good or service based on the utility provided by the product's (service's) attributes. Therefore, as seen in the previous chapter, the

² Interested readers can refer the seminal paper by Luce and Tukey (1964).

Lancastrian characteristics demand model provides a credible theoretical justification for the conjoint method.

The objective in a conjoint analysis is to determine what combination of a product (service) attributes is most influential on individual choice. Conjoint analysis begins by defining a real or hypothetical product (service). The selected product (service) is then represented in terms of its attributes. In the next step, a controlled set of the product (service) is presented to respondents. Conjoint analysis asks the respondents to state their overall interest in buying the product (service) varying in their attributes, benefits, and the price levels.

By analyzing each respondent's overall evaluation of the product (service), the implicit valuation of attributes can be obtained. These implicit valuations (part-worths or utilities) can be used to measure the relative importance of each attribute and the attribute levels; examine how consumers value the attributes; and the tradeoffs consumers make between the various attributes. The relative significance of attributes help explain the total utility judgements by a consumer. Part-worth scores are often used to create market models that estimate market share and revenue.

As mentioned above, conjoint analysis requires individuals to indicate their choices by trading off attributes, just as in the market conditions, and hence, portrays individual choices with a high degree of realism. Also, conjoint analysis is usually carried out at the individual level *i.e.* determining the structure of an individual consumer's preferences. The technique also covers the design and administration of questions in collecting the required data. The tool, in general, has been very effective in determining

the importance of product attributes and price, simulating consumers' choices, and forecasting the market results.

Conjoint analysis has many advantages and is widely used in marketing, product management, and operations research. However, the technique is more reliable when a limited number of attributes are studied. Moreover, the researcher must identify the relevant attributes and the levels in advance. These attributes must be meaningful to the respondents. Besides, information gathering can pose problems.

A typical conjoint analysis begins with a researcher identifying the number and levels³ of attributes relevant to consumers and the product (or service) in which the attributes are tested. Figure 3.1 illustrates the steps followed in conducting a typical conjoint analysis. Green and Srinivasan (1978) present an excellent discussion of these steps and critically evaluate the methods that can be chosen for the different steps. Thus, one can notice that conjoint analysis is not an estimation procedure but is, instead, a measurement technique that generates set of observations equivalent to the utility values for particular levels of each attribute of a product.

3.2.2 Conjoint Analysis in the Present Study

It is assumed that consumers' choice to buy organic food is influenced by their knowledge about the organic production methods as well as the importance individuals attach to the different organic production practices. In essence, the study attempts to understand consumer preference for various production attributes in organic food. Specifically, given the other product characteristics of apple (colour, size, taste, visual appearance, nutrition, *etc.*), the study seeks to better understand the values that

³ Generally, the term 'factor' is used to describe a specific attribute and the term 'levels' denotes all the possible values for each factor

Figure 3.1 Steps in Designing A Conjoint Analysis and Alternative Methods of Implementing Each Step

Source: Adapted from Green and Srinivasan (1978) and Hair *et al.*, (1998)

individuals ascribe to the production attributes of an organic apple. Therefore, conjoint analysis is best suited to capture consumers' overall assessment of organic production process characteristics and further decompose them at individual attribute level.

3.3 CHOOSING THE ATTRIBUTES AND THE GOOD

The first step in conducting a conjoint analysis, as mentioned before, is to choose the appropriate attributes, attribute levels and product. While choosing the attributes it is critical to balance the need for including the most significant ones against the need to minimize the number of attributes so that the problem faced by survey respondents is manageable. In this study, product attributes correspond to the organic production characteristics defined by the standards. The selected attributes and their levels are then need to be expressed in the form of product descriptions (or profiles). This section provides details on the choice of four organic standards: testing for synthetic pesticide-residues; rules regarding the location of product origin; agencies that set organic production standards; and agencies that monitor farmers' compliance with organic production standards, their levels, and the rationale for selecting an apple as a good to represent these standards.

3.3.1 Choice of the Good

In the present study, an organic apple is chosen on account of several reasons. Primarily, apples permit the study of all selected organic standards. For instance, consider pesticide-residue testing. The major food groups – most oils, dairy, meat and poultry products – contain few detectable pesticides and contribute very negligibly to pesticide residue-related risk. On the other hand, about a dozen of pesticides present in fresh produce and

juices pose significant risks (Benbrook, 2004). In the fresh produce, apples rank among the most likely fruits to test positive for pesticide residues. Similarly, consider the case of geographic origin. Organic apples sold in Canada come from different places in and outside Canada namely, the provinces of British Columbia, Ontario, Nova Scotia, Quebec and countries like the USA, Brazil, Argentina, and China. Therefore, it is possible to look at consumer preferences for organic apples grown in different geographic locations.

According to Hay (1989), Agriculture and Agri-Food Canada (2003) and Yiridoe, Bonti-Ankomah and Martin (2005), fresh fruits and vegetables dominate the current demand for organic products in Canada. Apples dominate the retail sales in the organic fruit category. Also, apples fall under ‘the gateway’ or introductory category in which consumers start purchasing organic goods (Hartman group, 1996). Therefore, it is assumed that consumers will have greater familiarity with apples. Also, since apples are one of the most sought after organic fruits, the availability of this fruit is high.

The important apple varieties that are available in the organic category are Empire, Fuji, Golden Delicious, Granny Smith, McIntosh, Mutsu, Red Delicious, and Royal Gala. For the purposes of the present study, a Red Delicious organic apple is chosen as it is popular (because, it can be used as fresh, for juice and in desserts) and is available for purchase during the data collection period.

3.3.2 Variation in Organic Production Characteristics

In order to select the organic production standards that could be varied for consumer responses, it is essential to know how these standards are defined. However, there is no single, comprehensive and universally acceptable standard grade determining the production of organic goods. Instead, there are multiple organic grades forming the basis

of certification and labelling. For instance, the European Union countries have EU regulations and the US has National Organic Program administered by the USDA. There are various other standards (for example, IFOAM, Demeter, Codex, Ecocert) that enterprises from these countries can follow and qualify for. Organic enterprises in different countries may follow more than one certification program, if need be, after conforming to the mandatory standard.

All the organic programs are designed to manage organic processes. However, the organic programs are not identical and therefore, can introduce unique production and product features. For example, EU and the USDA organic standards have dissimilar requirements for the pasturing of dairy cattle. Therefore, consumers who believe that organic livestock are required to be free ranging might be misled about the meaning of organic milk (or other livestock products) under the EU and USDA systems. Under such circumstances, examining the influence of organic production characteristics, as is done in this study, requires an identification of key standards that are common across the production systems. To accomplish this, a comparison of different organic grades is essential. As the study relates to the Canadian organic sector, production systems that have defined 'organic' in Canada are compared. Appendices A, B, and C present a list of organic standard grades compared in this study, the layout for the comparison and the results of the comparison, respectively.

3.3.3 Choice of Attributes and Levels

By comparing 18 different organic certification programs (Appendix C) that set guidelines for organic food production, processing, and distribution in Canada, key similarities and differences in the production processes are identified and presented

below. The analysis of similarities and differences among the organic standards is developed to select the four organic production standards for which consumer preferences are examined.

In general, all the organic certification standards required:

- Healthy interactions among all the life forms of a farm ecosystem
- Protect environment and decrease pollution
- Continual monitoring, maintenance and improvement of soil health
- Cropping pattern, varietal selection in crops and livestock suiting to the local and regional conditions
- Crop rotation, mulching and other practices to prevent soil erosion and enhance soil health
- Specific composting methods for animal and plant wastes
- Mechanical, cultural and biological methods of weed, pest and disease control
- Living conditions, feed, health, breeding and handling of animals promoting their behavioural needs
- Outdoor access for livestock
- Pasture for all ruminants
- Certified organic feed for animals under organic management
- Maintain the integrity of organic foods and processed products from the point of production to the final sales
- Inspection of all farm operations, processing and handling facilities and production and sales records by accredited agents

In addition, organic standards prohibited the use of:

- Synthetic fertilizers, pesticides, herbicides, and fungicides
- Genetically Modified Organisms (GMOs), seeds or ingredients
- Ionizing radiation and microwave
- Bio-solids (sewage sludge)
- Antibiotics or growth hormones
- Animal by-products in animal feed

Key differences among the organic certification programs compared are listed in Table 3.1. While, there may be a few other differences at the field level, and also in terms of substances that are permitted or prohibited by the different programs, the study did not involve a side-by-side comparison of the respective Material Lists.

Looking at the similarities and differences among the organic production standards in Canada, four organic production attributes are selected for the purposes of this study. The selected organic attributes are: (i) pesticide-residue testing, (ii) rules regarding the location of product origin, (iii) organization setting the production standards, and (iv) agencies that monitor the organic production standards. In addition, price points are also considered to provide a more realistic representation of the production attributes.

Upon selection of the attributes, the attribute levels must be defined. Hair *et al.*, (1998) suggest that attribute levels should be set slightly outside the actual values to avoid inter-attribute correlation, but also represent the attribute levels realistically. Hair *et al.* (1998) also suggest that it is important to keep the number of attribute levels equal across the attributes, as an attribute with a higher number of levels may signal greater importance to the respondent. Following these guidelines, attribute levels are chosen. In

Table 3.1 Variation in Organic Certification Programs

1. Claim that organic food promotes health of an individual
 2. Acknowledgement that organic food is not same as residue-free or contamination-free food
 3. Requirement of residue tests in soil, water and crop to verify the presence of prohibited substances
 4. Permissible levels of residues (of prohibited substances) in crops that do not disqualify for organic certification
 5. Certification norms for crops that are cultivated nearby the potential pollution areas (*e.g.* conventional farm)
 6. Use of local inputs and marketing the end products locally
 7. Products of animals/ birds that are not born on organic farms can be certified organic after the prescribed conversion period
 8. Use of concentrates in animal diet
 9. After the completion of withdrawal period, products of animals/ birds treated with antibiotics can be marketed as organic
 10. Permitting the use of plant and animal based growth regulators in greenhouse operations
 11. Fumigating storage and processing facilities with prohibited substances
 12. Definitions of 'certified organic' and 'made with organic' (or equivalent of the two)
 13. Enforcement of the certification program
-

the following sections a detailed discussion on the choice of the attributes and their levels is presented.

3.3.3.1 Testing for synthetic pesticide-residues in organic foods

Organic food is grown using a farming system that, compared to conventional farming, uses next-to-no pesticides. At the core of the organic practices, there also lies a ban on the use of synthetic fertilizers, herbicides, antibiotics and fungicides. A majority of the certification programs reviewed here have also highlighted this aspect. Therefore, many people consider that organic foods are devoid of any synthetic chemical residues and also perceive⁴ them to be safer, healthier and more environmentally friendly than the conventional equivalents. This is why consumers are looking to buy organic food products⁵ and in effect, reduce their risk loads and achieve greater safety levels against pesticide residues in food.

However, there are reports demonstrating the presence of pesticide residues in organic foods. For example, nearly seven percent of organic samples contained multiple residues and in the case of organic fruits and vegetables, 10 to 25 percent of the samples contained residues of synthetic pesticides (Baker *et al.*, 2002). Nevertheless, the presence of pesticide residues in organic food, in amount, number, and the rate of occurrence, is markedly lower than that in conventional foods. For example, conventional fruits are 3.6

⁴ Various studies such as Buzby and Skees (1994), Huang (1996), Loureiro, McCluskey and Mittelhammer; Torjusen *et al.* (2001), Wier and Calverly; Wolf; Zanolli and Naspetti (2002), Shuzzler, Govindasamy and Adelaja (2003), Option consommateurs (2004) and Shepherd, Magnusson and Sjoden (2005) have brought out these aspects.

⁵ For instance, “The Packer’s” 2003 Fresh Trends Survey in the United States notes that 63 percent of shoppers buying organic food did so because of ‘fewer chemicals in food’ and 51 percent said organic food was ‘better for me/my family’. 37 percent of the shoppers cited the reason - ‘better for the environment’.

times more likely to contain residues than organic fruits and conventional vegetables are 6.8 times more likely to have one or more detectable residues (Benbrook, 2004).

All organic certification programs also recognize⁶ that some low-level of contamination (from sources like long-lived residues of banned organochlorine substances (DDT), or from 'drift' from adjacent non-organic production plots) is unavoidable in spite of various measures devised to avoid any contamination (Appendix B). Certification programs tolerate low levels of synthetic residues in organic goods. These circumstances can shake consumer confidence in organic food. Thus, if low pesticide residues are a substantial reason that consumers buy organic food, then some Canadian consumers may have been misinformed about the extent to which this is assured under different organic certification programs.

Ensuring a reduction in frequency and the levels of pesticides in certified organic food will build consumer confidence and justify the price that people pay for minimizing the pesticide exposure to themselves and their families. Regular toxicological tests on the organic production plots, water used on the farm and the final products can achieve this. However, a very few organic certification programs recognize this aspect and such tests are declared mandatory under these programs and, a few other programs recommend residue testing when reasonable doubts of contamination exist (Appendix C).

In this context, the present study has looked at pesticide-residue test requirements in organic food. This attribute of organic food has assumed three levels – regular testing, testing when there is a reason to believe that organic foods have been exposed to synthetic chemicals, and no testing at all. Understanding the consumers' point of view in

⁶ All organic certification programs, except the two, compared in this study acknowledged that organic practices do not guarantee pesticide-free or contaminant-free food.

this respect could trigger a larger debate on how organic standards should deal with unavoidable pesticide-residues and the related policy changes under regulated organic regime.

3.3.3.2 Rules regarding the location of product origin

People, in recent years, have explicitly mentioned the desire to know where their food comes from and whether it is grown, transported and marketed in ways that are healthy and environmentally sustainable. As a result, the demand for environmentally responsive goods (recyclable, eco-labelled, grown with IPM, pesticide-free, organic, *etc.*) is on the rise. Organic farming, with its basic tenets of energy efficiency, social justice, and the agrarian ideal of small farms growing the produce for local communities⁷, has attracted consumers who are concerned about the environment and the origin of their food. To a significant portion of organic consumers it matters to know where and how food is produced (Lohr, 2001). Also, in general, consumers preferred locally grown organic produce, compared to the shipments from other places (Yiridoe, Bonti-Ankomah and Martin, 2005).

The preference for 'local' products by regular buyers of organic food tends to fulfill the multiple objectives of ensuring freshness and flavour (especially in fruits and vegetables), minimizing the unnecessary burning of fossil-fuel and thereby reducing the damage to the environment and an attitude of support toward local producers and businesses. Therefore, consumers have preferred conventionally grown local product over organic products sourced from outside the region (Lohr, 2001). For example, in

⁷ For instance, some of the certification programs compared in this study required that the operators use local inputs and market their products in neighbouring communities; for an organic certification, BIO SUISSE (Swiss organic program) requires that 90 percent of the ingredients in a processed product must be grown in Switzerland.

Japan domestically produced conventional (non-GM) soybeans were traded for higher prices (almost 14 percent more) than imported organic soybeans (Foreign Agriculture Service, USDA 2000).

The term 'local' remains to be defined and is left unregulated. For instance, in the Midwest United States it might mean food grown anywhere in the region. In California, with many small farms and a long growing season, it might mean food from a 25-mile radius (DeLind, 2000). Alternatively, some activist groups consider anything grown within '500 kilometre radius' as the local food. Nevertheless, it is clear that the term 'local' is indicative of the distance products travel before reaching the ultimate consumer. In this sense, the less distance a product travels, the more favourable the treatment by consumers with respect to the notion of locality.

Increasing demand for organic goods, however, has resulted in products being shipped over thousands of kilometres. The world's biggest organic markets, North America and Europe, import large amounts from the producers in Asia, Australia and the Latin America. Canada, for instance, imports approximately 80 percent of its organic food consumption. Canadian imports not only include exotic products but also foods like apples, tomatoes, and carrots that grow very well in the country. Growing trade in organic food has left consumers in the very situation that they always wanted to avoid; as such geographical origin of organic goods is an important area which potentially fails to reflect consumer preferences for and notion of an 'organic' good.

Under the circumstances similar to that of Canada *i.e.* limited growing season forcing the country to import agricultural goods including organic, and the growing demand for a variety of organic products all along the year, there is an urgent need to

reconsider some of the traditional propositions of ‘organic’ products and ‘organic’ farming. One such proposition, geographical origin of organic products, is studied here from consumers’ perspective. The attribute is represented in three levels *viz.*, products must be grown in Ontario, products must be grown in Canada, and absence of specific rules governing where the produce must be grown (*i.e.* rules specifically describing the geographic boundaries).

3.3.3.3 Agencies that set organic production standards

Prior to the period when organic agriculture was codified in certification standards and attained wider recognition, the idea of organic meant different things to different people. Organic was associated with characteristics of scale, locality, control, nutrition, social justice, participation, environmental quality, and regional food systems (DeLind, 2000, Fetter and Caswell, 2002).

Organic production systems accommodated the variations in local growing conditions and considered the commercial availability of inputs in different parts of the country. The decentralized smaller system also allowed the operators to quickly adapt to the changing production technologies and fluctuating market conditions. Thus, lack of regulation prompted many farmer organizations (*e.g.* Demeter, OCIA) to formulate organic production standards that focused on the growing conditions prevalent in a region along with incorporating the nuances of the organic farming philosophy. Consequently, buyers were presented with an opportunity of choice among several production standards that also placed varying degrees of emphasis on different goals of organic production.

With the benefits of trade in organic goods, for-profit, private firms (not related to farmer or farmer-based organizations) and public agencies entered the market with their

versions of production standards. For example, private entities like OCPRO, QAI and government agencies from the USA, EU, British Columbia and Quebec have been successful in popularizing their production standards in the Canadian market. Lohr (1998) notes that government standards are hierarchical and states, provinces, or prefectures have adopted stricter standards often preceding a broader national minimum standard.

Typically, for-profit, private certification and government standards are focused narrowly on production and processing methods and fail to deal with the stringent philosophical principles (Lohr, 1998). Under certain circumstances, regulatory agencies may have accommodated less stringent organic production standards. For instance, the United States' national organic standard does not clearly prohibit certified dairy operations from continually importing conventionally raised replacement animals and transitioning them to organic management. Furthermore, national standards have been criticized for favouring the large scale food manufacturing corporations that are trying to dominate the organic production and distribution. For example, Horizon Organic and Aurora Organic control up to 65 percent of the organic dairy market in the United States (Kastel, 2006). In response, consumers have expressed concerns regarding corporate take over of organic.

In the present circumstances, the Canadian organic market is comprised of a variety of products certified under different organic production systems that are managed by farmer organizations, private organizations and government agencies. These programs have rendered differing emphasis on the multiple features of organic production principles and practices. However, with the Canadian organic industry moving toward an

integrated national-level regulatory regime, there is a need to examine consumer preferences for the type of organization that sets organic production standards. Therefore, this study evaluates consumer preferences for organic goods certified as per the standards set by – (i) farmer controlled private organization, (ii) non-farmer private organization, and (iii) government agency.

3.3.3.4 Agencies that monitor farmers' compliance with organic production standards

Presently, Canadian organic businesses follow nearly 20 different organic production standards. Few of these production standards are designed and managed by national and provincial level government agencies (*e.g.* USDA, EU, JAS, Quebec and British Columbia) and the rest are from private agencies such as IFOAM, OCPRO, QAI, *etc.* This multiplicity of standards has caused confusion among consumers and in the supply chain on what 'organic' is all about.

Multiplicity of the certification standards also increases the costs of supplying the desired organic products. For example, in the process of manufacturing multi-ingredient products involving handlers that were certified by different programs the transaction costs are higher. Since the programs differ in standards and management, certifiers often undertake a costly document review process before accepting the ingredients certified by another program. Additionally, the present system can also result in variation in the costs of production for differences in residue testing, the implementation costs, livestock management standards, and the gaps between written and enforced standards⁸. Higher supply costs will have negative implications on consumer demand.

⁸ This study does not address the gaps between written and enforced standards.

A uniform national standard and the use of a single standardized label, on the other hand, are likely to benefit the organic consumers by reducing the confusion in the marketplace and lowering the transaction costs. However, stakeholders in the Canadian organic industry are not unanimous on the idea of a single national standard. Certain sections of the industry stress that the regulatory framework should follow the international standards and the few others suggest that Canada should raise the existing provincial standards (Quebec and British Columbia) to the national level (Option consommateurs, 2004).

Canadian consumers, however, have displayed a great degree of trust in organic products and their regulation by government agencies (Option consommateurs, 2004). Therefore, consumers are likely to support the national organic standard and the regulation being effected by the federal government and the existing provincial certification systems over the private standards. This kind of consumer preference will have major implications for the enterprises involved in organic food production and distribution. However, the above argument is not validated by research. Therefore, the present study has exclusively sought consumers' response to the three forms of monitoring the organic standard viz., a federal government agency, a provincial government agency, and a private agency.

3.3.3.5 Price

Price is an important factor because it adds realism to the study and is, as in this study, a critical part of the decision-making process. Price helps in determining the strength of individual preferences, if price is not important relative to the other factors, it can be

assumed that the consumer has strong inclination regarding the other production attributes of the organic good.

Three price levels are chosen to present realistic situations to the respondents. The price levels are determined on the basis of: (a) range of apple retail prices during the previous year (2005) and (b) prevailing retail prices of apple (both organic and conventional) in the local grocery stores. The prices are noted for the Red Delicious variety of apple (the following section has more details). These prices are then adjusted for a reasonable premium based on other relevant attributes.

The consumer prices for apples during 2005 were: \$1.18 per pound (minimum), \$1.27 per pound (average) and \$1.36 per pound (maximum) (Statistics Canada). Local grocery stores sold⁹ regular Red Delicious apples at an average price of \$1.69/lb (\$3.73/kg). Organic variants of Red Delicious apple were available for \$1.69/lb (\$3.73/kg) and \$1.99/lb (\$4.39/kg). After accounting for the premium that organic apples are usually paid¹⁰ and also providing for the costs of pesticide-residue testing (if, any) three levels of prices - \$1.69/lb (\$3.73/kg), \$2.19/lb (\$4.83/kg), and \$2.69/lb (\$5.94/kg) were included in the study.

The four organic standards and their levels and apple prices are summarized in Table 3.2.

⁹ Prices were noted from Ultra Food and Drug, Zehrs and Stone Store Natural Foods on September 19, 21 and 23 of 2006

¹⁰ Canadians, on an average, have paid 30 percent premium for organic products (Lohr, 1998 and Yiridoe, Bonti-Ankomah and Martin, 2005)

Table 3.2 Production Attributes and Levels in Organic Apple

Production Attribute	Levels
Testing for synthetic pesticide-residues	Regular testing Tested when doubts of contamination exist No testing
Rules regarding the location of product origin	Must be grown in Ontario Must be grown in Canada No specific rules governing where apples must be grown
Agencies setting the production standards	Farmer controlled private organization Non-farmer private organization Government agency
Agencies monitoring farmers' compliance with organic production standards	Federal agency Provincial agency Private agency
Price	1.69/lb (\$3.73/kg) 2.19/lb (\$4.83/kg) 2.69/lb (\$5.94/kg)

3.4 THE BASE MODEL OF PREFERENCE

Before constructing the conjoint models, it is necessary to specify the ‘composition rule’.

The composition rule of a conjoint model defines how the independent variables (product characteristics/attributes) are related and how their joint effects are created to obtain an overall preference value. The combination rule is typically either additive or interactive. In this study, an additive form is used.

The simplest and most frequently used case is the additive model, which assumes that the effect of each product characteristic on the dependent variable is independent of other product characteristics (Baker, 1999). Therefore, as Hair *et al.* (1998) note, in an additive model respondents simply “add up” the values for each attribute (part-worths) to obtain the total value (utility) for a combination of attributes (products or services).

The interactive model, on the other hand, allows for two-way interaction effects between the attributes (Baker, 1999). An interactive model also assumes that individuals implicitly add up the factor values (part-worths) to get an overall value of the good; however the combinations of attribute levels can be more or less than just their sum (Hair *et al.*, 1998). For example, considering the attributes included in this study, a respondent is likely to pay \$2.69 for a pound of organic apples but only if they are ‘Ontario grown’. In this case, higher price (\$2.69/lb) has low part-worth except when combined with specific level of another attribute (Ontario grown).

Factors used in the study may have some interaction effects, however, they are assumed to be small and negligible. Therefore, an additive model is used. The additive model is preferred over the interactive model because of the advantages such as high predictive power, requirement of fewer responses, and simplicity in the estimation

process that are associated with an additive model (Hair *et al.*, 1998). An interactive model could have also forced the analysis to be conducted at the aggregate rather than individual level (Hair *et al.*, 1998).

Within a conjoint model, the levels of each attribute (organic production standard in this case) are specifically related to the utility each attribute generates (Baker, 1999). Typically, these relationships are one of the three types: linear, quadratic (ideal point), or part-worth (Hair *et al.*, 1998). In the linear model, the most restrictive of the three (Hair *et al.*, 1998), increasing or decreasing the attribute level will bring about proportional changes in the utility (Ness and Gerhardy, 1994). The quadratic model assumes a squared relationship between scores or ranks and factors. It is also assumed that there is an ideal level for the factor, and distance from this ideal point (in either direction) indicates decreasing preference (Hair *et al.*, 1998). According to Baker (1999 p. 83), “the quadratic form allows for a curvilinear relationship between the attributes and utility levels”. The part-worth model, the least restrictive of the three, assumes no specific relationship between the attribute levels and the utilities (Ness and Gerhardy, 1994) and is, therefore, preferred in this study.

3.5 DATA COLLECTION PROCEDURE

After deciding on the factors, factor levels, the good and the base preference model, the next step in a conjoint experiment is data collection. Details on the data collection procedure are provided in the following sections.

3.5.1 Design and Evaluation of Stimuli

In this stage, consumers evaluate alternative product concepts described by attribute levels. The most common methods of data collection are the trade-off method and the full profile method (Hair *et al.*, 1998). “The trade-off method requires respondents to compare attributes two at a time, ranking all combinations of levels” (Ness and Gerhardy, 1994 p. 28). As this method is less realistic (consumers are confronted with the factors and their levels all together and not in pairs) and also confines the researcher to non-metric analysis, it is not widely used (Ness and Gerhardy, 1994). The full profile method, the one followed in this study, involves presentation of full product descriptions/profiles. The full concept method allows consumers to visualize all their possible choices simultaneously and therefore, is a better depiction of an actual market.

The total number of product concepts in the full concept method is equal to the product of the number of levels associated with each attribute (Ness and Gerhardy, 1994). In the present study, this is $3 \times 3 \times 3 \times 3 \times 3 = 243$ ¹¹. Presenting all these possible alternatives can be time consuming, expensive and fatigue respondents, thus potentially invalidating the responses. Therefore, in cases where there are a large number of factors or factor levels, it is preferable to follow a fractional-factorial design whereby only a subset of all the possible alternatives (combinations of attribute levels) is included in the experiment. Thus, in a fractional-factorial design, a researcher trades off the measurement of all possible interactive effects for a smaller number of profiles (Green, 1974).

A special type of fractional-factorial design which is most often used in this kind of research is an orthogonal design or orthogonal array. An orthogonal experimental

¹¹ There are five factors in this conjoint experiment, all of which have three levels. This leads to possible 3^5 or 243 combinations/profiles for the respondents to evaluate.

design combines each level of one factor with each level of another factor with equal or proportional frequencies. In an orthogonal design all the estimable effects are uncorrelated. Also, in an orthogonal design, only main effects are considered and the interactions are assumed to be negligible. Orthogonal arrays come in specific number of runs for specific number of factors with specific number of levels. In this case, with 243 possible combinations of factors, orthogonal design would require the respondents to evaluate 18 product profiles. However, considering the mall intercept method of data collection (explained in the following sub-section) it was thought that evaluating 18 alternatives would be tedious for the participants.

Experimental designs that can reduce the number of alternatives to a manageable level, yet maintain a high degree of factor independence needed to be chosen. One such experimental design is selected from SAS 9.1 using the built-in %MktEx autocall macro. The non-orthogonal design reduced the number of alternatives to be evaluated to 12 but the factor correlation was found to be 0.14. The correlation among factors denotes a lack of conceptual independence among the factors and creates unrealistic stimuli that are difficult to interpret. However, designs that develop practically acceptable stimuli even with small correlations (0.20 or less) are acceptable (Hair *et al.*, 1998) and therefore, the 12 profile design is used in this study.

After the number of profiles is finalized, the next task is to select the measurement scale of the dependent variable. Respondents could be asked to rate or rank the presented profiles. Preference ratings tend to be easier to analyze and allow conjoint analysis to be performed by multivariate analysis (Hair *et al.*, 1998). Rank-order preference measures are likely to be more reliable, as some respondents find them easier

to complete, however, they are more difficult to administer (Hair *et al.*, 1998).

Considering the advantage of reliability, respondents were asked to rank the 12 profiles in a two-stage process.

In stage one, respondents assess each product description separately and classify them into three categories *viz.*, most likely to buy, not likely to buy and in between most likely to buy and not likely to buy. In the second stage, respondents organize the profiles within each category from the most preferred to the least preferred. The most preferred profile in ‘most likely to buy’ is ranked #1 and the least preferred profile in ‘not likely to buy’ is ranked #12. During the entire process, respondents are allowed to revise their categories and the preference rankings.

3.5.2 Presentation of Stimuli and Data Collection

The 12 profile cards are included in a questionnaire (Appendix D) and are presented to respondents recruited through a mall intercept survey. Because of the advantages of reaching a cross section of the population, cost, and the accessibility, recruitment in a mall is preferred over the other methods.

A questionnaire is used to collect all the required information. In the beginning, the instrument included a screening question to exclude individuals below 18 years of age. Later on, questions soliciting information about respondents’ food purchase and consumption habits, their awareness about agricultural production technologies including that of organic production practices and certification were also included. Here, respondents were also asked to provide information on their attitudes regarding certain values. This section of the questionnaire introduced certain aspects of organic products and production systems and helped respondents in moving on to the conjoint set up.

Respondents were then provided with a brief explanation about the experimental set up and the organic standards included in the study¹². Finally, the questionnaire gathered information on demographic and socio-economic variables of the respondents. A version of the final questionnaire was pre-tested with 20 individuals. Pre-testing led to several revisions and edits, particularly in wording the attributes.

In October 2006, data was collected from 182 shoppers of Stone Road Mall, Guelph, Ontario. In most cases, trained enumerators administered the questionnaires and hence, the researcher influence was minimized. Prior to the actual survey, enumerators were made familiar with information on purpose of the study, questionnaire and the survey protocol. The survey team randomly intercepted shoppers and upon consent, were interviewed personally.

3.6 ESTIMATING THE EMPIRICAL MODEL

The aim of conjoint estimation is to calculate part-worths for every attribute and attribute level. Commonly used estimation methods in conjoint analysis include Monanova, Linmap, dummy variable regression, logit analysis and probit analysis (Ness and Gerhardy, 1994). Empirically, conjoint methods can decompose individual's total utility for a product (an organic apple in this case) into some combination of part-worth utilities defined for the relevant production attributes of organic apple (Baker and Crosbie, 1993). Once the part-worth scores are calculated, they can be used to predict consumer preferences for products not rated in the survey. The trade-offs between attributes can also be determined, which may be useful in determining what price consumers are willing to pay to avoid certain production practices.

¹² Though, adequate attempts are made to provide a clear explanation, it was not possible to record the respondents' understanding of different attributes. This can have implications for interpreting the results.

To ensure the validity and reliability of the conjoint experiment, an evaluation of the results is required. It is important to test the accuracy of the model and to evaluate its ability to predict consumer preferences (Hair *et al.*, 1998). Usually, Pearson's R and Kendall's tau statistics are used for this purpose. In both cases, a value close to one signifies a good fit for the model.

In a set of five attributes (price (z_1), testing for synthetic pesticide residues (z_2), rules regarding the location of product origin (z_3), organization setting the production standard (z_4), and the organization monitoring farmers' compliance with the production standards (z_5)), the utility function for an individual can be specified in terms of a combination rule W and a set of functional forms w_k (one for each of the five characteristics) as:

$$W(w_1(z_1), w_2(z_2), w_3(z_3), w_4(z_4), w_5(z_5)) \quad (3.1)$$

As noted above, the combination rule W was chosen to be additive and the functional form for the utility of the individual characteristics, $w_k(z_k)$ was the part-worth model, $w_k(z_k) = w_{zk}$. Following the methods in Baker and Crosbie (1993, p. 281), the estimated model assumed the following functional form:

$$W_i = \beta_{i1} + \beta_{i2}PRICE1 + \beta_{i3}PRICE2 + \beta_{i4}TEST1 + \beta_{i5}TEST2 + \beta_{i6}LOCN1 + \beta_{i7}LOCN2 + \beta_{i8}STD1 + \beta_{i9}STD2 + \beta_{i10}REGULATE1 + \beta_{i11}REGULATE2 + \varepsilon_i \quad (3.2)$$

Where,

W_i is the preference level for the i th individual

$PRICE1$ - price of apple - \$ 1.69/lb (1 if yes, 0 otherwise)

$PRICE2$ - price of apple - \$ 2.19/lb (1 if yes, 0 otherwise)

LOCN1 - grown in Ontario (1 if yes, 0 otherwise)

LOCN2 - grown in Canada (1 if yes, 0 otherwise)

TEST1 - regular residue testing (1 if yes, 0 otherwise)

TEST2 - testing when doubts of contamination exist (1 if yes, 0 otherwise)

STD1 - standard is set by a farmer-controlled private organization (1 if yes, 0 otherwise)

STD2 - standard is set by a government agency (1 if yes, 0 otherwise)

REGULATE1 - monitoring by a federal government agency (1 if yes, 0 otherwise)

REGULATE2 - monitoring by a provincial government agency (1 if yes, 0 otherwise)

Using SAS 9.1, the model is estimated by Ordinary least Squares (OLS) method, results of which are presented in the next chapter.

3.7 CONCLUSION

In this study, consumers were asked to state their preferences for different organically produced apples, which were differentiated based on the standards they are produced under. Conjoint analysis was chosen for the empirical analysis as it allows the researcher to measure how consumers implicitly trade-off attributes and attribute levels to determine their optimum product. Results are used to evaluate the proposition that consumers' purchase of organic goods depend on their preferences for organic standards. The results should provide some insight into consumer preferences for organic standards and will either reject or support the proposition.

Chapter 4

Results

4.1 INTRODUCTION

To meet the research objectives, a survey of consumers was undertaken. Results of the analysis are presented in this Chapter. Socio-demographic aspects of the individuals who participated in the research survey are first presented. Specific factors that might influence respondents' food (particularly, organic food) purchase habits are then discussed. Respondents' notion of organic food and organic food production methods are examined to obtain a glimpse of their perceived level of awareness regarding these issues. Overall results from the conjoint analysis are then compiled and discussed. Respondents' socio-economic-demographic characteristics and organic food purchase habits are then synthesized to seek further insights into their preference for organic standards. A summary of the important results is provided at the end of this Chapter.

As noted in the previous chapter, the questionnaire was administered to 182 individuals. Almost every one of the 182 participants answered the questions regarding food purchase habits. However, only 149 questionnaires could be used for analysis because: (a) some respondents were unwilling to answer certain questions, and (b) on a few occasions, especially in the conjoint experiment, enumerators did not record the preference rankings. Therefore, only 149 responses were used for the analysis.

4.2 SOCIO-DEMOGRAPHIC ASPECTS OF THE RESPONDENTS

Examination of respondents' socio-demographic characteristics such as age, education and income levels, gender, and marital status will help to determine who is buying

organic foods. This information can be used to verify whether consumer preferences for organic food standards are influenced by their socio-economic characteristics. As noted earlier, a total of 149 fully completed questionnaires are used for this analysis. Table 4.1 presents the key demographic characteristics of the survey participants in comparison with demographic information of the total population in Guelph.

Almost 42 percent of the survey respondents are in the age group of 20 - 34 years. However, this age group accounted only for about 23.5 percent in the city of Guelph. Thus, the survey is drawing heavily from the younger population. On the contrary, older segments of 65 and above are under-represented in the study. Hence, generalization of results with respect to the above-mentioned age groups can be misleading. Compared to the city wide distribution of the population, the survey under-represented individuals in the 35 - 44 year age group and over-represented individuals in the 45 - 64 year age group. This can be important considering these individuals have considerable purchasing power.

Female shoppers exhibit a higher participation rate than males. This is not surprising due to location of the data collection *i.e.* a shopping mall. It may also be due to the tendency that female members play an important role in food purchase decisions of the family and hence, are more interested in completing the survey. However, survey results can not prove this aspect. Also, In the city of Guelph, females outnumbered the males.

In terms of two other important demographic characteristics, marital status and average household size, the survey results were close to the city averages. 47 percent of the survey participants were either married or were living with another individual under the common law union. This category accounted for 50 percent among all the residents in

Table 4.1 Demographic Characteristics of the Survey Participants and Guelph Residents

Demographic Characteristic	Survey Sample	Guelph Population [§]
Age Group (%)		
20 – 24 years	20.81	7.74
25 – 34 years	20.81	15.71
35 – 44 years	14.77	17.16
45 – 64 years	26.18	21.11
65 and older	5.37	12.34
Gender (%)		
Male	42.95	48.94
Female	57.05	51.06
Married/With Common Law Partner (%)	46.98	50.51
Average Household Size (number of persons)	2.90	3.00
Education Levels		
Less than High School Graduation (%)	2.01	26.54
High School Graduate (%)	11.41	13.72
Some Post-Secondary Education (%)	30.20	11.68
College/University Graduate (%)	56.38	48.06
Median Family Income (CAD)	55,000 - 64,999	65,524

[§] Data pertained to 2001 census

Source: Data for Guelph population is obtained from Statistics Canada web pages

Guelph. The average number of people living in the households of the survey participants and an average household in Guelph is almost the same. Differences in the proportions of married/common law individuals in the survey sample and Guelph population can be attributed to higher participation of young individuals (especially in the age group of 18 to 24 years) in this survey. Thirty-three percent of the participants are in between 18 and 24 years of age and they may not have common law/marital relationship.

Educational attainment of the survey participants did not represent the schooling pattern of Guelph residents, except for the proportion of high school graduates. In other categories, more than twenty-six percent of the Guelph residents were not high school graduates whereas, merely two percent of the survey participants indicated that they did not finish high school. Fifty-six percent of the respondents were graduates of either a college or a university program while, 48 percent the Guelph population had obtained the same level of education. Similarly, there are differences with respect to the representation of individuals who have some sort of post-secondary education. In excess of thirty percent of the survey respondents received some post-secondary education while, only 11.6 percent of the Guelph residents had obtained similar education. Thus, in general, the survey represents individuals with higher educational background.

Looking at the figures under 'median family income', it appears as though the survey respondent's households and an average family in Guelph had similar income levels. This is not surprising as the residents of the city of Guelph are considered to be high income earners. Also, in an organic food related survey like this, higher income levels would be expected as one would assume that families with higher income might be more willing and able to purchase organic foods which are usually priced at a premium.

The survey participants reflect the features of Guelph residents in terms of gender distribution, marital or common law relationships, average household size and income levels. However, the survey included a greater proportion of young individuals than the city averages. The survey, compared to the city population, also has a greater proportion of college or university graduates as well as individuals with some post-secondary education.

4.3 RESPONDENTS' FOOD PURCHASE BEHAVIOUR AND FACTORS INFLUENCING THE BEHAVIOUR

The survey included several questions about respondents' overall food purchase behaviour and factors likely to influence such behaviour. These factors could be related to consumer attitudes, their value based judgements, perceptions, awareness and the like. Answers to some of these questions were obtained in terms of 'yes', 'no', or 'not sure', and were numerically coded as 1, 2 and 3 respectively. On the remaining questions, respondents were asked to use a scale of one (indicating strongly disagree) to ten (indicating strongly agree). Summary statistics of the results are presented in Table 4.2.

Almost every one of the respondents participated in household food purchase decisions (mean score of 1.0) and hence, these individuals can be considered well versed with grocery shopping. This is not surprising considering that the number of female participants exceeded the number of male participants. Mean scores for the remaining statements in Table 4.2 can be analyzed with respect to the respondents' current food purchase behaviour and factors likely to influence such behaviour. Respondents significantly value the aspects of taste and freshness. Similarly, respondents reported that they carefully observed the prices and read the product labels while making

Table 4.2 Respondents' Food Purchase Behaviour and Factors Influencing the Behaviour

Statements	Mean	Standard Deviation
Do you regularly participate in food purchase decisions for your household? ^a	1.08*	0.32
When buying food products taste of the food is an important factor ^b	9.00*	1.15
I always try to buy fresh fruits and vegetables ^b	9.18*	1.34
While shopping, I do not pay close attention to the prices of food ^b	4.90*	2.87
I carefully read the labels on food products ^b	7.42*	2.32
I trust government to make sure that food labels are accurate ^b	6.33*	2.76
I am concerned about how the food I buy is produced ^b	7.95*	2.08
I am concerned about where the food I buy is produced ^b	7.86*	2.09
I am concerned about the presence of chemicals in the foods ^b	7.82*	2.20
Agricultural production shouldn't rely on the use of synthetic chemicals ^b	7.21*	2.64

^a Measured on a scale one (Yes), two (No), three (Not sure)

^b Measured on a scale from one (Strongly disagree) to ten (Strongly agree)

* The mean scores are statistically different from zero

food purchase decisions. However, the mean score of 6.3 suggests that survey participants did not strongly trust government for the accuracy of food labels.

Respondents' perceptions and attitudes towards value based consumption decisions can potentially influence their food purchase behaviour. This can be particularly important in organic food purchases. From Table 4.2, respondents were equally concerned about 'how' and 'where' the food they buy is produced. Respondents were also concerned about the presence of chemicals in their food (mean score of 7.8). Respondents' attitude for increased food safety can possibly explain their notion of not depending on the use of synthetic chemicals in agricultural production (mean score of 7.2).

4.4 ORGANIC FOOD PURCHASE HABITS OF THE RESPONDENTS

As the study was concerned with organic foods, and an organic apple in particular, the survey asked a few questions regarding respondents' organic food purchase habits. Responses to these questions are analyzed using a mean-score table (Table 4.3) as is done previously.

Many respondents indicated that they are already consuming organic food products. However, the mean response score of 1.4 does not clearly illustrate this aspect. Moreover, many respondents did not indicate they would buy organic foods in the next three months (mean score of 1.7). Also, respondents pointed out that they bought organic products at an interval of every two weeks (mean score of 3.1). In spite of reports regarding the popularity of organic produce, apples were not favoured by the survey participants (mean response score of 1.85).

Table 4.3 Respondents' Organic Food Purchase Habits

Statements	Mean	Standard Deviation
Have you purchased organic food products in the past three months ⁱ	1.40*	0.62
Do you plan on purchasing organic food products in the past three months ⁱ	1.72*	0.87
Frequency of organic food purchase ⁱⁱ	3.11*	1.71
Have you purchased organic fruits in the past three months ⁱ	1.52*	0.64
Have you purchased organic apples in the past three months ⁱ	1.85*	0.61

ⁱ Measured on a scale one (Yes), two (No), three (Not sure)

ⁱⁱ Measured on a scale one (Never), two (Weekly), Three (Every two weeks), Four (Once a month), Five (Once every two months), and Six (Not sure)

* The mean scores are statistically different from zero

4.5 RESPONDENTS' PERCEIVED LEVEL OF AWARENESS REGARDING ORGANIC FOOD AND ORGANIC FOOD PRODUCTION METHODS

To note respondents' perceived level of awareness regarding organic food products and organic food production methods, they were asked to rate a set of statements regarding the characteristics of organic foods on a scale of one to ten. A rating of one indicated 'strong disagreement' with the statement, while a rating of ten indicated 'strong agreement' with the statement. Ten statements were included in the survey (see question 9 of the survey instrument). The list consisted of: (a) characteristics that consumers often associated with the meaning of organic food products as seen in the previous studies, and (b) certain popular notions regarding organic food products. The results are presented in Table 4.4,

A majority of respondents indicate they agreed, in relatively strong terms, with statements such as organic foods are produced in an environmentally friendly way (mean score of 8.2), are pesticide-free (mean score of 8.0), are naturally grown (mean score of 8.0) and are grown without the application of synthetic chemicals (mean score of 8.2). Though respondents seemed to agree with other statements like organic food is free from genetically modified food (mean score of 7.8), organic production involves humane treatment for animals (mean score of 7.6), organic food is grown in accordance with a set of pre-determined standards (mean score of 7.4), organic food is certified by an independent party to adhere to production standards (mean score of 7.3) and organic food is always identified by a certification label (mean score of 7.2), they did not respond with the same level of agreement as with other statements.

Table 4.4 Respondents' Perceived Level of Awareness Regarding Organic Food and Organic Food Production Methods ^a

Organic Food is:	Mean	Standard Deviation
Produced in an environmentally friendly way	8.19*	1.92
Pesticide-free	8.02*	2.12
Free from genetically modified organisms	7.80*	2.35
Naturally grown	8.02*	2.17
Grown without the application of synthetic chemicals	8.25*	2.10
Produced using rearing methods that treat animals humanely	7.61*	2.14
Grown locally	5.52*	2.83
Grown in accordance with a set of pre-determined standards	7.41*	2.21
Certified by an independent party to adhere to production standards	7.32*	2.13
Always identified by a certification label	7.18*	2.49

^a Measured on a scale of one (Strongly disagree) to ten (Strongly agree)

* The mean scores are statistically different from zero

Survey respondents did not express much agreement (mean score of 5.5) with the notion that organic foods are locally grown. This may be particularly true in the Canadian context, as Canadian consumers see more of the imported organic goods. Considering the dominance of US produce and the processed goods in the Canadian organic market, such a result is not surprising.

4.6 OVERALL CONJOINT RESULTS

As discussed in the previous chapter, survey participants were asked to examine and rate twelve different descriptions of an organic Red Delicious apple, where the descriptions differ by attribute levels. Conjoint analysis of the preference ratings allow for computation of “part-worth” utility for each attribute level, and an assessment of the relative importance of each attribute in each consumer’s preference ranking. These part-worth utility coefficients can be used to calculate the total utility a consumer derives from a product with specified attribute levels. These part-worth utility values can also be used to determine how consumers trade-off attributes and their levels.

As outlined in Chapter 3, this research examined consumer preferences for four organic food production standards *viz.*, testing for synthetic pesticide residues, rules regarding the location of product origin, organizations setting the organic production standards, organizations monitoring farmers’ compliance with organic production standards and the price. Using the TRANSREG (transformation regression) procedure in SAS 9.1, a metric conjoint analysis is conducted. In this study, the procedure is used to fit a linear model by ordinary least squares method. Analysis is conducted for the entire data set generated from 149 participants and the corresponding results are discussed in this section.

Table 4.5 presents part-worth utility estimates for each organic production standard attribute level. The TRANSREG procedure provided the estimates of part-worth utilities for each individual. The aggregate values, presented in Table 4.5, were calculated by averaging the part-worth utility estimates across all the individuals. These average part-worth values can then be used to calculate the aggregate utility function (equation 3.1) as described in the previous Chapter.

Conjoint models are generally validated by two measures of goodness of fit: the average R^2 and the comparison of predicted scores (rankings of product alternatives) against the actual scores (Hair *et. al.*, 1998; Baker, 1999). Since the conjoint experiment in this study did not involve holdout profiles, the latter measure of goodness of fit was not available for the model validation. Nevertheless, the average R^2 of the 149 models was 0.96, indicating a good fit. Furthermore, the average part-worth estimates all have the expected sign.

Respondents in this study preferred the following level of each of the four organic production standards and price in apple: regular testing for pesticide residues, Ontario grown, organic standard set by a government agency, monitored by a federal government agency, and a price level of \$1.69/lb (\$3.73/kg).

Although the estimated part-worth utilities provide useful information regarding consumer preferences for the selected attributes, they do not provide a direct measurement of the relative importance of these attributes. The relative importance of the attributes can be important for organic farmers and retailers in making production and marketing decisions. The relative importance scores for each attribute, presented in Table 4.5 and Figure 4.1 are derived from the part-worth estimates by computing the variation

Table 4.5 Part-Worth Utility Estimates for Organic Food Standards

Variable/ Measure	Value	Std. Dev.
<u>Intercept:</u>		
Coefficient	7.03	0.54
<u>Pesticide-Residue Testing:</u>		
Part-Worth: Regular	2.02	0.79
Part-Worth: In doubt	0.19	0.76
Part-Worth: No testing	-2.21	0.71
Relative Factor Importance	31.86	
<u>Rules Regarding Location:</u>		
Part-Worth: Ontario	0.84	0.79
Part-Worth: Canada	0.53	0.76
Part-Worth: No rules	-1.36	0.71
Relative Factor Importance	20.87	
<u>Standard Setting Agency:</u>		
Part-Worth: Government	0.47	0.76
Part-Worth: Farmer- Private	0.07	0.79
Part-Worth: Non farmer-Private	-0.54	0.71
Relative Factor Importance	14.89	
<u>Monitoring Agency:</u>		
Part-Worth: Federal Government	0.37	0.76
Part-Worth: Provincial Government	-0.03	0.79
Part-Worth: Private	-0.34	0.71
Relative Factor Importance	14.03	
<u>Price:</u>		
Part-Worth: \$1.69	0.71	0.76
Part-Worth: \$2.19	0.10	0.79
Part-Worth: \$2.69	-0.81	0.71
Relative Factor Importance	18.35	
R^2 (Average)	0.96	
Adjusted R^2 (Average)	0.59	
F- Statistic(Average)	28.57	
n	149	

in utility over the range of each attribute as a percentage of total variation due to all attributes. The variation in utility for an attribute is the difference between the highest part-worth score and the lowest part-worth score. The total variation for all attributes is the sum of the absolute value of the variations for all individual attributes (Baker, 1999).

Pesticide-residue testing is the most important attribute with a relative importance of 31.8 percent. This is followed by rules regarding location (relative importance of 20.8 percent), price (relative importance of 18.3 percent), standard setting body (relative importance of 14.8 percent) and finally, monitoring agency with a relative importance of 14 percent. Most participants were strongly concerned about the presence of chemicals in the foods they buy; therefore, the broad preference for residue-testing is meaningful. Also, over 80 percent of respondents strongly agreed that organic foods are pesticide-free. Therefore, it is clear that consumers in this study preferred greater assurance regarding pesticide residues in organic foods. Respondents seem to favour clear rules regarding the location of production. One may recall that many respondents were not sure whether organic food is grown locally. The attributes of testing for pesticide residues and rules regarding the location of product origin together are important to an extent of 52.7 percent in respondents' preference for organic apples.

Price was the third most important attribute. Due to hypothetical situation in conjoint methods, however realistically constructed it might be, the effect of price is usually underestimated and hence, a weaker preference is rendered for the price levels. In terms of the organizations that set and monitor organic production standards, respondents have attached lower but very similar levels of significance. Respondents' preferences for the attributes of standard setting organization and agencies monitoring the standards

Figure 4.1 Relative Importance of Organic Production Attributes and Price (n=149)

might have been influenced by: (a) a lack of understanding of the organic certification process, and/or (b) differences in understanding the meaning of these attributes and their levels.

Part-worth estimates can also explain how consumers trade-off attributes. Consumers will trade-off attribute levels when deciding which product to buy. To further explore this aspect, utility calculations for the entire 12 product profiles is carried out and presented in decreasing order of their values in Table 4.6. This exercise was particularly helpful in examining if consumers' purchase intentions of organic foods depended on their preference for the underlying organic standards.

Table 4.6 Utility Calculations for the Product Profiles

Profile Number	Attribute	Attribute Level	Part-Worth Value
1	Pesticide-Residue Testing	Regular	2.02
	Rules Regarding Location	Canada	0.53
	Standard Setting Agency	Non-farmer private	-0.54
	Monitoring Agency	Federal government	0.37
	Price	\$2.19/lb	0.10
		Constant	7.03
		Total Utility	9.51
10	Pesticide-Residue Testing	Regular	2.02
	Rules Regarding Location	Ontario	0.84
	Standard Setting Agency	Farmer-private	0.07
	Monitoring Agency	Provincial government	-0.03
	Price	\$2.69/lb	-0.81
		Constant	7.03
		Total Utility	9.12
5	Pesticide-Residue Testing	Regular	2.02
	Rules Regarding Location	No rules	-1.36
	Standard Setting Agency	Government	0.47
	Monitoring Agency	Private	-0.34
	Price	\$1.69/lb	0.71
		Constant	7.03
		Total Utility	8.53
3	Pesticide-Residue Testing	In doubt	0.19
	Rules Regarding Location	Ontario	0.84
	Standard Setting Agency	Government	0.47
	Monitoring Agency	Private	-0.34
	Price	\$2.19/lb	0.10
		Constant	7.03
		Total Utility	8.29
6	Pesticide-Residue Testing	In doubt	0.19
	Rules Regarding Location	No rules	-1.36
	Standard Setting Agency	Farmer-private	0.07
	Monitoring Agency	Federal government	0.37
	Price	\$2.19/lb	0.10
		Constant	7.03
		Total Utility	6.40

Table 4.6 (Continued) Utility Calculations for the Product Profiles

Profile Number	Attribute	Attribute Level	Part-Worth Value
11	Pesticide-Residue Testing	No testing	-2.21
	Rules Regarding Location	Ontario	0.84
	Standard Setting Agency	Non-farmer private	-0.54
	Monitoring Agency	Federal government	0.37
	Price	\$1.69/lb	0.71
		Constant	7.03
		Total Utility	6.20
12	Pesticide-Residue Testing	In doubt	0.19
	Rules Regarding Location	Canada	0.53
	Standard Setting Agency	Non-farmer private	-0.54
	Monitoring Agency	Private	-0.34
	Price	\$2.69/lb	-0.81
		Constant	7.03
		Total Utility	6.06
4	Pesticide-Residue Testing	In doubt	0.19
	Rules Regarding Location	No rules	-1.36
	Standard Setting Agency	Non-farmer private	-0.54
	Monitoring Agency	Provincial government	-0.03
	Price	\$1.69/lb	0.71
		Constant	7.03
		Total Utility	6.00
8	Pesticide-Residue Testing	No testing	-2.21
	Rules Regarding Location	Canada	0.53
	Standard Setting Agency	Government	0.47
	Monitoring Agency	Provincial government	-0.03
	Price	\$2.19/lb	0.10
		Constant	7.03
		Total Utility	5.89
9	Pesticide-Residue Testing	No testing	-2.21
	Rules Regarding Location	Canada	0.53
	Standard Setting Agency	Farmer-private	0.07
	Monitoring Agency	Private	-0.34
	Price	\$1.69/lb	0.71
		Constant	7.03
		Total Utility	5.79

Table 4.6 (Continued) Utility Calculations for the Product Profiles

Profile Number	Attribute	Attribute Level	Part-Worth Value
2	Pesticide-Residue Testing	No testing	-2.21
	Rules Regarding Location	No rules	-1.36
	Standard Setting Agency	Government	0.47
	Monitoring Agency	Federal government	0.37
	Price	\$2.69/lb	-0.81
		Constant	7.03
		Total Utility	3.49
7	Pesticide-Residue Testing	No testing	-2.21
	Rules Regarding Location	No rules	-1.36
	Standard Setting Agency	Non-farmer private	-0.54
	Monitoring Agency	Private	-0.34
	Price	\$2.19/lb	0.10
		Constant	7.03
		Total Utility	2.68

For example, even though, price was the third most important attribute, profile 8 is ranked higher than profile 9, although profile 9 has a higher price level of \$2.19/lb and profile 9, \$1.69/lb. This implies that price is not the only attribute with which respondents were concerned. The two profiles are similar in that they both require no pesticide testing and allow Canada grown products, but they differ in that profile 8 involved government agencies in setting and monitoring the standards and profile 9 involved farmer-controlled private organization for setting the standard and private agency for monitoring. Government participation in the standard setting and monitoring processes is traded off against the increase in price. The total gain ($[(0.47)+(-0.03)] - [(0.07) + (-0.34)] = 0.71$) in part-worth value for involving government agencies is greater than the negative incremental utility effect ($((0.10) - (0.71) = -0.61)$) of choosing \$2.19/lb price level. This

implies that respondents, on average, were willing to pay higher price if government assures the standard setting and monitoring processes.

Profile 12 is ranked higher than profile 4 due to the increased utility gains from profile 12 on account of defined rules of product origin. As seen in Figure 4.1, rules regarding the location of production were the second most important attribute and therefore, respondents were willing to pay higher prices. One can notice that respondents are trading-off government involvement in standard monitoring process as well as the lower price for the organic apples grown in Canada.

As another indicator of respondents' implicit trade-offs, utility values for the product profiles not evaluated by survey respondents can be calculated. For instance, consider a hypothetical apple profile with regular testing for the pesticide residues, grown in Ontario under a government standard which is monitored by a private agency and the price of level of \$2.69/lb. This profile would have a total worth of: $(2.02) + (0.84) + (0.47) + (-0.34) + (-0.81) + (7.03) = 9.21$. Comparing this hypothetical profile with the one described under profile 3, it is possible to observe the implicit trade-offs between price and residue-testing. The utility loss from moving \$2.19/lb apple to \$2.69/lb apple is much smaller than the utility gains of regular pesticide testing. This signifies that respondents favour residue testing in organic products and are willing to pay more to have testing mechanisms in place.

Though price was an important attribute, a lenient set of organic standards was not preferred to price decreases. Thus, it can be concluded that respondents, at large, purchase organic products for the specific production related characteristics, and these are not compromised for decreased price levels.

4.7 FACTORS INFLUENCING CONSUMER PREFERENCES FOR ORGANIC FOOD STANDARDS

From the previous section it is clear that consumers have specific preferences for organic production standards. However it is not certain whether all the respondents had a similar set of preferences or whether socio-economic conditions like age, income, education level and their food purchase habits influence preferences. Since such information is critical for making production and marketing related decisions, this section explores the effects of respondents' socio-demographic characteristics and their food purchase behaviour on the preferences for organic production standards.

4.7.1 Gender

Gender differentiated conjoint analysis results, presented in Table 4.7, indicate overall similar preferences between male and female respondents. Both gender groups place highest importance on pesticide-residue testing followed by rules regarding location and the price levels. For female respondents, the standard setting agency was the fourth most important attribute and monitoring agency was the fifth important attribute. However, for the male respondents standard setting agency and monitoring agency occupied fifth and fourth places respectively.

Even though both male and female respondents place similar levels of importance on pesticide-residue testing, rules regarding location and the price levels, both the groups do not value these attributes to the same extent. For example, pesticide-residue testing carries an importance score of 34.4 percent to the female respondents, but 28.4 to male respondents. Similarly for male respondents, price carried an importance score of

Table 4.7 Part-Worth Utility Estimates and Relative Factor Importance for Male and Female Respondents

Variable/ Measure	Male Participants	Female Participants	Full Sample
<i>Intercept:</i>			
Coefficient	6.94	7.10	7.03
<i>Pesticide-Residue Testing:</i>			
Part-Worth: Regular	1.72	2.25	2.02
Part-Worth: In doubt	0.05	0.30	0.19
Part-Worth: Not required	-1.77	-2.55	-2.21
Relative Factor Importance	28.45	34.43	31.86
<i>Rules Regarding Location:</i>			
Part-Worth: Ontario	0.69	0.95	0.84
Part-Worth: Canada	0.54	0.52	0.53
Part-Worth: No rules	-1.23	-1.47	-1.36
Relative Factor Importance	21.15	20.66	20.87
<i>Standard Setting Agency:</i>			
Part-Worth: Government	0.62	0.36	0.47
Part-Worth: Farmer- Private	-0.06	0.16	0.07
Part-Worth: Non farmer-Private	-0.56	-0.52	-0.54
Relative Factor Importance	14.92	14.87	14.89
<i>Monitoring Agency:</i>			
Part-Worth: Federal Government	0.42	0.33	0.37
Part-Worth: Provincial Government	-0.05	-0.02	-0.03
Part-Worth: Private	-0.37	-0.31	-0.34
Relative Factor Importance	15.47	12.94	14.03
<i>Price:</i>			
Part-Worth: \$1.69	0.95	0.54	0.71
Part-Worth: \$2.19	0.00	0.17	0.10
Part-Worth: \$2.69	-0.95	-0.71	-0.81
Relative Factor Importance	20.01	17.10	18.35
<i>R²(Average)</i>	<i>0.95</i>	<i>0.97</i>	<i>0.96</i>
<i>Adjusted R²(Average)</i>	<i>0.44</i>	<i>0.70</i>	<i>0.59</i>
<i>F-Statistic(Average)</i>	<i>24.80</i>	<i>27.17</i>	<i>28.57</i>
<i>N</i>	<i>64</i>	<i>85</i>	<i>149</i>

20 percent, but 17 percent to female participants. Relative importance values for rules regarding location were 21.2 percent (male respondents) and 20.7 (female respondents).

Looking at the magnitude of part-worth utilities for all the three attribute levels in pesticide-residue testing, female respondents, as compared to the male respondents, seemed to indicate stronger preferences for frequent testing. Similarly, female respondents preferred Ontario grown products more than the male respondents. However, as far as price levels were concerned, male respondents were found more sensitive than female respondents. From the above, it appears that female respondents were more willing to trade lower prices for stricter pesticide-residue testing requirements and the rules regarding location. On the other hand, male respondents were ready to accept, to a certain extent, lenient residue-testing standards if offered at lower prices. This is to be expected as female members who often tend to be the primary grocery shoppers for the family may value food safety related attributes more than prices.

4.7.2 Age

Like gender, age is another important factor that is considered in the analyses of consumer preferences. In this study, the respondents were classified into four age groups and their preferences for organic standards estimated. The results are presented in Table 4.8. Awareness about organic products and the willingness and ability to buy these products were assumed to be similar amongst the respondents in each age group.

All four groups place the highest importance on pesticide-residue testing requirements. However, from this point the groups diverge. For respondents in the 18 - 24 year age group, price is the second most important factor followed by the attributes of rules regarding location, standard setting agency and standard monitoring agency. This is

to be expected as respondents in this age group were likely to earn less income compared to the individuals in other groups. Moreover, individuals in this age group of 18 - 24 years can be expected to trade lenient standards regarding location for lower prices.

Respondents between 25 and 44 years of age place the highest importance on pesticide-residue testing requirements followed by the attributes of rules regarding location, price, standard monitoring agency and standard setting agency. As shown in Table 4.8, this group of respondents, as opposed to the previous age group, would be less willing to accept lenient standards regarding the location specifications for lower prices. In essence, these respondents were willing to pay a higher price for stringent residue-testing requirements and products grown in Ontario and Canada.

The next group included the respondents aged 45 to 64 years. Preferences of these individuals resembled that of the previous group with respect to the importance scores on testing requirements, rules regarding the location and price. However, unlike the previous group, these individuals considered standard setting agency to be more important than the monitoring agency.

Respondents of 65 or more years of age seemed to be departing from the earlier two groups. The attributes, in the order of importance, were: residue-testing requirements, rules regarding location, standard setting Agency, standard monitoring agency and price levels. Since this was the order in which the attributes were presented (Appendix D), there could be ordering influence on these individuals. Or else, this would mean that these individuals were in favour of stricter standards and were willing to pay higher prices for them. Since there were only eight respondents in this category, definite conclusions could not be reached.

Table 4.8 Part-Worth Utility Estimates and Relative Factor Importance for the Respondents in Different Age Groups

Variable/ Measure	18 - 24 years	25 - 44 years	45 - 64 years	65 years and Above	Full Sample
<i><u>Intercept:</u></i>					
Coefficient	6.96	7.02	7.10	7.20	7.03
<i><u>Pesticide-Residue Testing:</u></i>					
Part-Worth: Regular	2.03	1.76	2.32	2.18	2.02
Part-Worth: In doubt	0.13	0.23	0.21	0.25	0.19
Part-Worth: Not required	-2.16	-1.99	-2.53	-2.43	-2.21
Relative Factor Importance	32.52	28.70	35.43	31.36	31.86
<i><u>Rules Regarding Location:</u></i>					
Part-Worth: Ontario	0.83	0.95	0.74	0.59	0.84
Part-Worth: Canada	0.17	0.62	0.79	0.86	0.53
Part-Worth: No rules	-1.00	-1.57	-1.53	-1.45	-1.36
Relative Factor Importance	17.23	22.30	23.04	23.04	20.87
<i><u>Standard Setting Agency:</u></i>					
Part-Worth: Government	0.22	0.60	0.75	-0.30	0.47
Part-Worth: Farmer- Private	0.29	-0.09	-0.13	0.76	0.07
Part-Worth: Non farmer-Private	-0.51	-0.51	-0.62	-0.46	-0.54
Relative Factor Importance	13.38	14.87	15.90	19.39	14.89
<i><u>Monitoring Agency:</u></i>					
Part-Worth: Federal Government	0.23	0.51	0.32	0.52	0.37
Part-Worth: Provincial Government	-0.04	0.02	-0.11	0.05	-0.03
Part-Worth: Private	-0.19	-0.53	-0.21	-0.57	-0.34
Relative Factor Importance	13.29	15.80	12.60	13.79	14.03
<i><u>Price:</u></i>					
Part-Worth: \$1.69	1.10	0.85	0.14	0.19	0.71
Part-Worth: \$2.19	0.17	0.01	0.17	-0.03	0.10
Part-Worth: \$2.69	-1.27	-0.86	-0.31	-0.16	-0.81
Relative Factor Importance	23.58	18.33	13.03	12.41	18.35
R^2 (Average)	0.96	0.97	0.97	0.87	0.96
Adjusted R^2 (Average)	0.56	0.66	0.73	0.39	0.59
F-Statistic (Average)	19.97	26.08	34.47	19.84	28.57
N	49	53	39	8	149

4.7.3 Household Income

Household income is a key economic variable influencing individual preferences for goods and services. This is especially true for products like organic foods which are priced at a premium compared to conventional equivalents. Therefore, it is important to look at the role of family income on the preferences for organic standards. Such an analysis was conducted and the results are presented in Table 4.9. For convenience, respondents were divided into two groups: (i) respondents with income below the median level and (ii) respondents with income at or above the median level of income.

Both income groups indicated similar preferences for the attributes of pesticide-residue testing, rules regarding the location and price. Pesticide residue testing was ranked the most important attribute followed by rules regarding the location and price, in that order. Interestingly, both income groups indicated price as the third important factor. This would mean that respondents, on an average, were less willing to trade-off higher standards of testing for residues and rules regarding the location for lower prices regardless of the income levels. Standard setting agency was the fourth most important attribute for the higher income group respondents but, fifth for the lower group respondents.

The magnitudes of attribute importance, as expected, were different for the respondents in the two income groups. For lower income group members, residue testing was more important (32.8 percent) than to those with higher income levels (31.1 percent). Interestingly, higher income group members seemed to be more concerned about price (for the given levels of prices) than the lower income group members. Price as a factor in deciding organic food (apple) purchases was more important to higher income group

Table 4.9 Part-Worth Utility Estimates and Relative Factor Importance for the Two Income Groups

Variable/ Measure	Below Median Income	At and Above Median Income	Full Sample
<i>Intercept:</i>			
Coefficient	7.05	7.01	7.03
<i>Pesticide-Residue Testing:</i>			
Part-Worth: Regular	1.98	2.04	2.02
Part-Worth: In doubt	0.27	0.14	0.19
Part-Worth: Not required	-2.25	-2.18	-2.21
Relative Factor Importance	32.81	31.15	31.86
<i>Rules Regarding Location:</i>			
Part-Worth: Ontario	0.89	0.79	0.84
Part-Worth: Canada	0.46	0.58	0.53
Part-Worth: No rules	-1.35	-1.37	-1.36
Relative Factor Importance	20.14	21.42	20.87
<i>Standard Setting Agency:</i>			
Part-Worth: Government	0.32	0.58	0.47
Part-Worth: Farmer- Private	0.12	0.03	0.07
Part-Worth: Non farmer-Private	-0.44	-0.61	-0.54
Relative Factor Importance	14.35	15.30	14.89
<i>Monitoring Agency:</i>			
Part-Worth: Federal Government	0.38	0.36	0.37
Part-Worth: Provincial Government	0.13	-0.16	-0.03
Part-Worth: Private	-0.51	-0.20	-0.34
Relative Factor Importance	15.10	13.21	14.03
<i>Price:</i>			
Part-Worth: \$1.69	0.48	0.89	0.71
Part-Worth: \$2.19	0.22	0.01	0.10
Part-Worth: \$2.69	-0.70	-0.90	-0.81
Relative Factor Importance	17.60	18.92	18.35
R^2 (Average)	0.97	0.96	0.96
Adjusted R^2 (Average)	0.69	0.52	0.59
F-Statistic(Average)	15.21	33.87	28.57
N	64	85	149

people than the lower income individuals. Besides, respondents in the higher income bracket have demonstrated stronger preferences for the lower price levels. Regarding the location requirements, both the groups seemed to prefer Ontario grown products followed by Canada grown and from other places (lack of specific rules).

4.7.4 Current Organic Food Purchase Habits of the Household

Preferences for organic production standards might be correlated with factors like what kind of foods individuals buy, how often they buy, how keen they are towards certain types of products and other such routines of grocery shopping. Food purchase habits can lead to specific preference patterns.

Respondents' organic food purchase habits, more than general grocery shopping behaviour, can provide crucial insights regarding the preference pattern. In simple terms, this can be achieved by analyzing the two segments of the sample - purchasers and non-purchasers of organic foods. However, in this survey, only ten respondents did not buy any organic foods. With such a small representation of non-purchasers, no meaningful conclusions can be drawn regarding the preference strength in terms of purchasers and non-purchasers of organic foods. Therefore, such an analysis was not undertaken. Instead, survey responses were further explored to see if frequency of organic food purchase has any influence on the preference for organic standards.

The sample was segmented into three groups. The first group included those consumers who bought organic food on weekly or bi-weekly basis. The second group included those respondents who were purchasing organic foods once a month or every two months. The last group was comprised of those consumers who stated that they never

bought organic food *i.e.* the frequency was zero. The corresponding results are presented in Table 4.10.

For consumers who bought organic foods every week or every other week, residue testing requirements was the most important followed by location specifications, standard setting agency, price, and monitoring agency. For the other two groups, residue-testing requirements were still the most important but were followed by, in the order of importance, price, location specifications, standard setting agency and monitoring agency. Although the relative factor importance were similar in groups two and three, the part-worth utility estimates clearly suggest that the respondents who bought organic foods on a monthly/ bi-monthly basis had stronger preferences for residue-testing requirements and location specifications as compared to the respondents who never bought organic foods.

As shown in Table 4.10, those who buy organic foods more frequently were less willing to trade off higher organic standards for lower prices. Consumers with lesser frequency of organic food purchases would be more willing to trade off location specifications for the lower price level. Thus, it appears that the frequency of organic purchases is correlated with preferences for organic standards. Frequent consumers of organic foods were more concerned about the strictness of organic standards and less concerned regarding the prices than those who bought organic products less frequently. The results might confirm the previous expectations that frequent purchasers of organic foods are likely to be more knowledgeable and have stronger preferences for organic standards and are willing to pay more for them.

Table 4.10 Part-Worth Utility Estimates and Relative Factor Importance in Consumer Segments Based on Frequency of Organic Food Consumption

Variable/ Measure	Weekly / Bi-weekly	Monthly / Bi-monthly	Never	Full Sample
<i>Intercept:</i>				
Coefficient	7.13	6.96	6.90	7.03
<i>Pesticide-Residue Testing:</i>				
Part-Worth: Regular	2.15	2.08	1.55	2.02
Part-Worth: In doubt	0.34	0.17	0.16	0.19
Part-Worth: Not required	-2.49	-2.25	-1.71	-2.21
Relative Factor Importance	33.51	30.67	27.25	31.86
<i>Rules Regarding Location:</i>				
Part-Worth: Ontario	0.97	0.77	0.68	0.84
Part-Worth: Canada	0.59	0.54	0.64	0.53
Part-Worth: No rules	-1.55	-1.31	-1.32	-1.36
Relative Factor Importance	22.95	19.86	19.42	20.87
<i>Standard Setting Agency:</i>				
Part-Worth: Government	0.44	0.45	0.60	0.47
Part-Worth: Farmer- Private	0.11	-0.07	-0.09	0.07
Part-Worth: Non farmer-Private	-0.55	-0.38	-0.51	-0.54
Relative Factor Importance	15.21	14.60	15.85	14.89
<i>Monitoring Agency:</i>				
Part-Worth: Federal Government	0.35	0.30	0.26	0.37
Part-Worth: Provincial Government	0.02	-0.02	-0.13	-0.03
Part-Worth: Private	-0.37	-0.28	-0.13	-0.34
Relative Factor Importance	13.27	13.57	14.43	14.03
<i>Price:</i>				
Part-Worth: \$1.69	0.24	0.99	1.36	0.71
Part-Worth: \$2.19	0.15	0.23	-0.26	0.10
Part-Worth: \$2.69	-0.39	-1.22	-1.10	-0.81
Relative Factor Importance	15.07	21.30	23.05	18.35
<i>R²(Average)</i>	<i>0.98</i>	<i>0.96</i>	<i>0.92</i>	<i>0.96</i>
<i>Adjusted R²(Average)</i>	<i>0.76</i>	<i>0.50</i>	<i>0.08</i>	<i>0.59</i>
<i>F-Statistic(Average)</i>	<i>28.83</i>	<i>18.78</i>	<i>16.38</i>	<i>28.57</i>
<i>N</i>	<i>69</i>	<i>30</i>	<i>26</i>	<i>149</i>

4.8 IMPORTANCE OF ORGANIC STANDARDS - A SUMMARY

Drawing from the analyses of the sample and the sub-samples (gender groups, age groups, income groups and frequency of organic purchases), the relative importance of organic standards is presented in the following Figures for an easier comparison.

Figure 4.2 Importance Score for Residue-testing requirements

Figure 4.3 Importance Scores for the Rules Regarding Location

Figure 4.4 Importance Scores for the Standard Setting Agency

Figure 4.5 Importance Scores for Monitoring Agency

Figure 4.6 Importance Scores for Price

In general, as seen from the figures above, the relative importance of each of the organic production standard under study has remained the same across the various sub-groups. Pesticide testing requirements has occupied the prime place followed by the rules regarding the location of production and the price levels. This suggests that relative preference for organic standards remain same across the segments. Therefore, it can be concluded that respondents exhibit stated preference for the organic standards. Thus, consumer preference for organic foods can be influenced by production standards.

There exist certain minor differences with respect to the relative ranking of standard setting agency and monitoring agency. Differences also exist in the magnitudes of the relative ranks. The fact that price of an organic apple matters only after the testing requirements and the rules regarding the location of product origin illustrates that certain

non-price characteristics that define organic product are more important to consumers than the specified product price.

4.9 CONCLUSION

Consumer preferences for organic standards were measured by conjoint analysis. The estimates of part-worth utilities and relative factor importance indicated that individuals were in favour of stricter organic production standards in terms of pesticide-residue testing requirements and location specifications, and they were also willing to pay for the stricter standards. Individuals favoured government involvement in standard setting and monitoring. Segmentation analyses of survey responses confirmed that individuals' socio-demographic characteristics and organic food purchase behaviour could determine the preferences for organic standards.

Chapter 5

Summary and Conclusions

5.1 INTRODUCTION

This chapter summarizes findings of the research study and evaluates these findings with regard to the study objectives. This is followed by a discussion on the implications of these results with respect to the forthcoming national organic standard and marketing of organic food products in Canada. Research limitations are also noted and suggestions made for further areas of study.

Organic certification systems were developed to provide information to consumers and also to protect producers from fraudulent labelling. This was essential because of the credence nature of organic goods. Third party certification in accordance with pre-determined certification standards is the best mechanism to achieve this (Giannakas, 2002). However, organic standards vary due to differences in agronomic, cultural and economic factors of the corresponding agrarian systems. Moreover, such differences come in the way of increasing domestic and international movements of organic products. Multiplicity of standards can also create confusion in the market place.

In order to facilitate domestic and international trade, harmonization of standards is essential among the different regions of a country and across nations. To achieve harmonization of standards, a country should first establish a single standard. Yet, establishing a single standard is difficult because of diverse characteristics of organic production held close to heart of organic farmers and consumers. The situation is not different in Canada with nearly 20 organic certification systems in operation.

While Canada is preparing to establish a common minimum standard for organic production, it is essential to take into account consumer perceptions and preferences for organic production attributes. However, there has been a very little economic analysis about consumer preferences for organic production standards and its influence on the Canadian national organic standard. This study was intended to fill this gap and provide useful recommendations towards the development of the national organic standard and marketing of organic products in Canada.

5.2 SUMMARY OF FINDINGS

The first objective of the study, as noted in Chapter 1, was to examine Canadian consumer awareness about organic production methods. Results indicate that respondents differ in their perceived level of awareness about production related characteristics of organic foods, location aspects and certified organic production system. As expected, a portion of respondents were more knowledgeable than others. Compared to aspects of organic food and organic food production methods included in the study, responses with respect more contentious issues like geographical location of production and pesticide-residue levels in organic products had a greater spread.

Following the framework of Fetter and Caswell (2002), 18 organic standards were compared. Details on how the standards were selected, comparison criteria and the comparison itself can be found in Chapter 3 and Appendices A, B, and C. The comparison formed the basis for choosing the relevant attributes to be used in the conjoint analysis. Four standards were selected by comparing 18 different organic standards operating in Canada. To gather information on consumer preferences for

organic standards, a mall-intercept survey was conducted in Guelph, Ontario, Canada in October 2006.

The survey asked consumers to state the nature and frequency of their organic purchases, their motivations for purchasing organic and certain other foods, questions to test their perceived level of knowledge of organic production, and some questions regarding their socio-economic information. Consumers were also asked to rank Red Delicious organic apples based on their preference for the given organic production standards. The rankings were then evaluated using metric conjoint analysis. The conjoint experiment provides an importance rating for each attribute tested, a utility coefficient for the attribute levels and statistics testing the goodness of fit. Survey participants were also segmented into several groups on the basis of their socio-demographic characteristics and food purchase habits to see if these conditions have any influence on the preference for organic standards.

Estimates of part-worth utilities and relative factor importance indicated that individuals were in favour of stricter organic production standards in terms of pesticide-residue testing requirements and location specifications and they were willing to pay for the stricter standards. Individuals, at large, seemed to favour government involvement in standard setting and monitoring. Segmentation analyses of survey responses, regardless of the individual socio-demographic characteristics and organic food purchase behaviour, the relative factor importance has been very similar, at large. Therefore, it can be concluded that respondents exhibit stated preference for the organic food production standards.

Results and conclusions of this study provide evidence supporting the hypothesis that organic food purchase decisions are based on the preference for certain non-price characteristics that define organic products. The study thoroughly compared 18 different organic certification standards, identifies the salient features of these organic production systems, documents individuals' awareness about organic food and organic food production characteristics and on the basis of Lancasterian characteristics demand model individual preferences for the selected organic standards are quantified in the form conjoint part-worth utilities. Successful in meeting all the pre-determined objectives, this study addresses one facet of economic research concerning how the underlying institutional mechanisms could possibly equip the policy makers with an opportunity to direct the market outcome.

5.3 IMPLICATIONS FOR THE CANADIAN ORGANIC INDUSTRY

The results from the conjoint analysis suggest that consumers preferred stricter standards in residue-testing requirements and location specifications and were willing to pay higher prices for these attributes. However, the proposed national organic standard of Canada does not make provisions for pesticide-residue testing and specific rules regarding production location. Thus, it is clear that the proposed national standard will not meet consumer preferences with respect to the above-mentioned standards. Therefore, an opportunity exists to respond to consumer perceptions and develop different standards. As consumers were willing to pay higher prices, producers would have incentives to adhere to the stringent test requirements. However, the research could not answer the magnitude of such incentives. By following stringent standards, Canada could create a quality differential among the different organic products. In these days when organic is

slowly moving to be a mass category, such product differentiation could be advantageous to the Canadian producers.

Consumers, in general, preferred increased government involvement in the standard setting and monitoring processes. This could be considered important and favourable for the proposed organic regime in Canada. This implies that the national organic standard would be well accepted by consumers from regulation and administration points of view. With implementation of the national organic regime, consumers would less favour the provincial standards and therefore, Quebec and British Columbia standards may lose certain ground. The same could be expected from the producers because of the transactions costs involved in adhering to the multiple certification systems.

Greater consumer preference for Ontario products indicates enough market potential for the local organic farmers. Similarly, Canada grown organic products would stand to gain compared to the imported products. Considering that the current demand for organic products is mostly met by imports, there lies a tremendous opportunity to increase farm returns by encouraging organic production and processing activities.

5.4 LIMITATIONS OF THE RESEARCH

The choice of survey location may be a limitation. Recruitment of grocery shoppers at the supermarkets and specialty stores could be considered more appropriate. However, time and cost restrictions prohibited this option. Because of the same resource constraints, all the surveys were administered at one place. This could seriously limit the extrapolation of the results as respondents may not represent the perceptions of a typical Canadian consumer.

The experimental design can be another limitation. The design was a fractional-factorial of 243 possible combinations. Considering the mall-intercept survey setting, the product profiles were kept to the minimum possible. Thus, with only 12 profiles, the factors were correlated to each other and hence, were not orthogonal. Also, there weren't any holdout profiles. The absence of holdout profiles failed to provide for the validation of conjoint model by comparing predicted vs. actual rankings.

Another limitation of the study is related with the selection of attributes. In this study, the attributes were selected on the basis of key similarities and differences among the documented versions of the standards. Thus, the study did not consider the differences that might exist at the operational level of these standards. Given such information, there could be more significant attributes available for the research. Similarly, focus group sessions would have helped the selection of attributes.

5.5 RECOMMENDATIONS FOR FUTURE RESEARCH

In any research involving conjoint analysis should be based on a well-planned and rigorous experimental design. Such design should be able to provide for the important validation and statistical tests. This is important in the conjoint models where predictability is significant.

With the implementation of national organic regime in Canada, consumer willingness to accept products with the Canadian national standards and labelling requirements could be studied. Also, Canadian consumer preference for national standards of other countries could be useful in enriching the standard development process.

Just as the consumer preferences are studied here, producer preferences for different organic standards and certification systems could be examined. The information on the supply side along with the demand side information could be useful in determining a unique set of organic production practices. Research on the producer side of the problem would be useful in understanding important economic parameters of the decision-making process. Research on costs and benefits of implementing certain organic standards can be undertaken to assess the net benefits.

Additional research into harmonization of organic standards and equivalency agreements could be conducted across nations and linked back to the consumer preferences for the standards. This new information could be useful in determining a universal set of organic production standards.

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Appendix A

Organic Certifying Agencies and the Certification Programs in Canada

Certification Agencies	Certification Programs
Bio-Dynamic Agriculture Assoc. of BC (BC Bio-D)	BCCOP
Boundary Organic Producers Assoc. (BOPA)	BCCOP
British Columbia Association for Regenerative Agriculture (BCARA)	BCCOP
California Certified Organic Farmers Certification Services (CCOF International)	IFOAM NOP CCOF INTERNATIONAL
California Crop Improvement Association (CCIA)	NOP
California Organic Farmers Association	NOP
Canadian Organic Certification Co-Operative Ltd (COCC)	
Canadian Seed Institute (CSI)	NOP JAS EU
Consorzio per il Controllo dei Prodotti Biologici (CCPB) (Consortium for Quality Control of Organically Grown Products)	IFOAM NOP EU JAS CAAQ
Demeter	DEMETER
Fraser Valley Organic Producers Association (FVOPA)	NOP CAAQ BCCOP
Garantie Bio-Ecocert	NOP JAS EU CAAQ IFOAM CODEX GARANTIE BIO-ECOCERT

Certification Agencies	Certification Programs
Global Organic Alliance (GOA)	NOP EU JAS
<i>GOA Chapters:</i>	CAAQ
<i>Green Life Organic Association (GLOA)</i>	BIO SUISSE
<i>Biological Food Producers (BFP)</i>	GOA
Guaranteed Organic Certification Agency	IFOAM NOP EU JAS
International Certification Services, Inc.	NOP JAS RvA
International Certification Services/ Farm Verified Organic (ICS/FVO)	IFOAM NOP EU JAS CAAQ BIO SUISSE Sustainable Wild Aquatic Harvest (SWAH) Standard FVO
Islands Organic Producers Assoc. (IOPA)	BCCOP
Kootenay Organic Producers Assoc. (KOGS)	BCCOP
Living Earth Organic Growers Association (LEOGA)	Living Earth Organic Growers Association (LEOGA)
Maritime Certified Organic Growers (MCOG)	
Midwest Organic Services Association	NOP EU JAS CAAQ
North Okanagan Organic Assoc. (NOOA)	BCCOP
Nova Scotia Organic Growers Assoc. (NSOGA)	

Certification Agencies	Certification Programs
Ohio Ecological Food and Farm Association (OEFFA)	OCIA OEFFA
OneCert	IFOAM NOP EU JAS BIO SUISSE CAAQ
Oregon Tilth Certified Organic (OTCO)	NOP EU JAS
Organic Certifiers	NOP JAS CAAQ
Organic Crop Improvement Association International (OCIA)	IFOAM NOP CAAQ
<i>OCIA Chapters:</i>	JAS
<i>OCIA – New Brunswick</i>	EU
<i>OCIA – Quebec</i>	BIO SUISSE MAG OCIA
Organic Crop Producers & Processors Inc., and Pro-Cert Canada Inc. (OCPRO)	NOP EU JAS CAAQ COPMS OCPRO
Organic Producers Association of Manitoba Co-operative Inc. (OPAM)	EU
Organic Verification Organization of North America (OVONA)	
Pacific Agricultural Certification Society (PACS)	NOP BCCOP CAAQ

Certification Agencies	Certification Programs
QCB Organic Inc.	NOP
Quality Assurance International Inc. (QAI)	IFOAM NOP EU JAS CAAQ QAI
Quality Certification Services (QCS)	NOP
Quality Management Institute (QMI)	
Quebec Vrai	
Saskatchewan Organic Certification Association (SOCA)	NOP
Shuswap Thompson Organic Producers Assoc. (STOPA)	BCCOP
Similkameen Okanagan Organic Producers Association (SOOPA)	BCCOP
Stellar Certification Services, Inc. (SCS)	NOP
Surrey Organic Farmers Society (SOFS)	
Washington State Department of Agriculture Organic Food Program (WSDA OFP)	IFOAM NOP EU JAS

Appendix B

Criteria for Comparison of Standard Grades That Have Defined 'Organic' in Canada

1. GENERAL PRINCIPLES OF ORGANIC PRODUCTION

Presentation Principles

Concepts embedded in definition or list in preamble

Environmental Principles

Prevent soil erosion

Improve physical, chemical and biological soil health and the program emphasizes on soil building activities

Emphasis on increasing quality and quantity of soil organic matter to enhance biological activity of soil

Healthy and proper use of water and water resources and all life therein

Biological, cultural and mechanical methods of weed, pest and disease control

Control measures must have specific results and not affect other organisms nearby

Minimum tillage and cultivation

Avoid deep, intensive cultivation

Recycling of agricultural materials, resources and wastes

Ethical and humane animal husbandry - emphasis on health, normal socialization and behavioural need of animals; emphasis on lifetime performance and not on maximum output

Promote genetic and biological diversity, biological cycles, and soil biological activity

Minimize or prevent environmental pollution from agriculture

Protect biodiversity or wildlife habitat around farm

In the event of distribution of properties, these habitats have to be divided among farmers by the responsible authorities

Specific guidelines for maintaining meadows, pastures and borders

Ecological stability/sustainability of operations

Compare the farm to an ecosystem

Constructive interactions with natural systems, cycles and environment

Protection of environment and harmony with the environment

Farmers understand (or will have to understand) their responsibility to the natural fundamentals of life

Self-regulating system

Community wellness

Labour Principles

Provide safe environment for farm labourers

Adequate living conditions

Appropriate wages

Materials Principles

Avoid using prohibited materials

Emphasis on avoiding prohibited materials and practices

Reduce/Discourage/Limit using off-farm inputs

Food Quality and Safety Principles

Provide high quality food
Ensures safety of food
Provide nutritious food
Emphasis on quality (creation and maintenance) of production and not quantity
Certifier recognizes that there are no physiochemical, organoleptic or functional characteristics that distinguish organic from non-organic
Certifier acknowledges that organic certification does not guarantee residue-free or contaminant-free food
Indication that organic methods help to reduce potential contamination by chemicals, pesticides and drugs

Economic Principles

Create economically sustainable enterprise (adequate returns to producers)
Progress towards socially just production, processing and distribution chain
Optimizing productivity
Create socially sustainable production system
Developed in consultation with the certifying bodies
In the interest of consumers' health and creating appreciable value (in terms of price) for them
Organic = Biological = Ecological = Biodynamic (or any other terminology) as per the standard

2. REGULATION OF MATERIALS

Approaches to Regulation

Certifier has a Materials List
Restricts individual materials beyond minimum legal requirements
Certifier uses OMRI list as a source to formulate its materials list
Materials and Practices are clearly distinguished as

- Recommended
- Allowed
- Regulated
- Prohibited

Restrictions on the use of regulated materials

- Must reduce the use over time or use is discouraged
- Get permission before use
- Submit a separate list to certifier of all prohibited and regulated materials used

3. LAND AND RESOURCE MANAGEMENT

General Principles

Establish and maintain fertile soil rich in humus levels, optimum balance of nutrients, stimulate biological activity
Organic matter produced on the enterprise is the source of fertilization
Tillage practices are directed to minimize damage to the structure and tilth of soil
Fertilization to conserve soil and plant nutrients in the production system

Nutrient /ha through fertilization is not to exceed the amount in droppings from 2.5 Large Animal Equivalents in lowland areas
Avoid addition and removal of excessive nutrients
Use of crop residues and cover crop to prevent soil erosion and degradation

Recommended Practices for Organic Production

Usage of compost to improve soil humus and fertility

4. ORGANIC PRODUCTION ACTIVITIES

i. LOCAL OR REGIONAL FACTORS

Materials Principles

Emphasis on local inputs
Crops and Varieties to suit the local and regional conditions

Economic Principles

Promote regionally recognized agricultural economic system (sell products locally)

ii. PROHIBITED PRACTICES AND MATERIALS

Rotation of production units into and out of organic production
Non-certified annual seedlings and transplants
Use of synthetic products in any form
Use of GMOs and their derivatives
Detectable residues of synthetic chemicals and GMO/GMO derivatives
Biosolids / sewage sludge
Irradiation
Photodegradable plastics
Feed Medications
Glossy paper / colored ink

iii. ORGANIC CROP PRODUCTION

Plan and Transition time

Organic plan is required and details of what goes in organic plan
Gap assessment plan is required
Record Keeping
Plan or update must be submitted annually
Annual on-site inspection
Crop rotation plan
Inclusion of leguminous, deep rooted and catch crops in crop rotation is emphasized
Soil nutrient test is required for certification
Soil test is recommended
Soil residue test is required for certification
 Regular residue tests
Soil-building plan
Transition period of at least 24 months (production is managed as per the standards)

36 month transition period (from application of prohibited material to certification status)

Does not apply to land brought into cultivation after a fallow period of at least three years

Certifying Agency monitors the final year of pre-certification period

Twelve-month transition period when non-certified perennial planting material is used

Certifying Agency can set more stringent conversion periods

Conversion of individual production units is allowed

Conversion plan is required

"Transitional organic" product labelling is permitted

Crop Husbandry

Sourcing of planting material

Preferably the same standard approved planting material need to be used

Use of non-organic and treated planting material is to be avoided

Non-organic and treated planting material is allowed only under exceptional cases that too during transition period

The parent plant from which planting material is obtained should have been cultivated for one generation or at least two growth periods (perennial crops) as per the organic standards

Selection of plant species that fit well to the regional soil and climate, resistant to the predominant pests and diseases of the area is encouraged

Perennial stocks from non-certified source are permitted

Plant propagation

Fungicide treated seed: prohibited

Fungicide treated seed: regulated

Fungicide treated seed: certifier approval required before use

Fungicide treated seed: written documentation of search required

Inputs - fertilizers, manure, irrigation water

Raw manure: not permitted if not from organic source

Raw manure: can be used after composting if the source is non organic

Raw manure from organic source: when used raw, required time interval (in months) between use and crop harvest

Certifying Agency has to approve the usage of compost from off farm sources

Observe water conservation while irrigating the crops

Irrigation water must not contain prohibited materials

Use of plastics (mulch, hay wrappers, etc) are permitted

Weed control

Weeds are to be managed by cultivation techniques

Physical weeding methods, thermal and electric weed control are permitted

Insect, pest and disease control

Organic production methods should be aimed at minimizing losses caused by pests and diseases

Natural predators are to be protected and encouraged

Thermal sterilization of soil and compost is permitted

Parallel Production

Parallel Production is allowed if additional record keeping and organizational requirements are met

- But whole farm conversion is encouraged or required

- Must report practices and materials used on conventional portion of the farm

Non-organic production zone is not supposed to have GMOs

Measures to Avoid Contamination

Buffer zone requirements

- Space separation requirements

- Physical barriers recommended or required

- Runoff diversion required

No specific measures are suggested in the standard

Regular residue tests required, for soil

Regular residue tests required, for crops

Residue tests if there is a likelihood of contamination

Measures to monitor the quality of irrigation water eg: regular tests for prohibited substances

Residue levels in produce

- Permitted levels

- No levels stated

- Exceptions of residue levels

Crops with residues over permitted levels can never be labelled 'certified organic'

Drift of prohibited materials on to certified crops and land

- Crop is not labelled 'certified organic', regardless of the amount of drift

- Affected land is automatically decertified

- Crop is to be tested for residue levels and if the limit is exceeded crop is not labelled 'organic'

- Soil residue test is required for certification at the discretion of operator

Pre and Post-Harvest Handling

Discourage excessive processing or process minimally

iv. ORGANIC LIVESTOCK PRODUCTION

Sourcing and Conversion Time

Sourcing animals from same farm is preferred

Artificial Insemination means of breeding is permitted

Slaughter animals (excluding birds)

- Maximum limit for sourcing breeding/slaughter cattle from non-organic sources

- Animals not born to certified organic operation may be converted to certified status

- Transition time under organic feed requirements

- Transition time under organic health care requirements

Dairy animals

- Maximum limit for sourcing dairy cattle from non-organic sources

- Transition time under organic feed requirements

- Transition time under organic health care requirements

Replacing many animals at once limits the amount of total production coming from these animals

Lesser transition time if replacing many animals at once

Birds

Day-old chicks can be from any source as long as such flock is not treated with prohibited substances

Maximum age for conversion is 1 day old

If the birds are older than a day, required transition period

For egg layers

For broilers

Animals for non-edible livestock products

Transition time under organic feed requirements

Transition time under organic health care requirements

Housing and Husbandry

Slaughter and Dairy animals

Stocking area sufficient for the free movement of each animal

Sufficient fresh air and natural daylight as per the requirements of the animal

Edible bedding should be certified organic

Access to indoor or outdoor exercise areas is required (weather permitting)

Daily access to outdoors is required (weather and stage of production permitting)

Specific standards for outdoor access areas

If daylight is artificially extended, the total photoperiod may not exceed 16 hours per day

Routine, extended or lifetime indoor confinement is prohibited

Lifetime indoor confinement is allowed (explicit or implicit)

Protection from exposure to excessive sunlight, temperature, precipitation and wind

Free access to non-cement floor is required when the animal is indoors

Housing facilities are not to bother natural animal behaviour and comfort

Standard does not specify housing norms

Birds for meat and eggs

Stocking area sufficient for the free movement of each bird

Sufficient fresh air and natural daylight as per the requirements

Edible bedding should be certified organic

Access to indoor or outdoor exercise areas is required (weather permitting)

Specific standards for outdoor access areas

Regular access to outdoors is required (weather and stage of production permitting)

If daylight is artificially extended, the total photoperiod may not exceed 16 hours per day

Housing in indoor cages is prohibited

Lifetime indoor confinement is prohibited

Lifetime indoor confinement is allowed (explicit or implicit)

Protection from exposure to excessive sunlight, temperature, precipitation and wind

Floor space standards per bird must be followed

Housing facilities are not to bother natural bird behaviour and comfort

Standard does not specify housing norms

Handling: Responsible, with ethical care and respect. Care should be taken to prevent any undue stress, suffering

Feed Requirements

Nutritionally balanced diet as per the requirements

Ideally, feed should come from on-farm

Percent certified organic feed required

Allowable percentage of non-organic feed for not more than 6 months

Feeding animals with transitional organic crop/material is allowed

Additives, supplements and concentrates as a percentage of total feed

Certifier pre-approval required for using vitamins, pure amino acids and trace elements obtained from synthetic process

Emergency feed provisions mentioned in standards

Producer's organic plan must include provisions for emergency shortage of certified organic feed

Certifier pre-approval required for emergency status

Absolute time limit is stated for emergency feed allowances

Limit on percentage of emergency feed allowed

Labelling restrictions, if emergency feeding is required

Health Care Requirements

Preventive care emphasized as first defense

Use of biological, cultural and physical treatments and/or practices are recommended

Withholding treatment from sick animals to maintain organic status is not permitted / is grounds for decertification

Allopathic treatments are to be treated as the last resort

Use of vaccines and therapeutic drugs

Products from treated animals are not to be marketed as organic until an interval time period of withdrawal period

In the events of approved internal use of synthetic antibiotics, parasiticides

Mandatory withdrawal period in slaughter animals

Mandatory withdrawal period in dairy animals

Sub therapeutic use of antibiotics is prohibited

Detailed record keeping throughout the chain and identification of treated animals is necessary

Enforcement Procedures

Organic plan emphasized as enforcement tool

Audit trail emphasized as enforcement tool

Medical records of individual animals (or flocks, in birds) must be traceable through life cycle

Individual identification mark (physical marker/tag) on Agency of each animal (except birds)

Adequate record keeping to separate treated animals (with prohibited substances) from untreated ones

Tagging to separate treated animals from untreated animals (except birds)

Products from treated animals are not labelled organic

Transitional certification for livestock products

v. *ORGANIC MAPLE SYRUP PRODUCTION*

Certifying Agency shall define specs for tapping and sap collection techniques
Reverse osmosis techniques are permitted if enterprise has clearly defined methods for their use

Transition period of at least 36 months

On-site inspection by certifier during the final year of transition period

Mixed maple production (organic and non-organic) is not allowed

vi. *ORGANIC HONEY PRODUCTION*

General Principles

Knowledge of bee life cycle, pests and diseases is necessary for the operator

Bee husbandry is to promote natural resistance against pest and disease infestation

Supply of clean water and forage on a continuous basis

Record keeping on bee colonies

Operator has to demonstrate that bees have not been collecting nectar from sites treated with prohibited substances

Preserve and protect the quality and integrity of harvested honey

Recommended Practices

Rear genetically diverse queens to reduce the risk of diseases

When package bees or nucleus colonies are purchased from non-organic sources, first extraction is not marketed as organic

Pressure treated lumber, particle board, toxic wood preservatives are not to be used in hive construction

Only exterior surfaces of the hive shall be painted

Comb foundation should be from organic sources

Honey syrup from a known source shall be the major source of food for adult bees

Bees shall be removed by the use of bee escape boards, brushing, shaking, air blowers, minimal smoking from natural substances

Regular monitoring of hives (Biweekly)

Botanical remedies may be used (not within 30 days of honey flow)

Synthetic antibiotics may be used only when the health of colony is threatened. Colony has to be removed from organic production area.

Buffer zone requirements for apiaries from sources of non-permitted substances

Maximum storage period

Honey should not be heated to temperatures greater than 35 degree Celsius

vii. *PRODUCTION OF ORGANIC SPROUT*

Organic seed is used

Water used should meet or exceed federal drinking water quality standards for levels of microbial, chemical contaminants and chlorine limits

viii. *ORGANIC MUSHROOM PRODUCTION*

Wooden legs, sawdust and other organic substances are used
Certified organic spawn (seed) is used

ix. *ORGANIC GREENHOUSE MANAGEMENT STANDARDS*

Glazing used in construction or operation

is composed of glass, polycarbonates, polyethylene

Coated with whitewash or is shuttered when necessary

Not constructed from biodegradable plastics

Crops are to be protected from the exhaust of supplementary heating

Propane, kerosene or oil heaters are permitted in emergency situations

Artificial lighting is permitted

Permitted procedures/processes

Flame, fermentation, composting, compressed carbon di oxide - to enrich carbon di oxide levels

Steam heat sterilization - to clean and disinfect pots, containers

Plant and animal based growth regulators - to stimulate growth or development

hot water, steam water treatment

Pruning, vacuuming, rogueing - to prevent and control pests and diseases

air filters and screens

x. *ORGANIC WINE PRODUCTION*

xi. *WILD HARVEST AND COLLECTIONS*

36 months of compliance of the harvest area with this standard under routine inspections

Record on wild plant species, plan of harvest, harvesting methods

Measures to protect wild species, not disturbing the stable natural environment including the ecosystem

Buffer zone separating the production and non-production zones

Marking an audit trail

Can be combined/mixed with other organics produced under this standard

5. ORGANIC STORAGE, PROCESSING, HANDLING, AND DISTRIBUTION

Facility Management

Organic plan is required for each activity

Description of all specifications and steps under the control

Description, preferably a flow chart, of all the steps involved

All storage containers and packaging materials to use food grade coatings, paints and other coverings

Control systems that assure organic integrity and avoid potential commingling

Parallel Production is allowed if additional record keeping and organizational requirements are met

Producers to ensure organic integrity

HACCP or similar system involving critical control points

ISO 9000 series certification

ISO 14000 series certification

Efforts to reduce packaging in the handling operation

Irradiation and use of microwave is prohibited

Ecologically sound waste management plan and use of recycled materials

Managing Product Composition

Processors to maintain audit trail sufficient to track raw materials from supplier to retail

Input use list along with rationale for using non-organic ingredients (if any)

Nutritional quality to be preserved in processing and this point is made explicit

Additives and processing aids are used with product to maintain: nutritional value, food quality and composition and appearance

Regular or required residue testing for products

Certifier can test for residues if reason for suspicion

Producer must minimize packaging

Extra withdrawal time required after fumigation with prohibited material

On-farm processors to meet all processing standards

For 'organic' and 'MWO' products

Use of non-agricultural ingredients is kept to minimum

Certifier encourages using 100% organic ingredients/ requires preferential use of organic ingredients

Certifier allows an expanded set of non-agricultural ingredients in 'MWO' products

For 'COI' products

Certifier allows any ingredient to be used in COI products that are organically processed

Handling Regulations

Certifier has detailed guidelines for non-processor handlers

Handlers dealing with MWO or COI face less stringent standards

Less restrictive standards, if organic sales are below a specified level

Each transaction in supply chain has to be documented by both buyer and seller (if certified)

Handlers to maintain audit trail sufficient to track raw materials from suppliers to retail

Record of handling methods minimizing stress in animals

6. ORGANIC LABELLING GUIDELINES

Labelling Guidelines based on organic ingredients

"Organic" labelling on Principal Display Panel (PDP) requires

95-100% organic ingredients

or other % organic ingredients (specific)

"Made With Organic (MWO)" label on PDP requires

70-95% organic ingredients

50-95% organic ingredients

Other % organic ingredients

No guidelines

Products containing 70% or more of organic ingredients shall be labelled on the PDP as

Contains X% of organic ingredients OR contains X% of certified organic Y

Products not qualifying for MWO (<70%), but contain some organic ingredients

Statement of percent organic ingredients

Organic ingredients can be identified on ingredient information panel or side panel

Organic ingredients cannot be identified

Other norms

No guidelines

Organic food product shall not contain the same ingredients in both organic and non-organic forms

Program provides another certification, in addition to 'organic' or 'transitional'

For Products Labelled 'Organic'

Certification of processing is required

Certifier must pre-approve entire label

'Organic' must be smaller than product ID

Label on retail item must identify certifier of the final handler or distributor of product

Certifier contact information is required on retail item

Certifier name may appear on PDP

Certifier logo may appear on PDP

Certifier name may appear on label

Certifier logo may appear on label

Individual identification of organic ingredients on information panel

Statement of percent organic ingredients

No guidelines

For Products Labelled 'Made With Organic'

Certification of processing is required

Certifier name may appear on PDP

Certifier logo may appear on PDP

Certifier name may appear on label

Certifier logo may appear on label

'Organic' must be smaller than product ID

Individual identification of organic ingredients on information panel

Statement of percent organic ingredients

No guidelines

For Products Labelled 'Containing Organic Ingredients'

Certification of processing is required

'Organic' may not appear at all

Certifier name may appear on PDP

Certifier logo may appear on PDP

Certifier name may appear on label

Certifier logo may appear on label

Individual identification of organic ingredients on information panel

Statement of percent organic ingredients

No guidelines

For Packaged Multi-ingredient Products

For products labelled 'organic' on PDP

Certifier name may appear on PDP

Certifier logo may appear on PDP

Certifier name may appear on label

Certifier logo may appear on label

'Organic' must be smaller than product ID

Listing same ingredient from organic and non-organic sources is prohibited

Listing an ingredient as 'organic when available' is prohibited

Individual identification of organic ingredients on information panel

Statement of percent organic ingredients

No guidelines

Transitional Product Labelling

Transitional product is certifiable

Transitional product can use same logo as certified organic

Transitional product can use similar logo as certified organic

Label, seal or statement contains the word 'organic'

Labelling Through Distribution Chain

'Organic' required on invoice

'Organic' required on non-retailer container (box, bin, case and/or pallet)

Certifier ID required on invoice

Certifier ID required on non-retailer container (box, bin, case and/or pallet)

7. OVERALL CERTIFICATION PROGRAM MANAGEMENT

General Points

Policy prohibits undue disclosure by inspectors and decision makers

Policy prohibits financial interactions between applicants and inspectors/decision makers

At the time of application

One year before application

One year after application

Annual renewal of certification

Certifier performs unannounced second inspection on all first-time applicants

Certifier performs unannounced inspections on a random set of recertifying operators

Certifier reserves the right to make unannounced inspections at any time

Certifier will investigate reasonable reports of violations

Certified operator can appeal decertification decision

Organizational Structure

Program is run by producers' organization

Program is run by state

Program is run by non-profit organization

Program is self sufficient in funding

Certifier employs permanent staff

Board of Directors of this CB has final authority for de/certification process

In the case of State Programs,

Advisory board is mandated by statute

Board has input in standards decisions

Board has final decisions for standards

Board has input in de/certification

Board has final decision for de/certification

Interactions with Other Certification Programs

Program provides for communication with other program standards

Number of accredited certifying bodies

Number of accredited certifiers recognized by other programs also

Fee Structure

Determined by Program

Determined by individual certifiers

Basis for certification fees

For producers: Basis for fee

By sales volume

By physical size of operations

Flat fee for all producers

By number of inspections

By number of residue tests

By another criterion

For Processors: Basis for fee

By sales volume

By physical size of operations

Flat fee for all processors

By number of inspections

By number of residue tests

By another criterion

For Handlers: Basis for fee

By sales volume

By physical size of operations

Flat fee for all handlers

By number of inspections

By number of residue tests

By another criterion

Efforts to Promote Organic

Research efforts

Marketing efforts

Awareness campaign

Reference Standard

Appendix C

Comparison of Organic Standard Grades

Organic Standard Grades Selected for Comparison

Voluntary Organic Grades	Regulated Organic Grades
1. IFOAM	1. NOP
2. ISO 65	2. EU
3. CODEX	3. JAS
4. CCOF INTL	4. BIO SUISSE
5. DEMETER	5. BCCOP
6. ECOCERT	6. CAAQ
7. GOA	
8. FVO	
9. OEFFA	
10. OCIA	
11. QAI	
12. COPMS	
13. OCPRO	

IFOAM: International Federation of Organic Agriculture Movement

ISO 65: ISO 65 guideline of USDA

CODEX: Codex Alimentarius

CCOF INTL: California Certified Organic Farmers Certification Services, International

DEMETER: Demeter

ECOCERT: Garantie Bio Ecocert

GOA: Global Organic Alliance

FVO: International Certification Services/ Farm Verified Organic

OEFFA: Ohio Ecological Food and Farm Association

OCIA: Organic Crop Improvement Association International

QAI: Quality Assurance International

COPMS: Canadian Organic Principles and Management Standard

OCPRO: Organic Crop Producers and Processors Inc., and Pro-Cert Canada Inc.

NOP: National Organic Program of the United States of America

EU: European Union standards

JAS: Japan Agriculture Standards

BIO SUISSE: Switzerland Standards

BCCOP: British Columbia Certified Organic Program

CAAQ: Conseil des Appellations Agroalimentaires du Quebec

The following paragraphs provide a detailed comparison of organic standard grades.

General principles of organic production: As stated earlier, organic food is an outcome of the production activities following a set of practices. The underlying production principles and philosophy determine these practices. All the 18 organic grades that are analyzed here have mentioned these principles. However, programs differed in providing specific details and/ or the emphasis on various facets of these principles. Also, programs varied in terms of explicitly recognizing certain principles.

For example, OCIA and BCCOP recognized the importance of soil health and the soil building programs but did not recommend minimum tillage practices like the other comparable programs. Similarly, all but three programs, exclusively expressed the need to minimize/ prevent the environmental pollution from agriculture. Thirteen programs said that organic systems should provide safe environment for farm workers and other agricultural labourers. Almost all programs, except the two, acknowledged that organic certification did not guarantee residue-free or contaminant-free food.

More than half of the programs stressed on generating adequate returns to the entrepreneurs and hence, the providing economic sustainability of the operations. Majority of the programs did not mention about actions toward socially sustainable and just production, processing and distribution chains. Three of the programs also stated or implied that organic principles were in the interest of promoting consumers' health and creating appreciable value for them.

Regulation of materials: Fetter and Caswell (2002) state that the certification programs can be grouped into two based on their focus: programs that emphasize on the improvement of soil health and the programs that avoid certain materials. On the contrary, the observation here is that replenishment and promotion of long-term soil fertility and enrichment of soil health is one of the important aspects of all the organic programs that were surveyed. Programs planned to achieve this partly by following the management intensive cultural practices and partly by avoiding certain materials. Regarding the use of materials such as inputs, additives, and the processing aids in organic production, all the certification programs provided for the lists of materials that are allowed and prohibited. Most of the Material Lists were derived from the OMRI list. So, there were similarities in the formulation of Materials List. However, programs differed mainly in terms of the acceptability of specific materials.

Five of the programs articulated specific categories for materials: 'recommended', 'allowed', 'regulated' or 'restricted' and 'prohibited.' In majority of the cases, natural materials occupied the recommended list while synthetic compounds were prohibited. The regulated or restricted were mostly those materials whose usage was tolerated under certain conditions. Nine certifiers, including the above mentioned five, included in their Materials List a category for 'regulated' or 'restricted' substances and six of them implied that the producers must aim for 'continuous improvement' of the system by progressively reducing the use of these restricted materials.

Land and resource management: Most of the programs were identical in stressing on the importance of land and resource management principles and practices. These practices included: maintaining soil humus levels using compost, guidelines to use the crop residues and cover crops, following tillage practices that cause minimum damage to the soil structure and tilth, using the organic matter produced on the farm as the primary source of fertilization, and avoiding the addition and the removal of excess nutrients. However, only BIO SUISSE specified the amount of nutrient supply per hectare of land in terms of Large Animal Equivalents¹³.

Local or regional factors: The opinion of various organic certification programs in promoting farm economic system at local/ regional level was captured mainly in terms of their emphasis on using local inputs and marketing the products locally. On the two criteria, only one of the programs was explicit about the former and three programs were certain on the latter.

Prohibited practices and materials: Almost all programs were very vocal regarding the prohibition of certain practices and materials under the organic management. The use of synthetics in any form, genetically modified organisms and their derivatives, biosolids or sewage sludge as a source of manure and use of ionizing radiation (irradiation) was explicitly banned by all organic grades. Programs were also explicit on not permitting the rotation of production units into and out of organic management and on using seedlings and transplants (as planting material) that were not raised organically.

Organic crop production: Crop management practices outlined in the various organic certification programs were grouped into the ones concerning plan and transition period, crop husbandry practices, practices that allowed the enterprises to undertake organic as well as non-organic (conventional) production simultaneously, and measures that avoided contamination of farm and the crops by prohibited materials.

All programs required producers to submit a plan on organic crop production activities including the details on crop rotation. Programs also stressed on updating the plans annually. Five programs required mandatory soil nutrient tests before decision on certification. But, in general, programs were not keen in analyzing soil residues before the certification. However, four programs required regular soil residue testing but did not mention the frequency and timing of the tests. Majority programs compared here required a three-year transition period between the last application of a banned substance and the harvest of the first certified organic crop. Three programs also required that production be managed as per the standards for at least two years. Six of the 18 programs allowed producers to market their produce with labels such as 'certified transitional organic' or 'certified transitional'.

¹³ Large Animal Equivalents (LAE) corresponds to the annual manure output of one adult milking cow (105kg N, 35kg P₂O₅, 180kg K₂O, and 12kg Mg). For all other domestic animals, there are existing conversion factors (e.g. 1 sheep (not milked) = 0.17 LAE, 1 breeding pig = 0.45 LAE, 1 fattening pig = 0.17 LAE, 100 layers = 1 LAE, 100 fryers = 0.4 LAE, 100 turkeys = 1.5 LAE).

Regarding the crop husbandry practices, programs exclusively mentioned or implied that plant species that suit to the regional soil and climatic conditions and resistant to the predominant pests and diseases of the area were to be selected. Also, most of the programs stressed on sourcing the planting material from certified organic farms. However, programs differed greatly in setting the conditions for using the non-organic planting material. Six of the standard grades prohibited the use of fungicide treated seeds while nine programs regulated the use of fungicide treated seeds. Particulars on input use (raw manure, compost, irrigation water, and plastic materials) were broadly similar across the programs. Certification standards required that weeds were to be managed predominantly by cultural practices (cultivation techniques) and in some cases by mechanical/ thermal/ electric methods. Similarly, a combination of cultural practices (*e.g.* planting time, row spacing), mechanical methods (*e.g.* insect traps, thermal sterilization of soil) and biological methods (*e.g.* natural predators) were recommended to keep insects, pests and diseases under control. Insect, pest, disease and weed management standards were alike in the programs that were studied.

Sixteen programs allowed, explicitly or implicitly, entrepreneurs to undertake organic and conventional farming on the same farm provided the additional record keeping and organizational requirements are met. Two of the programs did not mention anything about this. However, eight programs required or encouraged eventual conversion of the whole farm. And, six programs said they required reports on practices and materials used on conventional portion of the farm and thus, sought greater control in the parallel production.

Programs suggested measures to prevent an unintentional contamination of organic crops by prohibited substances. As one of such measures, organic fields were required to have buffer zones on borders they shared with lands, such as highway or conventional field, where prohibited substances was a concern. Buffer zone requirement was featured in 16 of the 18 programs. In many cases, buffer zone meant a separation in space (usually, 8 meter or 25 feet wide strip of land). However, eight certifiers also required physical barriers and means to divert potentially contaminated runoff. But none of the programs required regular soil residue tests to ensure that contamination (if any) was attended to. However, four programs required regular residue tests in crops to see if there was any contamination by prohibited substances. CAAQ, for instance, recommended testing crops for the presence of hazardous substances when production units were near the potential pollution sources. On the other hand, BIO SUISSE adopted a stringent approach by not permitting the crops from the potential pollution areas to be marketed as organic. Moreover, seven of the 18 programs were suggestive of residue tests (not certain on the type and frequency of the test) in case of likelihood of any contamination. Though irrigation water is another potential source of contamination, only two of the programs required regular testing of irrigation water for the prohibited substances and four other programs suggested such tests in case of doubt.

Eleven programs defined the permissible levels of residues of prohibited substances (such as synthetic fertilizers/ pesticides/ herbicides) and stated that crops with residue levels above the permitted levels could not be certified organic. Thus, recognizing the

possibility of residues in organic food and setting a limit for them was in line with certifiers' acknowledgement that organic food is not residue-free. Programs varied significantly in treating drift of prohibited substances on to crops and land under organic management.

Organic livestock management: Livestock management under organic standards is based on three fundamental principles: (i) ethical and humane animal husbandry with an emphasis on provision of normal socialization and behavioural need of animals (ii) optimizing the health of animals while avoiding use of synthetic drugs (iii) emphasizing life-time performance and not maximum output. Almost all programs (except JAS) involved livestock standards and were highlighted either in preamble or in introductory sections. Six of the 17 programs have also provided conversion time requirements under organic feed and health care for the animals yielding non-edible products. Livestock standards, as in Fetter and Caswell (2002), are grouped into five sections: guidelines for sources and conversion times for organic animals; housing and husbandry practices; feed requirements; health care requirements; and enforcement methods. Often, the certification programs presented these guidelines separately for slaughter animals, dairy mammals and poultry. Two of the 17 programs clearly preferred to source animals and birds from the same farm whereas three programs did not explicitly emphasize this aspect. Remaining programs, however, favoured sourcing animals and birds from any of the certified organic farms. Almost all programs permitted the use of artificial insemination methods for breeding the livestock.

However, almost all programs (except for BCCOP in slaughter animals) allowed slaughter and dairy animals to be converted to organic production even when they were not born on certified organic farms. But under such conditions, animals were to be managed as per the organic feed and health care guidelines for a defined time period in order for their meat or milk to be labelled certified organic. The time period was mostly one year for the feed and in the range of 3-12 months for the health care. Only one of the programs imposed a more stringent norm that slaughter animals were to be under organic management from birth. Few programs also set a maximum limit for obtaining slaughter and dairy animals from non-organic sources and often this was to the tune of ten percent of the existing organic herd size.

In the case of poultry (broilers and layers), all programs allowed day-old chicks from non-organic sources as long as the parental flock was not treated with the prohibited substances. All programs (except BIO SUISSE) required birds (broilers as well as layers) to be in organic management latest from the second day of their lives in order for the meat and eggs to be certified.

Housing and husbandry practices were directed toward maximizing the health of livestock by offering enough natural light, fresh air, clean surroundings, access to indoor or outdoor exercise areas and comfort behaviours suited to the species and stage of production. All programs required that slaughter and dairy mammals have access to indoor or outdoor exercise areas (weather permitting). The programs, however, did not mention the frequency of such access. Only five of the programs required that slaughter

and dairy animals have daily access to outdoor areas, weather permitting. Seven programs had set specific standards for outdoor access areas. Almost all programs prohibited routine or extended indoor confinement of animals. Seven programs explicitly prohibited confinement for the duration of the animal's life.

In the case of poultry, seven programs required regular access to outdoors (weather permitting). Only one program required that poultry have daily access to the outdoors (for a minimum of six hours), weather permitting. Programs also mentioned the confinement guidelines. Almost all programs prohibited housing the birds in indoor cages. Six of the programs exclusively prohibited the indoor confinement of birds for their lifetime. However, surprisingly, one of the programs explicitly permitted the indoor confinement of birds for their lifetime.

Standards outlining the livestock feed requirements under various organic management systems were dealing with two major issues: nature and the composition of feed. Almost all programs emphasized the supply of nutritionally balanced diet as per the requirements of species and the stage of production. Six of the programs preferred to obtain feed from the same farm. Thirteen of the 17 programs required that 100 percent of the feed given to organic animals be certified organic. Twelve programs provided special guidelines for the producers to follow in an event of 'feed emergency' (certified feed is unavailable in sufficient quantity). However, programs differed with respect to the implementation of emergency provisions. Six programs required that producers obtain approval from the certifying agencies before implementing emergency provisions while three programs had set an upper limit on the percentage of allowable emergency feed. One of the programs stated absolute time limit for the use of emergency feed allowances. Four of the programs allowed supplying non-organic feeds for a time period not exceeding six months. But these four programs did not explain the rationale for such an unusual provision. Issues surrounding the composition of feed were related to the proportion of concentrates, supplements (vitamins, amino acids) and additives (trace elements) in the dietary ration. It is important to note that just three programs had provisions (quantitative limits) on the proportion of dry matter supply that could come from concentrates. This indicated that programs in general were avoiding the use of concentrates.

Overall, programs had similar health care requirements for animals. Programs were unanimous in emphasizing: preventive care as the first line of defense against diseases, use of biological, cultural and physical treatments/ practices in treating the diseases, and use of allopathic treatments as a last resort. Almost all programs stated that withholding treatment from sick animals in order to maintain organic status was not permitted or was grounds for decertification. This is an important aspect in averting unnecessary suffering to animals in cases of illness that cannot be adequately treated by organic-approved methods and thus, instigated the use of prohibited substances (antibiotic or parasiticide).

When the prohibited remedies were used, detailed records were to be maintained throughout the supply chain and the treated animals were to be identified separately. Products from the treated animals were not to be marketed organic until a time period known as 'withdrawal period'. The required withdrawal time was either for a temporary

or a permanent period. Programs specified the withdrawal periods in terms of: a multiple (usually two times) of the time required by the federal agency (such as Food and Drug Administration of the United States of America) for the specific medication, an absolute amount of time, or the greater of the above mentioned two durations. The absolute time period requirement for withdrawal, as recommended by various programs, ranged from 14 days to 90 days in slaughter animals and from one week to one year in dairy mammals. Four of the programs required permanent withdrawal of slaughter animals from organic production if animals had been treated internally with a prohibited substance. However, all programs allowed dairy animals to be brought back into organic production after meeting the withdrawal period requirements. All programs prohibited the administration of sub therapeutic doses of antibiotics, a practice used in conventional livestock operations to promote weight gain, prevent disease, or both (Fetter and Caswell, 2002).

Most programs used either the organic plan or the audit trail as an enforcement tool for organic livestock practices (BIO SUISSE used 'contract agreement'). Another uniform standard across the programs was that medical records of the individual animals (or flocks, in birds) were required to be maintained throughout the life cycle. Individual animal identification marks/ tags (except in the case of birds) were allowed.

Organic maple syrup production: Production of maple syrup is not economically important in all the agricultural systems. Therefore, expectedly, standardized practices involving collection of sap from sugar maple and the subsequent conversion into syrup were not mentioned by all the certification programs discussed here. Only four of the 18 programs provided standards for organic maple syrup production. These four programs had almost identical specifications with respect to tapping the maple trees, sap collection and the processing of sap into syrup.

Organic honey production: Five of the 18 programs mentioned organic honey production standards and all of them were very similar to each other. These programs stated that apiculture was to be a part of the agricultural production activities so that natural resistance against pest and disease infestation is promoted. However, aiding in pollination activities, which is generally understood to be an important function of honeybees was not indicated. The operators were required to possess knowledge of bee life cycle, pests, and diseases and were also responsible for adequate record keeping. It was required under the standards that operators demonstrate that bees had not been collecting nectar from sites treated with prohibited substances.

Organic honey production standards also recommended that certain practices be followed. They included: rearing genetically diverse queens that reduced the risk of diseases, comb foundation from organic sources, restrictions on the materials to be used for hive construction, honey harvesting methods that used no synthetic compounds, use of antibiotics only when the health of colony was threatened, and the maximum time period (usually not two years) for which honey could be stored.

Production of organic sprouts: Only seven of the programs mentioned organic sprout production standards. The two main requirements were that of using organic seeds and

the water quality that met or exceeded the standards for microbial, chemical contaminants and chlorine levels set by the respective federal regulatory agencies.

Organic mushroom production: Twelve programs included mushroom production standards that dealt mainly with the nature of spawn (seed material), growth media and the practices of mushroom production. The practices were similar across the programs.

Organic greenhouse management standards: Organic greenhouse management standards were not common among the programs. Only six certifiers had developed greenhouse standards. Four programs permitted the use of glass, polyethylene, and polycarbonates for the construction of greenhouses whereas biodegradable plastics were prohibited. Four certifiers accepted the following other practices: steam heat sterilization to clean and disinfect pots and containers; hot water or steam water treatment, pruning, vacuuming, rogueing, use of air filters, and/ or screens to prevent and control pests and diseases. Two programs (COPMS and CAAQ) were explicit in allowing the use of plant and animal based regulators that stimulated plant growth or development. Only BCCOP was explicit in defining the requirements of greenhouse management plan, conversion period of three years and biologically active growth medium.

Organic wine production: Wine production did not catch the attention of all the certifiers. Where the standards existed the requirements mainly concerned with the nature of grape (must be certified organic), discouraging the use of sulphur di oxide, and type of material to be used for the construction storage barrels. However, it is important to note that grapes were to be produced according to the approved organic crop production standards.

Wild harvest and collections: Six of the 18 programs had developed standards according to which wild harvests and natural collections could be labelled organic. The six programs required operators to adopt measures that protected wild species and also did not disturb the stable natural environment. Programs also stated that harvest area were to be managed for 36 months as per requirements of the standard. Operators were also required to maintain proper records on the species and harvest and must be made available at the time of inspections. Only two of the six programs permitted mixing of the wild harvest and natural collections with other organic food produced under the programs. For example, blue berries collected following the standards set in COPMS may be mixed with blue berries produced from the orchards maintained as per the COPMS program requirements. Three programs used audit trail as an enforcement tool.

Organic storage, processing, handling, and distribution: As explained earlier in this chapter, certification programs evolved to ensure integrity of organic goods from production to the final consumption. In the above paragraphs, production related aspects have been discussed. This section deals with many of the post-production activities such as handling¹⁴, storage, processing¹⁵, and distribution. Usually, an operator deals with two

¹⁴ Handling regulations included the guidelines for storage, packaging, brokerage, shipping, transfer of title, and any other activity, except processing, in moving the product from producer to the final consumer.

or more activities. For instance, a processor is involved in handling and storing the ingredients required for a processed food, actual processing, and handling of the finished product. Similarly, a distributor of organic food may have undertaken storage as well as handling.

Certifiers' guidelines in protecting the purity of organic goods during the post-production activities were grouped into three categories: facility management, managing product composition and the handling regulations. All the programs required entrepreneurs to present a plan for each activity (*e.g.* for storage, processing, distribution) and stressed that operators establish control systems that assure organic integrity and also avoid potential commingling. Six of the 18 programs stated that operators must describe the steps involved in different activities and an equal number of programs also preferred to have the steps specified in the form of a flow chart.

Sufficient record keeping and organizational requirements were must for a facility to be used for organic and conventional operations, a guideline expressed by majority of the certifiers. Almost all programs made it essential to use food grade containers, coatings, paints and coverings. However, the safety and quality assurance programs popular in food processing industries found very few mentions. For example, only three certifiers required that producers follow Hazard Analysis and Critical Control Point (HACCP) or any other similar system involving critical control points and one program recommended the adoption of ISO 9000¹⁶. In general, most programs agreed on preventing/ minimizing environmental pollution from agriculture. However, only five certifiers successfully engaged the processors in this issue by requiring the facilities to adopt ecologically sound waste management systems, use recycled materials, and minimize packaging the certified organic products. None of the certifiers, however, recommended adoption of systems such as ISO 14000¹⁷.

While managing the composition of multi-ingredient processed organic product, six of the 18 programs exclusively stated that processing activity should preserve the nutritional quality of the ingredients. With this effect, five programs permitted the use of additives and processing aids that did not alter nutritional value, food quality as well as composition and appearance. Five programs required that processors maintain sufficient records that could trace the origin of raw materials. Seven programs stated that each transaction in supply chain had to be documented by both buyer and seller. Six programs also stated that operators must possess records on input use and establish reasons (if, any) for using non-organic ingredients¹⁸. In the case of 'organic' and 'made with organic' (WMO) products (see footnote 6), seven certifiers required minimum use of non-agricultural ingredients and also encouraged the operators to use 100 percent organic

¹⁵ "Processing includes cooking, drying, mixing, fermenting, freezing, and other manufacturing that alters the flavor, keeping quality, or any other property of the food" (Fetter and Caswell, 2002).

¹⁶ Comprehensive quality management system of the International Organization for Standardization (ISO) widely used in business-to-business dealings.

¹⁷ ISO 14000 is an environmental management system enabling an enterprise to meet its environmental challenges including that of minimizing harmful effects on the environment caused by its activities. The system strives to achieve continuous improvement in the environmental performance of the enterprise.

¹⁸ The details are presented in the next section.

ingredients. In a less restrictive sense, two programs stated that any ingredient might be used in products of 'contains organic ingredients' (COI) category (see footnote 6). As these two certifiers did not provide sufficient explanation on what constitutes 'any ingredient', interpretations that assumed the use of irradiated or even genetically engineered ingredients could not be easily defeated.

To ensure processed products did not contain residues of prohibited substances, six of the certifiers recommended residue tests when reasons for suspicion existed. One of the programs, however, required regular testing of processed products to verify the levels of prohibited materials. Also, only five certifiers allowed processors to use prohibited materials to fumigate the areas where organic products or ingredients might be stored or processed. Three of the programs had detailed guidelines for non-processor handlers. However, seven programs stated that handlers had to maintain audit trail sufficient to track raw materials from suppliers to retail. In one of the programs, guidelines for handlers varied depending on the sales value they generated and the nature of organic product (organic, WMO, or COI) handled.

Organic labelling guidelines: These guidelines were related to labelling of multi-ingredient processed products and in most of the certification programs that were compared, product-labelling guidelines were based on the proportion of organic ingredients. In general, it was a three-way classification and the requirements were very much similar across most of the programs. Moreover, programs did not permit products to contain the same ingredients in both organic and non-organic forms.

Products with highest percentage organic ingredients (often, 95-100%) could be labelled as 'certified organic' on Principal Display Panel (PDP). For instance, 'certified organic granola bar'. Certifiers like BIO SUISSE imposed an additional requirement that at least 90% of the raw materials were to be Swiss grown in order to use 'bud' label along with the words 'Bio' and 'Suisse' (equivalent to certified organic). Most programs (except three) allowed a second category of products when organic ingredients ranged from 70 to 95%. Products in this group carried a label of 'Made With Organic' (MWO) on the PDP, for example, 'granola bars made with organic oats, nuts and honey'. Instead, COPMS and BCCOP required only an indication of the percentage of organic ingredients (*e.g.* contains X% of organic ingredients or contains X% of certified organic Y) on PDP when products contained 70-95% of organic ingredients. QAI, in a less restrictive sense, permitted the use of WMO label when products were comprised of 50-95% organic ingredients. Fourteen of the 18 programs allowed a third category (equivalent to 'contains organic ingredients' (COI) mentioned in Fetter and Caswell, 2002) of labelling for products with smaller percentage (usually, less than 70%) of organic ingredients. In this case certifiers did not permit the claim to be presented on prominent place such as that of PDP. But specifying the percentage of certified organic ingredients was permitted on the ingredient list or side panel of the product package.

However, programs differed in specifying the requirements regarding the placement of certifier's name and logo on PDP and/ or label, in demanding processing certificates before any claim of organic nature was made, in labelling organic containers through the

distribution chain, and in setting approval guidelines for the label design. Although many programs permitted transitional product labelling, none of them allowed a transitional product logo same as that of certified organic product. Also, under the provisions of two programs, transitional product label, seal, or statement did not contain the word 'organic'. Thus, certifiers have tried to separate certified organic from transitional and avoid confusion in the marketplace.

Overall certification program management: In order to understand how the different certifiers administered the programs, management of the certification programs was compared. However, focus of the analysis was to note significant similarities and/ or differences in general administration of the programs. Many programs prohibited disclosure of certain kinds of information about certified operators by the inspectors and decision makers. Also, programs prohibited financial transactions of any nature between the applicants and the inspectors or decision makers during the one-year pre and post certification period.

Annual renewal of the certification as well as annual inspection of the operations was required under most of the programs. Four of the certifiers reserved the right to make unannounced inspections of the operations at any time and an equal number of certifiers performed unannounced second inspections on all the first-time applicants and on few of the re-applicants. Six of the 18 programs exclusively permitted certifying agencies to investigate any reports of violations and the same certifiers also allowed the operators to appeal against the decertification decisions (if, any) of the certifying agencies. Moreover, BCCOP recommended that producers voluntarily withdrew from certification upon non-adherence to the organic principles and thus, left the onus of responsibility on producers. Fifteen of the 18 programs indicated their ongoing dialogues and the standing recognition agreements (verbal or written) with other certifiers. Such equivalency agreements might prove useful in sourcing inputs and other production variables.

Appendix D

Ontario Agricultural College
Department of Food, Agricultural and Resource Economics

Questionnaire

Consumer Awareness and Preferences for Organic Food Standards

Researchers in the Department of Food, Agricultural, and Resource Economics at the University of Guelph have developed a questionnaire to better understand the factors that motivate consumer purchases of organic food.

The researchers are interested in what you think and therefore, there are no questions that have a “right” or “wrong” answer. If you decide to participate in the survey, there are a couple of things you should know:

- You are not required to answer any question that you do not want to answer.
- You have the right to stop answering the questionnaire at any time.
- All responses to this questionnaire will remain confidential and we will not record your name nor identify you in any way with your answers.
- Finally, completing the questionnaire constitutes your consent to participate in the research.

This study has been reviewed and received ethical clearance through the University of Guelph Research Ethics Board. If you have questions regarding your rights as a research participant, please contact Ms. S. Auld of the University of Guelph Research Ethics Board at 519-824-4120 ext. 56606 or sauld@uoguelph.ca. If you have any further questions, please do not hesitate to email us at sshellik@uoguelph.ca or bdeaton@uoguelph.ca or jcranfie@uoguelph.ca. Alternatively, you can also write to us at:

Shreenivas Shellikeri / Dr. Brady Deaton / Dr. John Cranfield
Department of Food, Agricultural and Resource Economics
University of Guelph
Guelph, ON N1G 2W1
Telephone: 519-824-4120 (ext. 52765 or ext. 58527)

We thank you for your time and valuable contribution to this study.

Enumerator: _____ Questionnaire number: _____ Location: _____

Date: _____ Time: _____

1. Do you regularly participate in food purchase decisions for your household? (Check one)

- ☐ Yes
- ☐ No
- ☐ Not Sure

2. Have you purchased organic food products in the past three months? (Check one)

- ☐ Yes
- ☐ No
- ☐ Not Sure

3. *Do you plan on purchasing organic food products in the next three months?* (Check one)

- ☐ Yes
- ☐ No
- ☐ Not Sure

4. How often do you purchase organic food products? (*Check one*)

- ☐ Never
- ☐ Weekly
- ☐ Every two weeks
- ☐ Once a month
- ☐ Once every two months
- ☐ Not Sure

5. *Have you purchased organic fruits in the past three months?* (Check one)

- ☐ Yes
- ☐ No
- ☐ Not Sure

6. Have you purchased organic apples in the past three months? (Check one)

- ☐ Yes
☐ No
☐ Not Sure

7. For the following statements, please indicate the extent to which you agree or disagree
(Choose one box for each statement)

Statement	<div style="display: flex; justify-content: space-between;"> Strongly Agree Strongly Disagree </div> <div style="text-align: center; margin-top: 5px;"> ← → </div>									
	10	9	8	7	6	5	4	3	2	1
I am concerned about how the food I buy is produced	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
I am concerned about where the food I buy is produced	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
I carefully read the labels on food products	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
I trust government to make sure that food labels are accurate	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
While shopping, I do not pay close attention to the prices of food	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
I am concerned about the presence of chemicals in the foods	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
When buying food products taste of the food is an important factor	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
I always try to buy fresh fruits and vegetables	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Agricultural production shouldn't rely on the use of synthetic chemicals	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

8. Using the scale below, please indicate your level of knowledge with the following:
(Check one box for each)

	<div>High level of knowledge ←</div> <div>Low level of knowledge →</div>										Never Heard of
	10	9	8	7	6	5	4	3	2	1	
Genetic Engineering	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Nanotechnology	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Organic food production methods	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

9. Using the following scale, please indicate the extent to which you agree or disagree with each of the statements regarding organic food. (Check one box for each statement)

Organic food is:	<div>Strongly Agree ←</div> <div>Strongly Disagree →</div>									
	10	9	8	7	6	5	4	3	2	1
Produced in an environmentally friendly way	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Pesticide-free	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Free from genetically modified organisms	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Naturally grown	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Grown without the application of synthetic chemicals	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Produced using rearing methods that treat animals humanely	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Grown locally	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Grown in accordance with a set of pre-determined standards	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Certified by an independent party to adhere to production standards	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Always identified by a certification label	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

10. You will be presented with descriptions of twelve Red Delicious apples that are identified as organic. Please assume that all the apples look and taste the same and possess the same nutritional values.

However, these apples differ from each other in terms of (a) the retail prices and (b) the standards that define the apples as organic. The term organic standard refers to the set of rules that determine how food must be produced. The rules may vary from one organic standard to another.

In the apple descriptions that I will provide you with, the organic standards vary according to the rules that govern:

- (1) Where an apple can be grown;
- (2) How frequently an apple is tested for the presence of synthetic pesticide residues;
- (3) The organization responsible for setting the organic standard; and
- (4) The organization responsible for monitoring whether farmers are following the organic standards.

Taking into account the above-mentioned details, please rank these apple descriptions (SHOW THE PRODUCT CARDS) from the most likely to purchase to the least likely to purchase.

The first step is to sort them into groups. Group I should contain the descriptions of apples that you would consider buying. Group II should contain the apple descriptions that you are not likely to buy. Group III should contain the apple descriptions about which you are not certain whether to buy or not to buy.

The second step is to rank the descriptions in each group from the most preferred to the least preferred. Can you start with Group I? Can you now do the same for the apple descriptions in Group II? Can you now do the same for the apple descriptions in Group III?

PLEASE DO NOT WRITE DOWN THE RANKINGS. INSTEAD, PROCEED WITH THE NEXT QUESTION.

	Rank		Rank		Rank
Apple 1		Apple 2		Apple 3	
Apple 4		Apple 5		Apple 6	
Apple 7		Apple 8		Apple 9	
Apple 10		Apple 11		Apple 12	

Organic Apple 1

Testing for synthetic pesticide residues: Regular testing of apples is required

Geographic location: Apples must be grown in Canada

Organic standard is set by: Non-farmer private organization

Organization monitoring farmers' compliance with an organic standard: Federal government agency

Retail Price: \$ 2.19 per lb (4.83 per kg)

Organic Apple 2

Testing for synthetic pesticide residues: Testing of apples is not required

Geographic location: No specific rules governing where apples must be grown

Organic standard is set by: Government agency

Organization monitoring farmers' compliance with an organic standard: Federal government agency

Retail Price: \$ 2.69 per lb (5.94 per kg)

Organic Apple 3

Testing for synthetic pesticide residues: Testing required when there is a reason to believe that the apples have been exposed to pesticides

Geographic location: Apples must be grown in Ontario

Organic standard is set by: Government agency

Organization monitoring farmers' compliance with an organic standard: Private agency

Retail Price: \$ 2.19 per lb (4.83 per kg)

Organic Apple 4

Testing for synthetic pesticide residues: Testing required when there is a reason to believe that the apples have been exposed to pesticides

Geographic location: No specific rules governing where apples must be grown

Organic standard is set by: Non-farmer private organization

Organization monitoring farmers' compliance with an organic standard: Provincial government agency

Retail Price: \$ 1.69 per lb (3.73 per kg)

Organic Apple 5

Testing for synthetic pesticide residues: Regular testing of apples is required

Geographic location: No specific rules governing where apples must be grown

Organic standard is set by: Government agency

Organization monitoring farmers' compliance with an organic standard: Private agency

Retail Price: \$ 1.69 per lb (3.73 per kg)

Organic Apple 6

Testing for synthetic pesticide residues: Testing required when there is a reason to believe that the apples have been exposed to pesticides

Geographic location: No specific rules governing where apples must be grown

Organic standard is set by: Farmer-controlled private organization

Organization monitoring farmers' compliance with an organic standard: Federal government agency

Retail Price: \$ 2.19 per lb (4.83 per kg)

Organic Apple 7

Testing for synthetic pesticide residues: Testing of apples is not required

Geographic location: No specific rules governing where apples must be grown

Organic standard is set by: Non-farmer private organization

Organization monitoring farmers' compliance with an organic standard: Private agency

Retail Price: \$ 2.19 per lb (4.83 per kg)

Organic Apple 8

Testing for synthetic pesticide residues: Testing of apples is not required

Geographic location: Apples must be grown in Canada

Organic standard is set by: Government agency

Organization monitoring farmers' compliance with an organic standard: Provincial government agency

Retail Price: \$ 2.19 per lb (4.83 per kg)

Organic Apple 9

Testing for synthetic pesticide residues: Testing of apples is not required

Geographic location: Apples must be grown in Canada

Organic standard is set by: Farmer-controlled private organization

Organization monitoring farmers' compliance with an organic standard: Private agency

Retail Price: \$ 1.69 per lb (3.73 per kg)

Organic Apple 10

Testing for synthetic pesticide residues: Regular testing of apples is required

Geographic location: Apples must be grown in Ontario

Organic standard is set by: Farmer-controlled private organization

Organization monitoring farmers' compliance with an organic standard: Provincial government agency

Retail Price: \$ 2.69 per lb (5.94 per kg)

Organic Apple 11

Testing for synthetic pesticide residues: Testing of apples is not required

Geographic location: Apples must be grown in Ontario

Organic standard is set by: Non-farmer private organization

Organization monitoring farmers' compliance with an organic standard: Federal government agency

Retail Price: \$ 1.69 per lb (3.73 per kg)

Organic Apple 12

Testing for synthetic pesticide residues: Testing required when there is a reason to believe that the apples have been exposed to pesticides

Geographic location: Apples must be grown in Canada

Organic standard is set by: Non-farmer private organization

Organization monitoring farmers' compliance with an organic standard: Private agency

Retail Price: \$ 2.69 per lb (5.94 per kg)

The last part of this survey seeks general information about yourself. The information that you provide will be kept strictly confidential. The information can be used to compare the survey sample to the general population of Ontario.

11. Are you a male or female? (*Check one*)

- ☐ Male
- ☐ Female

12. To which of these age groups do you belong? (*Check one*)

- ☐ 18 - 20
- ☐ 20 - 24
- ☐ 25 - 34
- ☐ 35 - 44
- ☐ 45 - 54
- ☐ 55 - 64
- ☐ 65 years of age and older

13. What was the highest level of education you completed? (*Check one*)

- ☐ Some Grade School
- ☐ Some High School
- ☐ High School Graduate
- ☐ Some University/College
- ☐ University/College Graduate
- ☐ Some Graduate School
- ☐ Masters Degree
- ☐ Doctoral Degree

14. What is your occupation? (Please write in the space provided)

15. How long have you lived in Ontario? (Please write in the space provided)

_____ Years

16. Which one of the following best describes your marital status? (*Check one*)

- ☐ Single
- ☐ Married /common law partner
- ☐ Separated/divorced
- ☐ Widow/Widower

17. *How many people live in your home including yourself?* (Please write in the space provided)

18. *How many people in your household are under the age of 18 years?* (Please write in the space provided)

19. Do you spend your free time working with any of the following types of organizations? (*Check all that apply*)

- ☐ Food group
- ☐ Farm organization
- ☐ Environmental action group
- ☐ Community Shared Agriculture
- ☐ None of the above

20. *Do you work or have you worked in an industry that directly deals with organic foods?*

- ☐ Yes
- ☐ No
- ☐ Not Sure

21. Which one of the following best describes your annual household income level?
(Check one)

- ☐ under \$19,999
- ☐ \$20,000 - \$24,999
- ☐ \$25,000 - \$34,999
- ☐ \$35,000 - \$44,999
- ☐ \$45,000 - \$54,999
- ☐ \$55,000 - \$64,999
- ☐ \$65,000 - \$74,999
- ☐ \$75,000 - \$89,999
- ☐ \$90,000 - \$120,000
- ☐ more than \$120,000

22. If you have any additional comments please feel free to express them below. *(Please write in the space provided)*

Thank you very much for taking time to complete this questionnaire. Your participation in this research study is very important and is greatly appreciated. If you have any comments or concerns, please do not hesitate to contact us.

Moreover, if you wish to be informed about the outcome of this research, please provide the contact information on a separate sheet.